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ILLUSIONS OF CONTROL: EXPLORING THE DISSOCIATION BETWEEN EXPLICIT AND IMPLICIT SYSTEMS

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A thesis submitted to the School of Psychology, Bangor University, in fulfillment of the requirements of the Degree of Doctor of Philosophy

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"The easiest person to deceive is one's own self."

Edward Bulwer-Lytton (Vol. II, p. 189) The Disowned 1828, Chapter xlii

"When a person cannot deceive himself the chances are against his being able to deceive other people."

Mark Twain (Mark Twain's Autobiography, 1924)

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SUMMARY

The research in this thesis was motivated by the paradoxical concept of classic self-deception; how can an individual hold two contradictory beliefs simultaneously? von Hippel and Trivers (2011) proposed that a dissociation between inaccurate explicit (conscious) and accurate implicit (unconscious) information may facilitate self-deception. The thesis aims were to provide support for the dissociation theory, and to explore whether either system was predictive of future decision-making. This was examined via perceptions of control using tasks, in which responses and outcomes were predominantly noncontingently related (Alloy & Abramson, 1979). It was hypothesised that people would treat noncontingent situations as contingent situations and display illusions of control (IOC). In line with the theory of depressive realism, it was proposed that nondepressed people would report greater IOCs, whilst depressed people would be more realistic (Dobson & Franche, 1989). The task enabled the comparison between the subjective explicit/implicit judgements of control and the objective control. The novelty of the analysis was that the implicit measure of control was calculated using the judgements of reinforcement for each response. The results demonstrated strong evidence for the IOC, as the explicit perceptions were greatly overestimated compared to the actual control experienced. Conversely, the implicit judgements were more similar to the actual control, and thus more accurate. Therefore, support for the dissociation theory was present. However, contrary to expectations, subsequent response decisions appeared to be predominantly influenced by the more accurate implicit system. Additionally, there was only weak support for the depressive realism theory. This research has important implications for the adaptiveness of self-deception, how it can function within an individual, and the notion that mentally healthy people perceive reality accurately. Indeed, the prevalence of the IOC throughout the experiments indicates that people are commonly prone to unrealistically positive illusions, which has applications for clinical therapy.

PREFACE

Chapter One presents theories concerning self-deception; examining the most influential models and evaluating both the supporting and conflicting research. The concept of self-deception is the motivation that underlies the research in the thesis, specifically how mental processes might permit an individual to hold two contradictory, but simultaneously held beliefs. Whilst some researchers propose that this is illogical (Mele, 1997, 2001), the experiments in the thesis aim to investigate the evolutionary theory of a dissociation between explicit (conscious) and implicit (unconscious) processes that may facilitate self-deception (Trivers, 2000; von Hippel & Trivers, 2011). This is important, as it has implications for the literature on consciousness, and how information is encoded and stored within an individual. Additionally, a principal aim is to investigate the influence of each system of future decision-making, as this has implications for the adaptiveness of the dissociation theory.

Chapter Two provides the foundations for the design of the experiments that will constitute the thesis. It introduces the form of self-deception that will serve as the focus throughout the thesis; the illusion of control, a form of positive illusion where individuals deceive themselves in to believing that they have more control than the objective probability would allow (Langer, 1975). It also evaluates the literature on depressive realism, in which depressed people supposedly have a more realistic understanding about their environment (Alloy & Abramson, 1979), which could have implications for therapeutic interventions. Finally, it introduces the task that will be utilised and adapted throughout the thesis, the novelty of it being that it allows the comparison of subjective explicit and implicit judgements of control with the objective data. In particular, the implicit measure of control can be calculated using the conditional probabilities to examine the accuracy in comparison to the proposed inaccurate explicit data. This is essential to examine the concept of the dissociation.

Chapter Three describes the components of the task, as well as the modifications to the Alloy and Abramson (1979) set-up, as well as the procedures and statistical analysis for the experiments in the thesis. The first experiment is then presented, which investigates the explicit/implicit dissociation in a noncontingent situation, in which responses and outcomes are unrelated. Whilst previous studies have looked at subsequent responding, the experiments in this thesis will also assess how predictive the explicit and implicit systems are for future responses, which has implications for the adaptiveness of the evolutionary

model. This study reveals that people overestimate their control, i.e. display an IOC, which varies depending on the prevalence of active or passive reinforcement, whilst concurrently demonstrating accurate implicit judgements via their understandings of the conditional probabilities. Finally, the inaccurate explicit information appears to be more influential on future response decisions. These findings are interpreted as providing evidence for the evolutionary theory of self-deception (Trivers, 2000).

Chapter Four aims to extend the findings in the previous chapter by exploring the explicit/implicit dissociation in a contingent task, as well as the influence of the sign of the contingency and the frequency of the desired outcome. Experiment 2 finds an effect of outcome frequency, such that even when the actual control is kept constant, higher frequency of the desired outcome results in greater IOCs than low frequency. Additionally, the explicit perceptions of control appear to be more accurate, so the dissociation was less evident, and implicit knowledge emerges as more influential on future decision-making.

Chapter Five modifies the noncontingency task in order to investigate the effects of response modality. This is based on findings in Experiments 1 and 2 that reinforcement for active responding (active involvement) resulted in higher IOCs than for passive responding. This study reveals that when the responses are both active, the IOC is more inflated, and it eliminates the finding of the different patterns for response type that were present in Chapters Three and Four. Additionally, the implicit system remains more accurate and influential on subsequent responses. This has implications for the mode of representation that is used in tasks, as response modalities influence task performance differently.

Chapter Six demonstrates the validity and reliability of the research conducted thus far. Whilst the previously reviewed literature focused on a single time point, Experiment 4 investigates the IOC and dissociation across two time points, in which no intervention occurs. This study finds support for the maintenance of illusions in the long-term, supporting the notion that they are enduring and reliable (Taylor & Brown, 1988). Furthermore, Experiment 5 explores the real world applications of the research by investigating a novel psychometrics testing system on trainee traders, in which there are numerous personal and situation variables that are conducive to encouraging an IOC. This suggests support for an association between increases in control, risk-perception, and error, which has implications for job suitability and recruitment by employers, and discusses the importance of supplementary implicit information.

Based on the literature from Chapter Two that people are motivated to perceive a sense of control (Langer, 1975; Seligman, 1975), Chapter Seven investigates the effects of priming motivations on the IOC and explicit/implicit dissociation. Experiments 6 and 7 examine the power and competence motivations respectively. Fast et al. (2009) demonstrated that high power resulted in higher IOCs in a die-rolling task, so the novelty and significance of Experiment 6 was to increase the validity of this research by demonstrating the same effects using the noncontingency task, which is a more robust measure. However, whilst IOCs were present and the implicit system was generally more accurate, there did not appear to be an effect of motives on the control measures, which requires further investigation.

Chapter Eight, the last experimental chapter will examine the effects of a positive psychology intervention known as attribution retraining on the IOC and explicit/implicit dissociation. This intervention has been successful at increasing well-being and the perceived controllability of events and outcomes by changing attribution style, and this study was the first to look at the potential effects of the intervention on IOCs. Weak support was found, but Experiment 8 suggests that the intervention was successful at increasing perceptions of control in the experimental condition at post-test, and the dissociation was more evident.

Finally, Chapter Nine discusses the main findings of the thesis, and discusses the implications on self-deception, and the real world applications regarding employment and clinical therapeutic interventions.

CHAPTER ONE

LITERATURE REVIEW: SELF-DECEPTION

There is a common belief that it is beneficial to view the world objectively and accurately. Particularly in the realm of mental health, people were considered mentally healthy and capable of functioning effectively if they perceived reality accurately (Jahoda, 1958). However, in practice, this does not appear to be the reality, as can be seen in the increasing amount of literature investigating the phenomenon of self-deception in humans and their understanding of contingencies in the environment.

Self-deception is an interesting, and at times controversial subject, which presents a real puzzle from an adaptive perspective. Numerous theories have attempted to understand the topic, although only limited empirical research into supposedly self-deceptive behaviour has been presented to support these (Gur & Sackeim, 1985; Smith, 2004). Additionally, it seems that there is not an agreed upon definition or complete account of self-deception between psychologists as "the complexity of the phenomenon outstrips our knowledge" (Mele, 1997, p. 65). The aim of this introductory chapter is to provide a literature review outlining and examining the main theories of self-deception: traditional (classic), deflationary, and evolutionary, to evaluate the seminal research that has contributed to the literature thus far, and to discuss the benefits and costs of practicing self-deception. The greater our understanding of self-deception, the more likely it is that we will be able to do something about it.

1.1 The Traditional Approach

According to the Collins English Dictionary (2012), the definition of self-deception is "the act or an instance of deceiving oneself, especially as to the true nature of one's feelings or motives". This implies that the self-deceiver convinces him or herself of a falsity, whilst the truth remains hidden or inaccessible. This is in line with the traditional (or classic) approach to self-deception, which proposes that the self-deceiver (at some point) simultaneously believes that p and believes that not-p. Supporters of the traditional approach tend to understand self-deception in terms of interpersonal deception. In interpersonal deception, person A may deceive person B into falsely believing that p, and

there may be a time at which, simultaneously, person A believes that not-p and person B believes that p. Based on this model, it may be assumed that self-deception is when person A deceives person B (who may be the same person as A), and therefore, there may be a time when this person believes that p and not-p simultaneously (Mele, 2001).

Some psychologists think that self-deceivers begin by believing that not-p, and then deceive themselves into believing that p, with a point at which they believe both simultaneously (Kipp, 1980). Others believe that the self-deceiving individual has two subsystems so that the false belief (p) is held in the conscious mind and the truth (not-p) is held in the unconscious mind, which therefore keeps the two contradictory beliefs separate (Gur & Sackeim, 1979; Hilgard, 1986). Gur and Sackeim (1979) proposed the following four necessary conditions:

1. The individual holds two contradictory beliefs (p and not-p).
2. These two contradictory beliefs are held simultaneously.
3. The individual is not aware of holding one of the beliefs.
4. The act that determines which belief is and which belief is not subject to awareness is a motivated act.

1.1.1 Seminal research: Voice recognition studies

The supporting evidence for Gur and Sackeim's (1979) concept of self-deception was derived from a series of voice-recognition studies. They aimed to demonstrate that misidentifying voices (self or other) were instances of self-deception. In the main experiment, participants had to listen to five groups of six voices (all reading the same paragraph), and identify whether each voice they heard was their own voice or a stranger's voice, and the degree of certainty of their decision. Concurrently, galvanic skin responses (GSR) to the voices, and the reaction times of the identifications were recorded. Finally, they completed a number of measures including the Self-deception Questionnaire (SDQ), and a postexperimental questionnaire that asked how many times they thought they heard their own voice, and whether they thought they had committed any false negative responses (misidentified own voice as others) and false positive responses (misidentified others voices as self).

For the results to be considered evidence of self-deception, they had to satisfy each of the four criteria outlined above. The results showed that even when the participants incorrectly identified their own voices, there was an increase in GSR, suggesting that correct identification occurred at a different level of cognitive processing. This fulfilled the

first condition of holding two contradictory beliefs, as the participants' appeared to know and not know that they had heard their own voices. This also fulfils the second condition that the two beliefs were held simultaneously, as they were measured at the same time. They claimed that the third condition was satisfied by looking at the agreement between the measures on the postexperimental questionnaire. All but one of the participants who committed false negative errors were not aware (did not report) that they had done so, although only half of the participants who committed false positive responses were not aware that they had made such errors. Therefore it was concluded that, in general, they were not aware of holding the other belief, and in fact, participants who denied awareness exhibited greater GSRs to all the voice stimuli. Finally, participants who committed errors also scored higher on the SDQ, and particularly those who committed more false positive responses scored lower on aversiveness of self-confrontation and were more likely to seek it out. They claimed that this was initial evidence for the lack of awareness being motivated, fulfilling condition four, although they conceded that it was not very convincing.

To present a more compelling argument for voice misidentifications being motivated, they primed participants with either success or failure before the voice recognition task. Those in the failure condition had slower reaction times and reported less certainty when identifying their own voices. They were also more likely to misidentify the self as others, whereas participants in the success condition were more likely to misidentify others voices as their own. Therefore, these instances of self-deception appear to be motivated, as people were less likely to recognise their own voice when they were made to feel like failures.

However, a criticism of studying self-deception is how the investigators know that they have demonstrated that their subjects simultaneously believed that p and believed that not-p. In Gur and Sackeim's (1979) study, belief that p was measured by self-report via the postexperimental questionnaire, and so the experimenters must trust that the participants were sincere in their answers. However, it is unclear as to whether the measure of belief (not-p) via GSR was valid. Indeed, Mele (1987b) criticised whether the threshold for the physiological response is lower than the threshold for cognition (both conscious and unconscious) of it being their voice, and questioned whether the physiological reaction is equivalent to having a belief that not-p.

In an attempt to replicate Gur and Sackeim's (1979) findings, Douglas and Gibbins (1983) also conducted a voice-recognition study, but found that participants also

demonstrated an increase in GSR when they had to recognise "other" voices, specifically the voices of people that they were familiar with. They point out that although GSR is used during lie detection, it is a measure of any kind of arousal, and does not necessarily indicate that a lie has been uncovered. This does not support the case for the involvement of self-deception and would suggest that there is another factor that contributes to a raised physiological response. However, Gur and Sackeim (1985) issued a response stating that the researchers did not present evidence that the false negative and false positive responses were not examples of self-deception. They claimed that Douglas and Gibbins (1983) had misrepresented their account by only fulfilling the first two criteria, and then assuming that the self-other recognition errors were not motivated. They also pointed out a methodological issue, which was that the two conditions, self-other and acquaintance-other (distinguishing an acquaintance's voice from a stranger's voice), were not counterbalanced, which may be a confounding variable. Gur and Sackeim (1985) also discuss apparent differences in the results. In the self-other condition, only 8 out of 30 participants did not commit any errors (perfect recognition), compared to 18 out of 30 in the acquaintance-other condition. This suggests that it was easier to recognise familiar voices, than to recognise their own voices, which could have motivational implications.

1.1.2 Supporting evidence for Gur and Sackeim's conditions

Quattrone and Tversky (1984) have conducted studies that they claim fulfilled the necessary criteria. One such experiment asked participants to submerge their forearm into a chest of circulating cold water for as long as possible to get a baseline level of tolerance. Afterwards, they were told that either an increase or decrease in tolerance of pain was associated with a longer life expectancy. This was followed by a second trial of submerging their forearm into the chest, in which participants in each group showed a change in tolerance in the predicted direction, despite denying on a postexperimental self-report questionnaire that they had done so knowingly. Specifically, those who were told that an increase in tolerance was associated with a longer life expectancy kept their arms in the water for longer, and vice versa. It was assumed that participants both believed, as seen through either their increase or decrease in tolerance time, and did not believe, as seen through their self-reported denial on the questionnaire, that they had purposefully changed their tolerance levels in the more favourable direction, and that they were not aware of holding the former belief. As the change in tolerance was associated with longevity, it was concluded that these were motivated instances. Quattrone and Tversky (1984) suggested

that it is a widespread belief that pain thresholds and heart responses are involuntary reactions as an explanation for why the participants did not believe that they purposefully attempted to shift their tolerance on the second trial. However, whilst the evidence for not believing was taken from the self-report questionnaire, in which we must trust that the participants were sincere in their denial, the investigators provided no perceived evidence that the participants' also contradictorily believed that they tried to shift their tolerance, or that the change in tolerance time was indicative of belief (Mele, 1997).

In support of the traditional approach, it was believed that two conditions were fulfilled in both the Gur and Sackeim (1979), and Quattrone and Tversky (1984) studies: that each individual held two contradictory beliefs (p and not-p), and that these were held simultaneously. These conditions have been heavily criticised by many psychologists as being paradoxical, and described as "an impossible state of mind" (Mele, 1997, p. 92), as it does not seem possible that someone can convince themselves to believe p without there being any influence from the fact that they already believe that not-p. This will be examined further in the deflationary approach. The proposal of two subsystems where the false information is held in the conscious mind, separate from the true information, which is held in the unconscious mind, where it is inaccessible to conscious processes, is a potential approach to resolving this paradox, and will be discussed further in the evolutionary approach.

In summary, I think that the traditional approach was very influential, and reflective of a general view of self-deception, in which the self-deceiver is described as "knowing the truth deep down/all along". However, whilst the two primary studies that I evaluated were elegant in their designs, they were both let down by their measure of the true belief that not-p, i.e. that the participants believed that they had correctly identified their own voice or had changed their tolerance level. Therefore, a better measure for not-p is needed. Additionally, the theory is lacking an explanation as to why people self-deceive and its adaptive value, and the process of how people enter and maintain self-deception, both of which are fundamental for understanding self-deception. The next theory that I will discuss, the deflationary account, presents a markedly different approach and aims to address the limitations of the traditional approach.

1.2 The Deflationary Approach

The deflationary approach, proposed by Mele (1997, 2001), suggests that self-deception is neither paradoxical nor puzzling, and can be explained without the involvement of unconscious processes and dual-beliefs. His main issue with the traditional approach to self-deception is with the proposal that an individual can possess two contradictory beliefs (that p and that not-p) simultaneously, which were the first two conditions proposed by Gur and Sackeim (1979). As Mele (1997, 2001) does not endorse the suggestion that unconscious processes are involved, which could allow for the separation of the two beliefs in the mind, he fails to comprehend how two opposing conscious beliefs can exist concurrently. Specifically, if an individual believes that p, how does the belief that not-p occur without replacing and undermining the belief that p? For example, in Quattrone and Tversky's (1984) study, if a participant believed that they did not purposefully change their tolerance level, then it seems implausible that they could also believe that they purposefully changed their tolerance level. Mele (1997) has proposed the following conditions that he claims are satisfactory for becoming self-deceived in acquiring a belief:

1. The belief that the person acquires is false (p).
2. The person treats information that is relevant to the belief in a motivationally biased way, acting as if the belief is true.
3. This biased treatment is a cause of the person acquiring the false belief.
4. The body of data possessed by the person at the time provides greater warrant for the opposing true belief (not-p).

Condition one reflects an essential component of self-deception, that a person is self-deceived in believing that p, only if p is false. This element is consistent across both the traditional and deflationary approaches, and the false belief exists in the conscious mind.

Regarding condition two, Mele (1997) describes four ways that people can treat data, motivated by the desire that p: negative misinterpretation, positive misinterpretation, selective focusing/attending and selective evidence-gathering. These processes allow people to favour the information that they would prefer to believe and supports their viewpoints, and to avoid unwelcome information that does not support their beliefs, needs and goals. Negative misinterpretation describes when information that would otherwise be

recognised as evidence against the belief that p is viewed as flawed and invalid, and therefore not counted, allowing the individual to continue believing p. For example, when faced with opposing evidence to their theoretical viewpoint, a researcher may focus on the limitations and flaws in that person's research to discount it. Positive misinterpretation describes when evidence that would otherwise be recognised as against p, is interpreted as supporting evidence for p. An example that Mele (1997) discusses is of a man who interprets the continuous rejection from a woman he is romantically interested in as her playing hard to get, and wanting to encourage him to prove his love for her even more. This should be evidence against the woman's interest in him, but instead it is interpreted as supportive of the contradictory belief that she likes him romantically.

Selective focusing/attending occurs when an individual focuses on supportive (welcome) information and avoids focusing on unsupportive (unwelcome) information. Wilson, Wheatley, Kurtz, Dunn and Gilbert (2004) found that if participants were told that they were unlikely to be chosen for a hypothetical date, then they would focus on the negative information about the person, rather than the positive information. This selective attention prevents the encoding of unwelcome information about the pleasant qualities of someone who is likely to reject them. Finally, selective evidence-gathering occurs when an individual searches for information that supports their belief that p, even if it is less available or accessible, but ignores and/or avoids searching for information that is unsupportive of their belief, even if it is more available. For example, a researcher may search for papers from authors whom they know to be supportive of their theoretical viewpoint, and avoid the papers of authors whom they know oppose their perspective. Therefore, it is very similar in effect to selective focusing in that the opposing true belief (not-p) is never acquired. Consequently, an individual cannot hold two contradictory beliefs, as only information for the belief that p, which is considered welcome and pleasant, has been found and attended to. However, it is possible that the person is aware that information that is inconsistent with their belief may exist, and is then able to avoid it or stop the information search before coming across it. Supporters of the traditional approach could argue that this is potentially a case of a person knowing and not knowing simultaneously, and therefore Mele may somewhat contradict his own argument against holding contradictory beliefs here. Nevertheless, these four processes help us to understand how people can acquire beliefs that they are self-deceived in holding, and how these beliefs can be retained. However, whilst Mele aims to present an approach to self-deception that is not puzzling, the fact that the processes previously described allow people

to screen out relevant facts and to acquire false beliefs is also puzzling from an adaptive perspective, as net behaviour is still being driven by unrealistic and inaccurate beliefs.

Condition three just means that the false belief (p) is caused by the individual's biased treatment of the information, via the processes described in condition two. Finally, condition four signifies that people deceive themselves into believing that p despite possessing more evidence for the belief that not-p. However, Mele does not consider this condition as necessary for the occurrence of self-deception, as the processes outlined under condition two may prevent the person from acquiring evidence that not-p. As described in the preceding paragraph, selective evidence-gathering may lead to someone attending to supportive information that strengthens their belief, even if there is more evidence available in the world that supports the opposing belief. Therefore, they come to acquire their self-deceived belief, and are capable of retaining it as they hold more evidence for p than for not-p. However, even though Mele challenges the proposal of simultaneously held contradictory beliefs endorsed by the traditional approach, I believe that this condition has overtones of the idea that he is attempting to rebut. By proposing that people possess more evidence for not-p than p, it implies that people may have knowledge of the truth simultaneously with the false belief (Gergen, 1997), even if they try to avoid this information in a motivationally biased way. I feel that this brings us back to the dual-belief concept, and seems to contradict his position. If Mele does not view it as a necessary condition, it does make me question why it has been included, and maybe deserves more explanation.

Mele also recognises that the vividness of information can influence the acquisition of a belief. Vivid information is more likely to be identified, attended to and recalled than weaker information. Additionally, people are also influenced by the frequency and availability of information and events, known as the availability heuristic. The greater the availability and frequency, the more likely the information will be perceived, attended to and remembered. Further, he describes how the confirmation bias can influence people's formation of a belief. When people set a hypothesis to test, they are more likely to look for confirming cases rather than disconfirming cases, and the confirming instances are likely to be more salient, therefore providing more evidence to support their hypothesis and the belief that p. He claims that these can all be instances of cold biasing, which are unintentional processes, so people can enter self-deception without trying to deceive themselves. He proposes that sources of biased belief can function independently of motivation, but that they can also be primed by motivation. For example, in the case of the

confirmation bias, a particular motivation may affect which hypothesis a person chooses to research, and may influence the vividness and salience of the data that supports this hypothesis. These processes can also be utilised in the retention of the beliefs.

Motivation as outlined in condition four in Gur and Sackeim's (1979) necessary assumptions may be an important factor in self-deception, as people usually believe something that they desire or want to be true. For example, in Quattrone and Tversky's (1984) study, the participants desire to have a healthy heart and be in good health, so they are motivated to convince themselves of this belief. Alongside this, people are also motivated to avoid acquiring information and beliefs that they find personally threatening. Kunda (1987) investigated the effects of motivation on beliefs by asking both men and women to read an article about how caffeine consumption is harmful for women. Both genders were split into heavy and low consumers, and the men served as a control group. Each participant was asked how convinced they were about the information and the claims in the article, and the results showed that women who were heavy caffeine consumers were less convinced than the low consumers, and that there was not a significant difference for the men. As the information was more personally threatening for the female heavy consumers, it seems likely that they were more motivated to be critical of the article and to dismiss or disbelieve it, convincing themselves that it was not true, even though it was clear that the evidence favoured the belief that caffeine was harmful, supporting condition four in Mele's (1997) assumptions. It may be the case that self-deception produces short-term rewards by allowing the person to avoid unpleasant information, but it may make the person worse off in the long-term (Ainslie, 1997). Using the preceding example, by deceiving themselves in to believing the article about the risks of caffeine to women was unconvincing, the female heavy consumers would be avoiding anxiety about their future health in the short-term, but if the claims in the article were true, they would be causing their bodies more harm in the long-term.

1.2.1 Everyday hypothesis testing and PEDMIN models

In his quest to explain self-deception, Mele (2001) also endorses the model of everyday hypothesis testing proposed by Trope and Liberman (1996, as cited in Mele, 2001), which involves the notion of confidence thresholds. The acceptance threshold and the rejection threshold are the minimum levels of truth or untruth needed, respectively, to accept or reject the hypothesis. When the acceptance and rejection thresholds are at different levels, it will be easier to reach one of them, i.e. the lower the threshold, the less

evidence is required to reach it. In other words, if the belief that p has a lower threshold than the belief that not-p, then the likelihood that the person will believe p increases. These thresholds would be expected to be subjective and to differ amongst people if driven by desires and motivation. For example, a mother would have a lower threshold for accepting the belief that her son is not doing drugs, and a higher threshold for rejecting it. This may be different to the thresholds of the employer of the boy, and can be accounted for by using the primary error detection and minimisation (PEDMIN) model (Friedrich, 1993). This explains this concept in terms of the potential subjective costs of falsely accepting or falsely rejecting a hypothesis, and the need to minimise costly errors. In the preceding example, it is more costly (emotionally threatening) for the mother to falsely believe that her son is doing drugs due to the psychological discomfort it could cause, and more costly to the employer to falsely believe that he is not doing drugs as they could affect his work productivity and performance. Therefore, the mother is motivated to test the false hypothesis that p, that her son is not doing drugs, which increases the likelihood of finding supportive evidence, and in the case of the everyday hypothesis testing model, increases the probability that she will reach the acceptance threshold and acquire (or retain) the belief that her child is drug-free. Mele applies this notion of confidence thresholds in explaining the results of various experiments claiming to provide supporting evidence for the dual-belief condition. Mele suggests that in place of Quattrone and Tversky's (1984) conclusion that participants believed both that they did and did not try to shift their tolerance in the cold-water task, people desired to believe that their hearts were healthy, as it is more emotionally threatening to believe (falsely) that you have an unhealthy heart. Therefore, they had lower confidence thresholds for the belief that they did not try to shift their tolerance, hence they were able to acquire the minimum information needed to bring about this belief quicker. On the other hand, they would have had higher confidence thresholds for the opposing belief that they did try to shift their tolerance. Whilst I agree with the principle that people will require less evidence to accept a belief that they desire to be true, and more evidence for a belief that they do not desire to be true, I believe that the concept of subjective confidence thresholds is complex, as it does not seem plausible that there is a line (the threshold) that once a person finds one more piece of supporting evidence, they pass over the line and suddenly acquire a belief.

1.2.2 Limitations of the deflationary approach

An important limitation of Mele's (1997, 2001) deflationary model of self-deception is that it only appears to be theoretical. He explains how this theory can be applied to the invented examples that are typical of garden variety (traditional) self-deception, such as a husband deceiving himself in to believing his wife is not having an affair, and a mother deceiving herself in to believing that her son is not doing drugs. However, he is lacking support for his theory in the provision of empirical evidence. Additionally, he does not prove that the people in his examples did not hold contradictory beliefs simultaneously (Krebs, Ward & Racine, 1997).

Whilst Mele argues that some theorists have made self-deception more theoretically difficult than he believes it is with the postulation that a person can hold mutually inconsistent beliefs simultaneously, some theorists, although applauding his efforts to explain self-deception without the paradox, believe that his deflationary account is too broad, reductionist and missing essential points. Audi (1997) points out that the account is missing the tension that exists in the traditional approach when there is an affirmation of p that coexists with knowledge that not-p. By presuming that a person can only have one belief about a topic, Mele does not take in to account that people often have many beliefs about a topic, just not at the same time (Foss, 1997). The belief that is activated is dependent on the context at that particular time. The individual may not detect these single incidents of self-deception, as each single case may be plausible and the person may not see the link between this and the contradictory belief (Baumeister & Pezza Leith, 1997). Therefore, the person can hold both beliefs, which are insulated from each other (Bermudez, 1997).

Martin (1997) also acknowledges the lack of cognitive conflict in Mele's theory, such as believing that p and suspecting that not-p. However, whilst agreeing that holding contradictory beliefs simultaneously is not a necessary condition for self-deception, he argues that there may be suspicions, partial beliefs, hopes and fears that are not considered by Mele, but contribute to the basis of entering self-deception. Bach (1997) argues that Mele's approach does not address how people repeatedly avoid the truth and thoughts that contradict their belief. He believes that it would not be a case of self-deception if the person did not at least occasionally have contradictory thoughts that he/she needed to actively avoid or get rid of. However, in response to these criticisms, Mele does not deny that there is no tension/cognitive conflict in self-deception, but claims that it is not a necessary condition.

Losonsky (1997) argues that the deflationary account is too broad, so that cases of prejudice and bias may be erroneously included. Let us recall the earlier example of an individual using selective evidence-gathering to collect supportive information for their hypothesis. Losonsky contends that it is not clear as to whether the researcher is deceiving him or herself, or whether this is a case of prejudice or bias, which would not be a typical incidence of self-deception. Unlike Mele, he proposes that self-deceivers have the false belief that p, even though they possess "active" evidence that not-p, and that this may present itself as recurring or nagging doubts, which separates it from prejudice and bias. It is assumed that under normal circumstances, the same evidence would lead the individual to believe not-p, but in these particular circumstances, the person is motivated to falsely believe p. However, the recurring or nagging doubts keep trying to trigger the belief that not-p.

In their quest to provide supporting evidence for holding two contradictory beliefs simultaneously, researchers propose that people may hold a belief that p, and hold suspicions and/or emotional understandings consistent with not-p (Dalgleish, 1997). For example, whilst acquiring and retaining the false belief that their spouse is not having an affair, they may also experience feelings of jealousy, which would be consistent with the true, but not acquired belief that their partner is engaged in an affair. Also, emotional states can influence attentional processes, increasing the vividness and availability of data that is consistent with the prevailing emotion (Derryberry, 1988, as cited in Mele, 2001). A man may falsely believe that his wife is being adulterous, and the feelings of jealousy that he experiences may make him focus on memories that he interprets as consistent with his belief, such as her having to work late on occasion. Instances of entering self-deception may also be explained not just by a desire that p, but by a fear that not-p, so that its function may be to avoid feelings of anxiety, in which case emotion could appear to have a significant role (Barnes, 1997). Mele (2001) retains his position by positing that holding a belief and a contradictory suspicion and/or emotion is not the same as holding two contradictory beliefs. However, it demonstrates how an individual can hold contradicting information simultaneously, which is supportive of the traditional account of self-deception (Gur & Sackeim, 1979, 1985; Quattrone & Tversky, 1984).

To summarise Mele's deflationary approach, he proposes that self-deception should not be modelled on interpersonal deception, as in the traditional approach, and attempts to strip self-deception of its paradoxical nature by shunning the idea of dual-beliefs, and replacing it with a collection of information-processing methods. Whilst I

think that it is a notable account, which explores why we self-deceive more so than in the traditional approach, it is also lacking a thorough explanation of the adaptiveness of self-deception. The suggestion from the FTL model, that self-deception avoids emotionally threatening and costly errors does not suffice, as the individuals are still making errors by ignoring or avoiding true relevant information.

1.3 The Evolutionary Approach

The final approach to self-deception to be discussed here is the evolutionary theory developed by Trivers (1985, 2000; see also von Hippel & Trivers, 2011); this proposes that there is survival advantage through the use of self-deception in social interactions. The following quote summarises the purpose for the natural selection and function of self-deception:

> If (as Dawkins argues) deceit is fundamental in animal communication, then there must be strong selection to spot deception and this ought, in turn, select for a degree of self-deception, rendering some facts and motives unconscious so as to not betray – by the subtle signs of self-knowledge – the deception being practiced. (Trivers, 1976/2006, p. 20)

To expand on this, deception is a powerful tool that can be observed in many organisms, encompassing viruses, plants, animals and humans. For example, the mirror orchid produces flowers that impersonate female wasps, in order to attract male wasps to the plant. The deception results in the male wasp, in it's desire to mate, picking up pollen from the plant, which it then deposits on the next mirror orchid it lands on, serving the reproductive needs of the plant. Camouflage is a frequently used method of deception that allows an organism to avoid detection by predators, such as the stick insect, which replicates the forms of sticks and leaves. Therefore, it is clear that deception amongst non-human species is widespread, and that those adept at deception have the upper hand over competitors for resources, enhancing the likelihood of survival and reproductive success (Smith, 2004). Likewise, this is true for humans, and in support of this, one study found that approximately half of the lies that people told were in order to gain a resource (DePaulo & Kashy, 1998). Furthermore, deception is a frequently used tool with one study finding that college students lied in one in every three social situations (DePaulo, Kashy, Kirkendol, Wyer & Epstein, 1996), and another study finding that for every ten minutes of

conversation a person engaged in, three lies were told (Tyler & Feldman, 2004). Therefore, the ability to deceive others effectively appears to be an adaptive advantage, whilst to be a victim of deception appears to be a disadvantage. In line with this, it has been proposed that this natural selection for deception led to a co-evolutionary struggle between the need to develop newer, more effective methods for detecting deception, and the need to develop more advanced methods of deception (Trivers, 2000). Self-deception is considered to be an important and sophisticated tool in the advancement of deception and a universal human trait. He believes that it is exclusive to humans, aided by our capacity for language, so non-human species could only deceive, but never self-deceive.

The adaptiveness of self-deception can be considered within the context of Trivers' highly influential theory of reciprocal altruism (Trivers, 1971). Altruism occurs when a cost is suffered in order to gain a benefit; therefore reciprocal altruism is "the exchange of such acts between individuals so as to produce a net benefit on both sides" (Trivers, 2005, p. 68). Hence, people will act altruistically and display unselfish behaviour if they believe that they will later gain from this. It is this concept, that the species will gain more than they put in, that makes the reciprocal altruism system stable. However, the costs of displaying altruistic behaviour may include the loss of resources such as time, effort and money. Therefore, it can sometimes be beneficial to cheat by reaping the benefits of the altruistic behaviours of others without reciprocation. Analogous to self-deception, a degree of cheating can be adaptive, so there is a co-evolutionary struggle between natural selection favouring subtler forms of cheating as well as favouring detection of cheaters. The development of self-deception can facilitate this cheating. If the person self-deceives into believing that they really have displayed altruistic behaviour, they are more likely to convince those who they need to deceive, which means that they are more likely to receive benefits whilst expending less costs, but also to maintain the image of themselves as a beneffective individual, i.e. that he or she benefits others and is effective when doing so (Greenwald, 1980).

1.3.1 Functionality of self-deception

In any evolutionary theory, functionality is important, and any trait that has been naturally selected to survive must be adaptive and fitness enhancing. In order for the trait to be considered adaptive, it must have evolved as a solution to a problem. In line with this and the reasoning presented earlier, von Hippel and Trivers (2011) proposed that the primary adaptive reason that self-deception evolved was to aid people in negotiating the

social world by facilitating the deception of others to accumulate resources. This is achieved by reducing the likelihood of displaying signals, such as nervousness, control and cognitive load, which may indicate deception. Control signals may be exhibited when trying to avoid signals of nervousness, such as overacting and planned/rehearsed stories and behaviour. Cognitive load occurs from the effort it takes to retain both the true and false information, but to keep the information separate and consistent when relaying it to others. This forced task takes time and concentration, which slows down responses and reduces performance on concurrent tasks, and may inadvertently reveal the underlying unconscious processes (von Hippel & Trivers, 2011). So when lying to others, cues may still be presented through the attempts to cover up the deception. It has been suggested that the act of deception causes the deceiver stress, as the prospect of the lie becoming uncovered, and the reaction of the deceived person can cause anxiety. Therefore, it is possible that this tendency to unintentionally reveal these signals of deception (by-products of stress) is what led to the evolution of self-deception (Smith, 2004). Hence, by deceiving ourselves into believing what we want other people to believe, we can more effectively and sincerely deceive others. Additionally, if another person uncovers the deception, then the self-deceiver can defend themselves more easily against retribution, social shame, loss of reputation and credibility, by justifying that unconscious processes were at work, so they did not intend to and were unaware that they were propagating lies, and were indeed a victim themself. Lockard (1997) also agrees that self-deception exists due to being favoured by natural selection, and that it is adaptive in that it helps people evade feelings of stress and guilt as well as the problems associated with interpersonal deception.

A secondary advantage to self-deception is that it also facilitates self-enhancement, allowing individuals to convince themselves and others that they possess greater levels of socially desirable traits, such as confidence and altruism, than they actually do, in order to obtain social benefits and resources. Research supporting this shows that people who are viewed as being more confident are more likely to have their advice followed, as well as being chosen as leaders (Conger & Kanungo, 1987; Zarnoth & Sniezek, 1997). It also allows them to be satisfied that their values, beliefs and behaviours are correct, and that they appear as beneffective individuals and “existentially successful” to others (Kipp, 1980). These positive illusions of oneself may lead to greater persistence and motivation (Taylor & Brown, 1988) and cause them to be more optimistic about the future (Trivers,

2000). Positive illusions, and illusions of control, which are forms of self-deception, will be addressed in more detail in Chapter Two.

1.3.2 Mental processes enabling self-deception

The evolutionary theory consolidates concepts from both the deflationary and traditional approaches, viewing self-deception as being enabled by a combination of biased memory processes, information search and processing biases, and a dissociation between mental processes such as explicit and implicit memories and attitudes (von Hippel & Trivers, 2011).

This dissociation between mental processes is akin to the dissociation of unconscious/conscious subsystems separating the true and false beliefs respectively. They propose that some information can be stored consciously in memory and attitudes, accessible via explicit measures such as recall, whilst other information may be inaccessible to consciousness, which can be measured using implicit measures, such as Implicit Association Tests (Greenwald, McGhee, & Schwartz, 1998). It is proposed that both explicitly and implicitly assessed memories and attitudes influence an individual's behaviour. The terms explicit and implicit correspond to the terms conscious and unconscious respectively and von Hippel and Trivers (2011) suggests that if true information were held within the individual, then it would be stored in varying degrees of unconsciousness, with limited accessibility for the individual, which is in agreement with the traditional approach. Trivers (2000) proposes that unconscious modules were favoured by natural selection, allowing people to pursue selfish/deceptive activities whilst hiding them from others and themselves. Therefore, it would be logical that the inaccurate, welcome information stored in the explicit conscious modules would be more accessible, and consequently more influential on behaviour. Although generally agreeing with the deflationary views of Mele, Bornstein (1997) agrees that like there exists explicit and implicit memory, there may be certain cases where self-deception is aided by implicit processes. These are most likely to be applied when the belief, memory or attitude is deemed as socially undesirable, and is able to exist unconsciously and still influence behaviour without the person consciously knowing. It is therefore argued that the conscious mind acts as a social front, containing the false, deceitful and welcome information, which is accessible to the self and is presented to others, whereas the true and accurate but unwelcome information is held in the unconscious mind, inaccessible to the self. Figure 1.1 below displays this concept; the first model represents all information in

the conscious, where everything is accessible for the individual to use, which epitomises Mele's (1997, 2001) deflationary approach that does not endorse an unconscious module. The second model embodies the evolutionary approach, with the division between false/welcome information in the conscious (social front) and true/unwelcome information in the unconscious. In model two, it is clear how this method of organising knowledge allows for successful self-deception, and sequentially the deception of an outside observer.

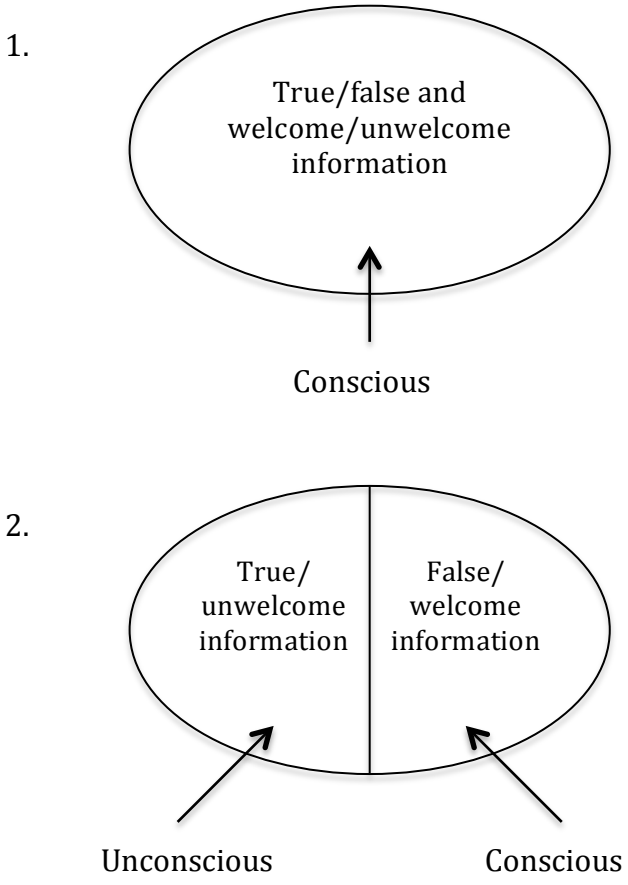

Figure 1.1. Two models highlighting how the deflationary (1) and evolutionary (2) approaches represent information in the mind.

Potential supporting evidence for this conscious/unconscious or explicit/implicit approach to self-deception may be obtained from clinical populations of split-brain patients and anosognosic patients. Patients with anosognosia experience delusional beliefs about the extent of their acquired motor impairments (Feinberg, Roane, & Ali, 2000). In a dot-probe visual attention task, anosognosic patients with a motor disability were slower than non-anosognosic patients with a motor disability in responding to emotionally salient

words, such as WALK (Nardone, Ward, Fotopoulou, & Turnbull, 2007). This selective attention prevented unwelcome and threatening information from being initially encoded, avoiding the paradox of holding two contradictory beliefs simultaneously. These patients may have self-deceived as a coping mechanism, as it is easier than dealing with the reality of their deficit. Additionally, the explicit reports by the anosognosic patients revealed the extent to which they were inhibiting thoughts about impairments. However, it appears that there was implicit knowledge about their deficit, as the stronger they explicitly denied their impairment, the greater interference they experienced in the dot-probe task. This finding suggests self-deception and supports the theory of a dissociation between the explicit conscious and the implicit unconscious.

In terms of the intentionality of self-deception, von Hippel and Trivers (2011) do not agree with the claim by Mele (1997, 2001) that it can be both intentional and unintentional; they consider self-deception to be entirely intentional, indeed "the active misrepresentation of reality to the conscious mind" (Trivers, 2000, p. 114), even if the intention is unconscious. This is comparable to the traditional approach, which considers an unconscious component where information is unavailable to the conscious mind. However, intention is not a prominent factor in this approach; instead the focus is on the adaptive advantage of self-deception, as the notion of behaviour being driven by incorrect beliefs is more puzzling in terms of evolution and the trait being naturally selected for.

As in the previously discussed deflationary approach, the evolutionary approach also endorses information-processing biases such as selective evidence-gathering, so it is possible that the unwelcome information may not have been encoded and stored in the first place, and the "hidden truth" may never have existed (Lewis, 1996; Mele, 1997). This would suggest self-deception of only the conscious processes in these cases, as the contradictory information would not coexist in the unconscious. von Hippel & Trivers (2011) build on the four processes (positive and negative misinterpretation, selective attending and evidence-gathering) discussed earlier in the deflationary account by adding amount of information searching, misremembering and rationalisation. People may stop the information search they are engaged in when they are satisfied with their current amount of information and wish to avoid potentially contrasting and unpleasant material. For example, Ditto, Munro, Apanovitch, Scepansky and Lockhart (2003) found that if participants were led to believe that colour change on a test strip was not indicative of a disposition towards developing a pancreatic disorder, they waited 60% longer than people who believed it was indicative. In other words, people looked away quicker when colour

change was considered a negative result, so that they could avoid a contradiction to the welcome information they had seen so far (i.e. no colour change), and continue to feel satisfied in the knowledge that their result was positive.

If unwelcome information is processed and stored in memory, it does not ensure that it will be retrieved accurately or at all, as information can be forgotten and misremembered. For example, people are more likely to have a better memory of their good rather than their bad behaviour (D'Argembeau & Van der Linden, 2008). It can also be distorted during rehearsal and sharing of information with other people, as people can gradually become convinced of the deception that they are promulgating to others. Another method for dealing with information that has been accurately stored and retrieved is to rationalise the motivations behind it, so that it is justifiable to both the self and others. For example, Saucier, Miller and Doucet (2005) found that Caucasian people were less likely to help African Americans if they could attribute it to an external impediment, such as distance or risk. By rationalising that they would have helped if it had not been for these obstacles, they were able to maintain a positive view of themselves whilst displaying socially undesirable behaviour. Likewise, in their paper 'Honesty takes time', Shalvi, Eldar and Bereby-Meyer (2012) found that when participants were asked to roll a die three times under a cup (assurance of anonymity), and then asked to report the result of their first roll to establish how much money they had earned, they were more likely to cheat/deceive (by reporting a higher die roll) when justifications for their behaviour existed, and they were given a short amount of time to make a decision. Conversely, participants were more honest in their reports if they were given extra time to make their decisions and justifications did not exist, although if justifications were present, the participant was more likely to lie despite the extra time to reason about their behaviour. The authors concluded that serving our own interests is an automatic tendency, and that justifying the lies to ourselves serves to alleviate the experience of negative emotions, which would support the adaptive advantage of the evolution of self-deception. Although the evolutionary approach combines memory and information-processing biases and a conscious/unconscious dissociation, more explanation is needed as to the reason why biases prevail on some occasions and the dissociation occurs on other occasions.

1.3.3 Limitations and costs

As the evolutionary theory proposed by von Hippel and Trivers (2011) combines the traditional and deflationary approaches, it is also subject to the same limitations that

were discussed earlier. For example, the dual-mind concept satisfies the lack of tension criticism by Audi (1997) about the deflationary theory but brings up the issue of the paradox from the traditional approach that a person cannot hold two contradictory beliefs. Also, like in Mele's (1997, 2001) deflationary theory, more empirical evidence is necessary to support their claims (Dunning, 2011). However, Troisi (2011) claims that clinical studies investigating somatoform disorders are supportive of von Hippel and Trivers' (2011) theory of self-deception. These patients display physical symptoms that appear to have no cause, but unlike people who are faking their symptoms (factitious disorders and malingering), patients with somatoform disorders truly believe that they are ill. He suggests that these people may have deceived themselves in to believing that they are ill so that they can better convince others of their illness, in order to elicit care-giving behaviour from them. Likewise, this is linked to research by Merckelbach, Jelicic and Pieters (2010) using a nonclinical sample that showed that after being asked to intentionally feign neurocognitive and psychiatric symptoms during a task, people who scored high on self-deceptive enhancement were more likely to continue reporting these on a later task that required them to be honest about symptoms.

A criticism by Fridland (2011) is that information processes that result in the truth never being gathered and stored unconsciously can mean that the person genuinely believes what they are telling other people (p), which is a case of being mistaken, not deceiving. Fridland (2011) therefore believes that it can only be considered deception/self-deception when the individual also has knowledge of not-p. However, von Hippel and Trivers (2011) contend that as the motivation behind the self-deception is to facilitate the deception of others, then the selective evidence-gathering process is still deception, or at least presents somewhat of a puzzle against Fridland's (2011) argument.

There are both benefits and costs associated with self-deception. Some of the benefits have been discussed throughout this review, including their functions in the social world by facilitating deception of others to gain resources without displaying deceptive signals and self-enhancing more successfully. These may lead to greater physical and mental health. The resources gained may enable people to maintain or enhance their physical health, and self-enhancement will most likely lead to positive illusions, and may protect individuals from developing mental disorders such as depression (Alloy & Abramson, 1979), which will be discussed in more detail in Chapter Two.

On the other hand, an obvious cost of self-deception is the loss of both the quantity and quality of information collected and available. By deceiving ourselves, it means that

the true information is no longer available to us. This inaccurate perception of reality that one brings about may consequently lead to inappropriate behaviour, which could have disadvantageous outcomes for their health and the social situations they engage in. For example, by deceiving oneself into incorrectly believing that he or she is competent at a risky sport, the person could sustain a serious injury (Frey & Voland, 2011). Also, if the individual is not accurate in their self-knowledge and the information available to them concerning their environment and their own behaviour, then it could make them less able to realise when other people are deceiving them (Humphrey, 2011). However, von Hippel and Trivers reason that deception is not always accompanied by self-deception, and therefore people learn about how people deceive each other in these cases to help them in their recognition of deceit by others.

The memory processes discussed such as misremembering, rehearsal of inaccurate or distorted information, and inaccurate retrieval of information allow a person to more effectively self-deceive and therefore deceive others, but it may lead to the implantation of false memories. Also, if people cannot accurately remember details of previous situations and outcomes, then they may be unable to learn from past experiences and could be susceptible to repeating mistakes. This supports the limitation mentioned earlier that self-deception may only produce short-term gains, as avoiding the unpleasant/unwelcome information or keeping it hidden in the unconscious may be more beneficial for us at the time, but may be more costly in the long-term (Ainslie, 1997). However, Lu and Chang (2011) believe that the truth is stored until it is not necessary to perpetuate the falsehood anymore, and then the truth becomes accessible (conscious) again. Therefore, if this is the case, then this could minimise the costs of self-deception.

Furthermore, despite the claim from von Hippel and Trivers (2011) that self-deception can protect the deceiver from retribution if other people discover it, there may be a limit to the number of times that this explanation would work. Social relationships are often long-term and after being repeatedly deceived, the person may become frustrated and not care if the deceiver was aware of their actions or not, so the self-deceiver's credibility may be lost in the long-term (Bandura, 2011). Therefore, it leads from this that self-deception should be used selectively, and von Hippel and Trivers believe that it should only be used in situations where the deception is important and meaningful to the self-deceiver, and not in trivial cases. Otherwise, self-deception would become naturally selected out of existence due to the costs outweighing the benefits of social manipulation.

Bandura (2011) argues that, with the knowledge of the neuronal structure of the brain, it is difficult to understand how the two subsystems could remain dissociated, but yet the unconscious knowledge could still influence behaviour. However, there is neurophysiological evidence that neuronal activity begins approximately 350ms before the person consciously intends to do something (Libet, 1996). Therefore, it appears that the unconscious system is functioning before the conscious system has engaged, so it is possible that self-deception is achievable by the unconscious manipulating information before it is available to the conscious. It is also understood by some that whilst the unconscious mind appears to be able to influence behaviour to be in line with goals and motivations, the conscious mind does not seem able to access the unconscious mind. If there are connections that allow information to pass from the conscious to the unconscious subsystem, then it would be possible that by self-deceiving in to believing that p, they could also come to believe that p at the implicit level, at which point it would not appear to be self-deception anymore (Johansson, Hall & Gärdenfors, 2011).

In summary, the evolutionary approach proposes that there is survival advantage through self-deception in social interactions, with the primary functions being to deceive the self the better to deceive others, and to self-enhance, both of which are used to gain resources. It comprises of a dissociation between explicit and implicit processes, complemented by information-processing methods, which combines both the traditional and deflationary approaches. From my review of these three approaches, I have concluded that the evolutionary approach is the best model to follow, as it is the most extensive. It describes the evolution of self-deception from deception, and thereby addresses the adaptive value of the trait, which resulted in it being naturally selected for. The explicit/implicit dissociation allows for the internal conflict that is often assumed to occur in self-deception by including an unconscious module, whilst the inclusion of information-processing methods allows for situations where unwelcome information may not have been encoded.

1.4 Summary and Thesis Direction

This literature review has endeavoured to provide an overview and critical evaluation of the most popular theories of self-deception, its functions, and the benefits and limitations. There is much controversy surrounding the apparent paradox of holding two contradictory beliefs simultaneously, but as Dunning (2011) suggests, more research

in to the explicit/implicit dissociation is needed, as empirical evidence is lacking. I have chosen to support the evolutionary approach (Trivers, 2000; von Hippel & Trivers, 2011), which includes the important concept of explicit/implicit dissociation. This will be explored throughout the thesis, and the primary aim will be to provide support for this notion, to show that contradictory information can be held concurrently in the explicit and implicit systems. Additionally, as both systems have been shown to be capable of influencing behaviour, this research will also explore what system appears to drive future behaviour: the inaccurate/false information in the explicit system, or the accurate/true information in the implicit system.

The thesis will focus on a supposed type of self-deception called illusions of control (IOC), which will be presented in Chapter Two. Experiment 1 (Chapter Three) will examine the explicit/implicit dissociation in a noncontingent two response-outcome task where one response is active and the other response is passive. This is followed by an investigation into the dissociation experienced during a contingent task in Experiment 2 (Chapter Four), in which the frequency of the desired outcomes is varied. Experiment 3 (Chapter Five) explores the noncontingent task with a different response modality, in which both responses are active to determine the effect on the IOC. Experiments 4 and 5 (Chapter Six) investigate the IOC in non-student populations from the company partners affiliated with this research, examining employees and volunteers at the Citizens Advice Bureau, as well as data collected by ESP Advance examining realism in trainee traders. Experiments 6 and 7 (Chapter Seven) investigate the effects of priming motivations (power and competence) on the IOC and the dissociation. Experiment 8 (Chapter Eight) will explore the effects of attribution retraining, a positive psychology intervention, on perceptions of control. A general discussion of the thesis findings is presented in Chapter Nine.

CHAPTER TWO

POSITIVE ILLUSIONS, ILLUSIONS OF CONTROL AND CONTINGENCY

In Chapter One, it was stated that good mental health has historically been associated with the ability to perceive reality accurately, and in a meta-analysis of the research available at the time, Jahoda (1958) concluded that "the perception of reality is called mentally healthy when what the individual sees corresponds to what is actually there" (p. 49). In agreement with this view are cognitive theories of psychiatric disorders, primarily depression, such as Beck's cognitive model and the learned helplessness model, subsequently revised to become the attributional reformulation of the learned helplessness model, extending the account to include causal explanations made by people (Peterson & Seligman, 1984). Beck's cognitive model proposes that depression occurs due to self-referent cognitive biases and errors, distortions and irrational and dysfunctional beliefs that are systematically pessimistic and inaccurate (Beck, 2005). The learned helplessness model proposed that uncontrollable and aversive events lead to cognitive, emotional and motivational deficits (Seligman, 1975). The individuals' learned perceptions of independence between their responses and outcomes leads them to underestimate the amount of personal control they possess, and their ability to influence their circumstances and gain desirable outcomes, resulting in feelings of helplessness, and eventually depression. Congruently, it was assumed that to function effectively, the information-processing systems of well-adjusted and psychologically healthy individuals were unbiased and rational, and therefore inferences were accurate and in line with reality.

However, there has been an increasing amount of literature challenging this traditional viewpoint, contending that better mental health may actually be associated with inaccurate, pervasive, enduring, and systematic illusions about the self, notably "unrealistically positive self-evaluations, exaggerated perceptions of control or mastery, and unrealistic optimism (Taylor & Brown, 1988, p. 194). This chapter will present a literature review on positive illusions and illusions of control (IOC), which are to be understood as forms of self-deception. I will also discuss the literature surrounding peoples' understanding of contingencies, as this will provide the foundations for the design of the studies that will constitute the thesis.

2.1 Positive Illusions

An illusion has been defined as "a perception that represents what is perceived in a way different from the way it is in reality" (Stein, 1982, p. 662). Stein (1982) explains that this false perception may be a misrepresentation of the reality or that it may be entirely imagined by the individual. Illusions are an enduring pattern of errors made by the person when gathering and processing information, and are often biased in a particular direction according to that person's motivations, goals, expectations and experiences. Therefore, these illusions are self-serving interpretations, and in the case of positive illusions, people bias and distort information in an exaggerated and unrealistic positive direction (Taylor & Brown, 1988). For example, in her study of breast cancer patients, Taylor (1983) found that women compared how well-adjusted they were to women who they believed were worse off than themselves, and if they did not know such a woman personally, then they made this social comparison to hypothetical women whom they imagined. However, in these downward social comparisons, people may select categories in which they are above average in (Colvin & Block, 1994), as "everyone is better off than someone else as long as one picks the right dimensions" (Taylor, 1983, p. 1166).

2.1.1 Self-enhancing behaviours

Self-deception is "the active misrepresentation of reality to the conscious mind" (Trivers, 2000, p. 114), and von Hippel and Trivers (2011) proposed that a secondary advantage of self-deception is self-enhancement, where people believe that they are better than they actually are. Positive illusions are distortions of reality that contribute to how people self-enhance, and many behaviours have been identified that enable people to bias information to create an overall more positive image of themselves, which facilitates self-deception (Baumeister, 1998). For example, people tend to remember their performance as more positive than it actually was, and will remember with greater frequency the successes and praises that they received, compared to a poorer memory for the failures and criticisms that they received (Crary, 1966; Greenwald, 1980). Additionally, when people do receive negative feedback about themselves, they tend to spend less time attending to it than they do to the positive feedback and are more likely to look for flaws related to the evidence so that they feel justified in dismissing the negative information. However, even if people do acknowledge their negative attributes, they are likely to downgrade the importance of the trait and insist that it is a common trait amongst people, whilst their positive attributes are

exaggerated and considered to be a rarity amongst people (Campbell, 1986). For example, as we know from research on attributional style, people are more likely to attribute successes to themselves and failures to external causes, such as chance **(**Peterson & Seligman, 1984; Seidel et al., 2012). However, a criticism of this self-enhancing bias is that it is also shown for close friends and relatives, i.e. close others are rated as more positive and less negative than the average person (Brown, 1986). A possible explanation of this could be that people generally select close others on the basis that they share the same or similar views, attitudes, interests and background as themselves, to reinforce the notion that their beliefs are correct (Swann, 1984). As these people may be viewed as a reflection of the self, it would be favourable to extend this positive bias to them.

2.1.2 The better than average effect

An additional example of a positive illusion has been identified as the above-average effect, or the better than average effect (BTAE), which is a type of social comparison, where people believe that they are better than other people by placing themselves above average for desirable traits and skills (Kruger & Dunning, 1999). It is a robust form of self-enhancement that has been documented across a variety of traits and abilities (Taylor & Brown, 1988). For example, Gilovich (1991) surveyed one million students and found that 70% considered themselves to be above average in leadership ability. Likewise, 25% of the students placed themselves in the top 1% in their ability to get along with other people, with none of the sample believing that they were below average for this trait. Similarly, 94% of university professors believed that they were better than average at their jobs compared to other professors. Indeed, some of these individual claims will be true, but it is statistically impossible for the majority of people to be better than average. Therefore, when all of the individual cases are aggregated, the illusory nature of these positive views is realised. It is likely that people were motivated to self-deceive in this way, as the traits that they were assessed on are considered highly desirable.

2.1.3 Positive illusions and depressive realism

Additional evidence against the traditional position that good mental health is associated with an accurate perception of reality comes from research concluding that people who are low in self-esteem and/or are depressed tend to have a more balanced and unbiased awareness of both their positive and negative aspects. The term for this

phenomenon, where depressed individuals hold more realistic and accurate perceptions regarding the self and their environment than nondepressed individuals, is depressive realism (Alloy & Abramson, 1979, 1982). Supportive research for positive illusions and depressive realism was found in a study comparing the subjective ratings on social skills of depressed, psychiatric control (no depression) and nondepressed control individuals to observers' objective ratings (Lewinsohn, Mischel, Chaplin & Barton, 1980). Following a group session, where each person had to present a 3-minute monologue describing themselves, coders rated each participant on 17 desirable attributes, such as friendliness, positive outlook on life, warmth, and popularity. The nondepressed and psychiatric control participants rated themselves more positively and socially skilful than the depressed participants. The observers rated the depressed participants as less socially competent in all attributes, and the subjective ratings of the depressed individuals were closely matched to the objective counterparts, whilst there was a larger discrepancy between both the psychiatric controls' and the nondepressives' subjective ratings and their objective counterparts. It was concluded that the depressives were more accurate and realistic due to their more balanced and unbiased ratings, whilst the control groups were prone to positive illusions, in line with previous research that people generally view themselves as better than other people (Kruger & Dunning, 1999; Taylor & Brown, 1988). Therefore, it seems that self-deception allows nondepressed individuals to show a self-enhancing bias to maintain and protect their self-esteem (Chandler, Lee & Pengilly, 1997), whereas this motivational bias for self-deception appears to have broken down in people with depression, possibly because their self-esteem is so low that it is not deemed worth protecting, resulting in a non self-serving bias (Alloy & Abramson, 1982; Carson, Hollon & Shelton, 2010). However, the coders' ratings may have been affected by biases, as they were informed that they would be observing depressed people, so it is possible that even though they were not told specifically which participants had depression, they may have been looking for symptoms in people, and then rated them lower on all the social skills due to preconceived conceptions of people with depression. Also, if positive illusions foster mental health, then it would be expected that the data of the participants with psychiatric disorders would be analogous to the results of the depressed participants. Therefore, it could be argued that positive illusions may infer an absence of depression, rather than generalising to good mental health (Colvin & Block, 1994). However, this still counters the traditional perspective that healthy, well-adjusted individuals are characterised by realistic judgements and evaluations (Taylor & Brown, 1994). Additionally, people who

scored highly on the Self-deception Questionnaire (Sackeim & Gur, 1979), scored lowly in depression on the Beck's Depression Inventory (Roth & Ingram, 1985), also supporting the viewpoint that distortions of reality, not accurate self-perceptions, are associated with good mental health.

2.1.4 Benefits and costs

The research suggests that people have a self-enhancing bias, with most people possessing a positively distorted view of themselves (Greenwald, 1980). Therefore, it is not surprising that these positive illusions appear to be connected with happiness, with 60% of people believing that they are happier than other people, another example of the BTAE, which also supports the viewpoint that illusions are associated with good mental health (Freedman, 1978, as cited in Taylor & Brown, 1988). Related to this is the finding that in both cancer and cardiac patients, the belief that they are coping better and/or are healthier than other patients results in lower levels of distress, serving self-enhancement needs (Helgeson & Taylor, 1993; Taylor, 1983). Additionally, the more positive an image people have of themselves, the more likely they are to behave favourably to themselves and to other people, e.g. display altruistic behaviours (Rosenhan, Underwood & Moore, 1974).

However, it has been proposed that positive illusions are only adaptive until they are challenged or disconfirmed, e.g. a cancer patient suffers a relapse, then the disconfirmation of their belief is likely to result in psychological distress and maladjustment (Taylor, Kemeny, Reed, Bower & Gruenewald, 2000). However, in this situation, Taylor (1983) found that disconfirmation did not result in the psychological disturbance that was expected. Instead, the positive illusions may have influenced the ability to cope with the bad news.

Additionally, whilst positive illusions may be advantageous in the short-term, they may be considered costly in the long-term, as it is likely that people are not integrating the negative feedback that is available in the environment in to their decision-making processes and behaviours (Weinstein, 1984). Therefore, people may be persevering in vain at something that could fail, as they have not made a balanced appraisal of all the information available. However, in response to this, research suggests that when people are engaged in periods of deliberation, positive illusions are suspended whilst they are evaluating the pros and cons. However, once a decision has been made and the person enters the implementation stage, then positive illusions about their decision may motivate

the person in obtaining the desired outcome by working longer and expending more effort, thereby bringing about a self-fulfilling prophecy (Gollwitzer & Kinney, 1989; Taylor & Brown, 1988; Taylor & Gollwitzer, 1995). Therefore, if illusions only occur in the implementation but not the deliberation stage, then this could be considered much more adaptive.

2.2 Illusions of Control

2.2.1 Importance of control

Self-deception is also present in research on perceptions of control. Control has been defined as the "perceived ability to significantly alter events" (Burger, 1989, p. 1), and perceived control as "the belief that one can determine one's own internal states and behaviour, influence one's environment, and/or bring about desired outcomes" (Wallston, Wallston, Smith & Dobbins, 1987, p. 5, as cited in Thompson & Spacapan, 1991). It is important to emphasise that it is not necessarily the amount of *actual* control that is important, but the *perception* of personal control, and it is widely established that people are motivated to feel a sense of control or mastery in their lives (Fast, Gruenfeld, Sivanathan & Galinsky, 2009; Langer, 1975; Seligman, 1975).

The wealth of literature generally agrees that possessing a sense of personal control is adaptive and important for the maintenance of physical health and well-being (Friedland, Keinan & Regev, 1992; Larson, 1989; Price, Choi & Vinokur, 2002; Rodin, 1986a; Thompson & Spacapan, 1991). For example, when people believe that they possess control, they are more likely to recover faster from illness, and they are better able to cope with stressors (Glass & Singer, 1972; Thompson & Spacapan, 1991), supported by research that found that control was linked with lower levels of cortisol when individuals were exposed to stress (Seeman et al., 1995). People may also be motivated to possess control, or at least a perception of control, to avoid the negative consequences associated with a lack of control (Langer, 1975). For example, Lefcourt (1973) found that when participants were exposed to uncontrollable versus controllable noises, the loss of control lead to feelings of anxiety, stress and helplessness. Congruently, the literature on learned helplessness identifies that a fundamental element that leads to depression is a perception of no control, sustained over a period of time (Peterson & Seligman, 1984).

In adults, there appears to be a negative correlation between age and degree of control (Langer, 1983), and indeed, elderly people in care homes are generally encouraged

to act as patients, and to be dependent on staff, as conformity and obedience make people easier to treat and care for. However, this results in an absence of control over the day-to-day running of these individuals' lives. Langer and Rodin (1976) designed an intervention to encourage a group of elderly residents at a nursing home to have more control and responsibility for themselves, by making more decisions regarding day-to-day events. They found that in comparison to a group where staff responsibility over their lives had been stressed and a control group who received no intervention, the experimental group became more active and reported greater levels of happiness, as well as more involvement in social activities such as competitions and movie nights. These effects were still present at an 18-month follow-up, as well as finding a lower mortality rate in the responsibility-induced group, which supports the importance of a sense of control (Rodin & Langer, 1977).

Likewise, when Schulz (1976) gave elderly residents in a care home control over choosing the times that volunteers would visit them, it resulted in positive effects in the residents, including increased activity, life satisfaction and generally better health. However, at a follow-up 42 months after the volunteers' visits had stopped (i.e. the control was terminated), it was these residents that were most negatively affected, compared to residents who had not been given initial control over visiting times (Schulz & Hanusa, 1978). Therefore, the experience of acquiring control, which was then taken away, was more detrimental, than not possessing control in the first place, so the continuation of control possession is necessary to ensure long-term benefits.

However, an increase in control may not always be associated with positive consequences, instead resulting in negative affect, such as greater anxiety and lower self-esteem when participants were given the choice of which personality test to complete, which may have resulted from the pressure they felt to choose the right test (Rodin, Rennert & Solomon, 1980). Therefore, more control may be accompanied by greater responsibility and pressure to achieve the desired outcome. If there is uncertainty that the outcome will occur, then there may be self-presentation concerns as to how other people will view them if they fail to perform, and the risk of facing social disapproval may arise (Burger, 1989). As previously discussed, one of the functions of self-deception is to facilitate self-enhancement by convincing the self and others that they possess greater levels of socially desirable traits than in reality (von Hippel & Trivers, 2011). Therefore, in order to facilitate this, it may sometimes be beneficial to relinquish control to others and to avoid situations in which they could fail to obtain outcomes, to prevent showing the self in

an unfavourable light and disconfirming their beliefs that they possess control. However, despite these contradictions, the majority of research concurs that the perception of control is desirable, and that increased control is accompanied by an increase in positive affect and positive outcomes.

2.2.2 The illusion of control

It is recognised that people are motivated to seek out and maintain control (Burger, 1989; White, 1959), supported by research that when people suffer a loss of control in one area of their life, they will attempt to gain or increase their sense of control in another area. For example, it was found that people who had received a diagnosis of cancer, although unable to control the illness, attempted to regain some control by effectively managing the side effects of treatments (Taylor, 1983). Additionally, if people are primed to feel like they lack personal control, they will look for it elsewhere by perceiving meaningful patterns among random stimuli (Whitson & Galinsky, 2008).

Therefore, the restoration of control appears to be essential once control is threatened (Friedland et al., 1992; Liu & Steele, 1986), and this need to protect or regain control can lead to people displaying an illusion of control (IOC), which is the phenomenon where individuals overestimate the degree of control that they have over the environment (Thompson, Armstrong & Thomas, 1998). The IOC is considered to be a pervasive human tendency where there is "an expectancy of a personal success probability inappropriately higher than the objective probability would warrant" (Langer, 1975, p. 311), and people "believe that, or act as if, one can skilfully influence and control outcomes of chance events" (Budescu & Bruderman, 1995, p. 109). This concept is very important for the studies that will be conducted in this thesis, as I will mostly be looking at people's IOCs in noncontingent situations, where there is no objective control and no relationship between responses and outcomes.

An example of when people behave as if they are exerting control in a chance situation is in dice throwing; they believe that they can maximise their control if they implement the correct technique. It is common for people, particularly in gambling practices, to throw the die or dice gently when they are trying to achieve a low number, but more powerfully when trying to achieve a higher number (Henslin, 1967). Whilst this is an irrational practice as the outcome is determined by chance, there are many rituals that people perform to influence their control, which are usually accompanied by superstitious beliefs that they will experience negative outcomes if the ritual is not completed,

particularly in sports (Gregory & Petrie, 1972). For example, the famous tennis player, Serena Williams, performs many rituals including tying her shoelaces in a specific way and bouncing the tennis ball five times before her first serve, and attributes her game losses to not following these rituals closely enough (Murphy, 2013).

2.2.3 Situational and person-based factors

It is apparent that people fail to distinguish between uncontrollable and controllable events, which may be due to chance-determined factors being confused with skill-determined factors, hence suggesting a causal relationship between behaviour and outcome (Langer, 1975; Thompson, 2004). Langer (1975) conducted a series of studies investigating how the following skill-related factors might induce an IOC in chance situations: competition, familiarity, choice and involvement. For example, when asked to wager against either a confident or shy/awkward competitor in a card game, participants bet more money against the latter confederate, and it was concluded that this characteristic signified a lack of competence, thereby instilling more confidence in the participants that the probability of winning the bet was increased. In studies where people were asked if they would like to trade their current lottery ticket for a different lottery ticket with better winning odds or to sell their ticket, the decision of whether to keep, swap or sell their ticket was affected by choice, familiarity and involvement. More specifically, participants were more likely to keep their tickets if they had chosen the ticket themselves compared to being given it by the experimenter, if the ticket had a familiar letter compared to a non-familiar symbol, particularly if this letter was meaningful to the participant such as the initial of their names, and if they had a higher degree of involvement with their ticket, which in this case was receiving the three digits of their ticket number across three days compared to receiving all three digits on the day of ticket purchase. Therefore, this seminal research concluded that people can be deceived by characteristics of the situation, which appear to influence peoples' judgements and behaviour rather than the objective amount of control. Langer's findings were very influential for generating research investigating the IOC, and other factors have since been found to induce illusory perception of control. Thompson et al. (1998) supported the influence of skill-related factors as well as identifying the following conditions, which affect the IOC: emphasis on success or failure, need for outcome, desire for control, mood and intrusion of reality.

Langer and Roth (1975) found that sequence of outcomes was a factor that influenced the IOC. Participants were required to predict coin-toss outcomes and were

given feedback on the accuracy of their predictions. However, the sequences of outcomes were fixed, with three different patterns: descending, ascending and random. In the descending sequence, wins (accurate predictions) were concentrated at the beginning, whilst wins were concentrated at the end in the ascending sequence. Therefore, in the initial trials, success was emphasised in the descending group, and failure was emphasised in the ascending group. Participants in the descending group showed a greater IOC, believing that the task was more skill-based, remembering more correct predictions than they actually made, and predicting that they would have greater predictive success in a future attempt. It was concluded that decisions about ability may be made early, so that those who experienced early successes and then experienced later failures attributed these to chance fluctuations.

In order to measure the individual differences in the motivation to possess control, Burger and Cooper (1979) constructed the Desirability of Control Scale. They found that people who were high in their desire for control displayed a greater IOC than people with a low desire for control, by betting more chips in a chance-determined gambling task. Similarly, the relationship between the individual's need for the outcome and the skill perceptions/perceived level of control (IOC) was explored (Biner, Angle, Park, Mellinger & Barber, 1995). The participants would be rewarded with a McDonald's hamburger if they were successful on a memory task, and then drawing the correct numbered card from a pack labelled 1-20. Need state was primed in one condition by instructing the subjects to skip breakfast and lunch on the day of the study, thereby inducing hunger (food-deprived), whilst the other condition was required to eat both meals (food-satiated). Even though the card-drawing task was chance-based, the food-deprived (high need) group were more confident that they had a better chance of winning the task, and perceived it as more skill-based than the food-satiated (low need) group. Therefore, the greater need for the outcome resulted in a higher IOC.

As well as suggesting that nondepressed people are more likely to display positive illusions than depressed people, the depressive realism literature proposes that depressed individuals have more realistic perceptions of their control than nondepressed individuals. A series of studies investigated participation of nondepressed and depressed people in a chance-determined task, with two conditions: player-control and croupier-control (Golin, Terrell & Johnson, 1977; Golin, Terrell, Weitz & Drost, 1979). The player-control condition, which aimed to increase the IOC, required the participant to throw the dice (active participation), whilst the experimenter threw the dice in the croupier-control

condition (passive participation), which aimed to decrease the IOC. The first study investigated mildly depressed college students, whilst the second study replicated the task with a clinically depressed sample of hospital patients. Results suggested that active participation encouraged a greater expectancy of success (larger IOC) in the nondepressed participants, but lowered expectancies in both mildly and clinically depressed subjects. This is consistent with the depressive realism literature and increases the external validity of the results, which is essential, especially as research exploring depressive realism has been criticised for the use of nonclinical samples (Ackerman & DeRubeis, 1991; Carson et al., 2010). Conversely, in the croupier (passive) condition, the mildly depressed succumbed to an IOC, whereas the nondepressives did not. The findings that nondepressives show an IOC for themselves, but not other people, are consistent with the self-enhancement function of the evolutionary model of self-deception. However, it appears that the depressed subjects expected other people to have greater levels of success than themselves, whilst considering themselves as less competent, and more susceptible to failure (Golin et al., 1977). This would not be consistent with depressive realism, as we would expect depressives to be accurate in their judgements, and not pessimistic as in traditional cognitive theories. However, the clinically depressed participants did not show an IOC in the croupier-control condition, so it appears that they were more accurate than nondepressed subjects in both conditions, as well as being more accurate than mildly depressed subjects. This finding is consistent with the depressive realism theory, and suggests that it is also applicable to clinical samples, as well as dysphoric samples.

The issue of cause and effect exists here; does becoming depressed lead to a more realistic perception of the environment or does a more realistic outlook increase vulnerability to depression? Alloy, Abramson and Viscusi (1981), investigated this relationship by inducing elation in depressed subjects and inducing depression in nondepressed subjects. Subjects were instructed to talk themselves in to their respective moods by reading aloud statements that began with the same neutral statement and then progressed to either elated or depressed statements. The findings revealed that the depressives who were induced with elation reported higher ratings of control and therefore showed an IOC, whilst the nondepressives who were induced with depression more accurately judged their degree of control in a task in which there was no control. Therefore, this research suggests that accuracy in control judgements may be influenced by current mood states. This could have implications for therapeutic interventions that are designed to treat depression, in that instead of encouraging individuals to form realistic

perceptions of their control over their circumstances, the alleviation of symptoms may be produced by encouraging the development of IOCs.

2.2.4 Benefits and costs

There are many benefits that accompany a sense of control, some of which were discussed earlier in this chapter. Therefore, it follows from this that it may also be beneficial and adaptive to possess an IOC. For example, if an individual is lacking actual control in a situation, then the possession of an IOC may encourage the person to take action and to motivate them to spend time and effort in an attempt to change their circumstances, whereas if the person had an accurate perception of their lack of control, he or she may become hopeless, which has been linked to the development of depression (Peterson & Seligman, 1984). This is also supported by research investigating the differences in control beliefs between high and low-income groups (Lachman & Weaver, 1988). As expected, it was found that subjects with a higher level of income perceived themselves as experiencing few constraints and being higher in mastery, which was associated with greater life satisfaction, in comparison to persons with lower income. However, a small subgroup of individuals in the lower income group who had retained a high perception of control resembled those in the higher income group in terms of life satisfaction. Therefore, even though people in lower social classes generally experience fewer opportunities in which they can influence events in their environment, it appears that possessing an IOC may function as a buffer against the negative effects on well-being. This was also proposed by Alloy and Clements (1992) who found that people who displayed an IOC were less likely to experience emotional deficits such as symptoms of depression, and more likely to maintain positivity after facing negative life events, possibly bolstered by their overestimation of control that they will be able to prevent future adverse incidents.

People who have a sense of control may also experience better health as they are more likely to engage in health-promoting behaviours and active coping efforts, such as researching information, visiting health practitioners, following prescription procedures, and taking care of themselves generally, e.g. eating a balanced diet (Aspinwall & Taylor, 1997; Rodin, 1986a). Additionally, inducing an IOC in patients undergoing stressful medical procedures was associated with better coping and adjustment in comparison to people undergoing the same procedures, but who did not receive any control-enhancing intervention (Thompson & Spacapan, 1991). Likewise, in Friedland et al. (1992), people

assigned to the high-stress condition showed greater IOCs than people in the low-stress condition, which it was concluded was to compensate for the stress-produced loss of perceived control. Therefore, an IOC appears to be important as a coping method.

On the other hand, there are costs associated with perceptions of control. If indeed there is no control in the situation, so that the responses of the individual have no effect on the outcomes, then spending time and effort trying to influence their circumstances instead of more controllable and productive situations is futile and unrewarding, as they may fail to achieve the desired outcomes (Abramson & Alloy, 1981; Burger, 1989). Additionally, if an individual believes that a situation is controllable when it is uncontrollable, inevitable failures to effectively exert control may lead to feelings of incompetence, self-blame and learned helplessness (Peterson & Seligman, 1984). Contrary to the finding discussed in the previous paragraph, that an IOC may be adaptive in lower social classes, an alternative interpretation may be that it is particularly detrimental for the economically disadvantaged to believe that they possess control. The reason being that these individuals are more likely to experience obstacles and uncontrollable situations, so an IOC is unrealistic and would lead to feelings of disappointment and failure (Thompson, Cheek & Graham, 1988). However, if they have an attributional style where they attribute successes to internal factors and failures to external factors such as luck, then this may also protect individuals against these costs. However, although attributing to external factors avoids the cost of self-blame, it may be harmful if other people are blamed for the misfortune. Therefore, it may be more appropriate to have an accurate understanding of their circumstances. However, perhaps rather than an all or nothing approach, a more complete account would consider illusions as adaptive in some circumstances, and maladaptive in other circumstances (Robins & Beer, 2001; Thompson, 1999).

2.3 Contingencies

A limitation of the majority of the studies discussed thus far is that there were no objective standards to compare the subjective judgements against, so the validity of the accuracy of depressives in comparison to illusion-prone nondepressives is questionable (Ackermann & DeRubeis, 1991). In the Golin et al. (1977, 1979) studies, the use of confidence ratings instead of probability measures as the dependent variable was challenged, as confidence ratings cannot be compared to an objective standard, and there are no right or wrong levels of confidence, whereas there is a correct measure of

probability. In the Lewinsohn et al. (1980) study, it was argued that the observer ratings, which the participants' subjective ratings were compared against, could not be considered an objective measure of reality, as the raters' judgements were subject to their own biases. Contingency and noncontingency tasks are considered to be more valid, as there is an objective standard that can be set, to examine the accuracy of judgements against. This section will review the IOC in studies investigating accuracy in judgements of contingency.

2.3.1 Contingency judgements in the environment

Contingency judgements refer to the extent that people believe that their actions will result in the attainment of desired outcomes (Thompson & Spacapan, 1991). Many theories of learning, such as Pavlovian conditioning, work on the assumption that people are sensitive to relationships between events in the environment, and understand the contingency between their own responses and the environmental outcomes (Maier & Seligman, 1976; Rescorla, 1967). Understanding the causal relationships between events is important, as it "enables individuals to explain the past, control the present, and predict the future" (Crocker, 1981, p. 272). On this basis, it would be logical to assume that the subjective representations of contingencies that humans form imitate the objective contingencies, and it has been suggested that these subjective representations can also influence an individual's behaviour (Maier & Seligman, 1976). This would be consistent with the traditional model of mental health that healthy individuals have realistic and accurate perceptions. Additionally, it is necessary to assess what an individual learns in a noncontingent situation, i.e. when there is no objective contingency between a response and an outcome. If humans are accurate in their assessments, then they should learn that their responses and the outcomes are uncorrelated. Indeed, the learned helplessness model proposes that depression ensues when people learn that outcomes occur independently of their behaviour (Maier & Seligman 1976).

2.3.2 Degree of contingency and conditional probabilities

Many variables are binary, so that there are only two possible levels, where the event either occurs or does not occur (Crocker, 1981). Therefore, when the response and outcome variables are both binary, this creates a 2x2 table of frequencies, also called a contingency matrix (see Figure 2.1).

	B	~B
A	a	b
~A	c	d

Figure 2.1. Frequencies table comparing event combinations for the input variable (A) and the output variable (B).

Within this table, the diagonal cells a and d are confirming cases, so that when the input occurs, the output occurs, and when the input does not occur, the output does not occur, respectively. Cells b and c are disconfirming cases, so that when the input does not occur, the output does occur, and when the input does occur, the output does not occur, respectively. The degree of contingency, referred to as delta P (ΔP), is considered to be the most appropriate measure of contingency, and can be accurately judged with the information regarding the conditional probabilities (Allan & Jenkins, 1983; Ward & Jenkins, 1965). Seligman, Maier and Solomon (1971) proposed that people are knowledgeable about the conditional probabilities in two response-outcome situations: the conditional probability of an outcome given the occurrence of a response, *P*(O/R), and the conditional probability of an outcome given no response, *P*(O/~R). The contingency judgement can be calculated using the equation ΔP = *P(O/R) – P(O/~R)*, i.e. by calculating the difference between the conditional probabilities. This also gives the index of the degree of control that is available in the situation (Allan, 1993). Therefore, if people understand these contingencies, it follows that they should also be accurate in their judgements of control.

However, even though some research suggests that people produce accurate contingency judgements, other research proposes that humans are not sensitive to contingencies (Ward & Jenkins, 1965), arguing that when individuals' judgements are correct, it may not be because they have used the correct heuristic (Carson et al., 2010). Instead, people are more likely to use simpler rules, such as a reliance on reinforcement from confirming cases, cells 'a' and 'd' in the contingency matrix, particularly cell 'a' where an active response results in the desired outcome (Allan, 1980; Schustack & Sternberg, 1981).

2.3.3 The IOC in noncontingency tasks

Jenkins and Ward (1965) investigated conditional probabilities in the two response-outcome situations, separate from the literature on learned helplessness. The participants

were presented with problems, each consisting of 60 trials, where the responses and outcomes were contingently or noncontingently related. For each problem, the two possible responses were to press Button 1 or Button 2. This was followed by two possible outcomes, where the participants either received or did not receive a score. The participants then estimated their degree of control (contingency) on a scale from 0 to 100. They found a high correlation between the judgements of control and the frequency of positive confirming instances, i.e**.** judgements of control increased as the number of button presses that resulted in a score increased. Thus, only successful outcomes were used to determine the relationship, i.e. a response followed by the obtainment of a score, whereas the subjective representations of contingencies were uncorrelated with the objective contingencies. However, whilst the participants could either receive a score (event) or no score (nonevent), the responses were both button presses (i.e. both events). Allan and Jenkins (1983) found that when one response was active and the other was passive (i.e. no button press), judgements were less influenced by the frequency of the scores that were experienced, and more in line with the objective contingency (ΔP).

Research exploring the IOC has suggested that people are not particularly proficient when assessing their degree of control, frequently judging noncontingent situations as contingent situations, as if their responses and behaviours exert control over the environmental outcomes (Langer, 1975; Thompson et al., 1998). This is supported by seminal work by Alloy and Abramson and colleagues (1979, 1981, 1982, 1984) exploring the IOC and depressive realism in college students in noncontingent and contingent situations. Alloy and Abramson (1979) aimed to explore the assumption by the learned helplessness model that depressives underestimate the degree of control that their responses exert over outcomes in contingent situations and are accurate in noncontingent situations, using a modification of the two response-outcome contingency task employed by Ward & Jenkins (1965, see also Jenkins & Ward, 1965). Unlike previous studies exploring the IOC (see subsection 2.2.3), the contingency tasks allow the experimenter to set an objective amount of control, so that the biases of nondepressed and depressed individuals can be analysed. Unlike in Ward and Jenkins (1965), where the two responses were both active button presses, the two possible responses that could be made were pressing or not pressing a button, and the two responses that participants could receive were green light onset and green light off. Participants completed 40 trials, and were asked to judge the amount of control, as well as the conditional probabilities on scales of 1-100. In support of Seligman, Maier & Solomon (1971), it was found that both nondepressed and

depressed people accurately judged the conditional probabilities of green light onset when pressing and not pressing. Therefore, all the participants appeared to be knowledgeable of the information required to judge their control. However, in support of the depressive realism concept, nondepressives showed an IOC, overestimating the degree of contingency (" P) between their responses and outcomes in noncontingent problems. Therefore, it appeared that nondepressives did not use the appropriate data to make contingency estimates. However, moderately depressed and dysphoric people accurately judged their degree of control, so the researchers concluded that depressed people appear to be sadder, but wiser.

Similar to Golin et al.Õs studies (1977, 1979), Martin, Abramson & Alloy (1984) investigated the IOC in self and other conditions, but unlike these earlier tasks in which there was no objective standard, this study employed Alloy and Abramson's (1979) noncontingency task. Replicating previous literature regarding the IOC and depressive realism, when the participant completed the task (self condition), nondepressed people overestimated their judgement of control, and dysphoric people accurately perceived a lack of control. However, when the participant was instructed to watch a confederate complete the task (other condition), and to judge their control, dysphoric subjects and nondepressed females overestimated the degree of control, whilst nondepressed males did not succumb to an IOC for other people. Therefore, the finding that nondepressed males did not overestimate others' control is consistent with self-enhancing biases.

Extending Alloy and AbramsonÕs (1979) research on contingency tasks, Tasks and Critelli (1990) also found support for the depressive realism concept, with mildly depressed subjects making more accurate judgements than nondepressed participants, when a monetary incentive was contingent on light onset but not on accuracy of judgements. The researchers aimed to encourage nondepressed participants to give up their IOCs by introducing a monetary incentive contingent on accuracy. However, inconsistent with the authorsÕ hypotheses, their results showed that even in these situations where it

regardless of response. As the midway value, I believe that this is a sensible percentage. Furthermore, as Alloy and Abramson (1979) did not find depressive realism, in the 25% problem, it appears that a low-density reinforcement problem is not suitable for observing the IOC.

It was a discrete-trial task, where the information was received trial-by-trial (i.e. response, outcome, response…), modified from Ward and Jenkins' (1965) study, in which they compared this method of information presentation with two other conditions, where participants only received summary information with no trial-by-trial feedback or they received both. They found that participants in the trial-by-trial condition were most likely to make judgements that were unrelated to the actual contingency, whilst people who only received the summary information made more accurate judgements. In the real world, as information that is utilised in contingency judgements is more likely to occur on a situation-by-situation basis, it was concluded that receiving information trial-by-trial is most likely to reflect real life. Additionally, in terms of the IOC and self-deception, as I am interested in whether systems are aligned or misaligned with reality, this appears to be an appropriate mode of presentation to use in my research.

Alloy and Abramson (1979) also introduced a short 10-trial behavioural task as an additional measure of the participants' contingency judgements, renamed as the maximisation task in my research. This took place after the participants had completed the main task and the judgements of control questionnaire. It was explained that their aim was to maximise green light onset using what they had learnt in the previous task, and allowed the researchers to analyse the pattern of responses. Although, there should technically be no "correct" response in a noncontingent problem, as both responses are reinforced equally, it is still of interest as to whether there is a relationship between participants' judgements of control and their subsequent response behaviour.

It has been proposed that one of the factors that may increase the IOC is the amount of exposure to the experimental task that people experience, i.e. the number of trials (Carson et al., 2010). According to their rationale, as the number of trials increases, the IOC would decrease, with the judgements of control becoming more representative of the true objective baseline. In both the Carson et al. (2010) and Alloy and Abramson's (1979) research, participants completed 40 trials and the IOC was present. However, in Ward and Jenkin's (1965) study, participants completed 60 trials and subjective judgements of control still did not reflect the objective amount. In my research, I have extended the number of trials to 100 to explore whether the IOC is still present, even when

people have more exposure to both confirming and disconfirming cases. If people are deceiving themselves in to believing that they possess more control than in reality, then they should still display an IOC despite experiencing more circumstances that could disconfirm their belief. Additionally, in chance situations, people may experience fluctuations from the noncontingent baseline, so a second advantage of increasing the number of trials is that the actual experience is more likely to reflect the asymptotic value.

Further, whilst Alloy and Abramson's (1979) task instructions were very thorough, the amount of detail was possibly unnecessary and laborious to read (see Appendix A). Indeed, it has been found that participants have had difficulty understanding the instructions, most likely due to the volume of information (Dobson & Pusch, 1995). Therefore, I have simplified the instructions in an attempt to reduce the time needed for the task introduction, to hopefully lessen the possibility of boring or tiring the participant, and to increase the likelihood of them reading the instructions thoroughly (see Appendix B). In order to ensure that participants fully understood the instructions before starting the task, Dobson and Pusch (1995) introduced ten 100% contingent practice trials to acquaint the participants with the computer graphics. They compared a practice condition with a no-practice condition and found that the addition of practice trials did not bias contingency judgements or response type (active/passive). Likewise, I decided to introduce five practice trials before the main task phase, so that the participants could experience the sequence of graphics, and so that I could confirm that they understood how and when to respond appropriately.

The wording of the objective(s) of the task has also been investigated to determine whether this influences judgements of contingency. Results have indicated that participants are more accurate in their estimates of noncontingency when they are instructed that their aim is to assess their degree of control, that it is advantageous to equally sample both responses so that they can experience the effect on the outcomes, and when the possibility of noncontingency is made apparent (Matute, 1996; Peterson, 1980). On the other hand, an IOC was more likely to be induced when participants were instructed to obtain the desired outcome, as they were more likely to attend to confirming cases, where an active response resulted in the desired outcome. In my task instructions, as in Alloy and Abramson's (1979) instructions, participants were required to assess their degree of control over whether the outcome occurs or not, and encouraged to try out both responses. Therefore, past research supports that I am not actively attempting to induce an IOC through the wording of the instructions.

3.2 General Methods

Ethical Approval

Ethical approval for the research was granted by the Ethics Committee of the School of Psychology in Bangor University.

Participants

All participants had normal or corrected-to-normal vision. Participants were excluded from the experiments if they failed to follow the experimental instructions to try out both responses. More specifically, if they made one response on less than 10% of the trials, this qualified as failing to follow the experimental instructions.

Design

The judgement of noncontingency task had a two response-outcome format, with two possible responses, pressing the space bar or not pressing the space bar, and two possible outcomes, green light onset or no green light. The degree of control was 0% (50-50). The first number in the brackets denotes the percentage of trials on which green light onset occurred when the participants pressed the space bar, and the second number denotes the percentage of trials on which green light onset occurred when the participants did not press the space bar. These two numbers represent the contingencies between responses and the environmental outcomes. Therefore, on each trial for each response, there was a 50% chance of being rewarded with green light onset, so the outcomes were random. The task consisted of a 5-trial practice phase, a 100-trial learning phase, which took approximately eight minutes, followed by a 10-trial maximisation task, which lasted for approximately two minutes. The experimenter was present for the practice trials in order to assess that the participants understood the task instructions, but was not present whilst the participants completed both the learning and the maximisation phases.

Apparatus

The judgement of noncontingency task developed by Alloy and Abramson (1979) was utilised, but in the place of their manual switch circuitry device contingency task, the current study used a computer and keyboard setup (see Carson et al., 2010; Koenig, Clements & Alloy, 1992). The noncontingency between participants' responses and outcomes was programmed in a Psychtoolbox file. The response screen was presented for 1500ms, on which the yellow light onset indicated the time to make a response. Afterwards, the reinforcement screen was presented for 1000ms with one of the two

possible outcomes (see Figure 3.1). A fixation cross in the centre of the screen occurred between trials.

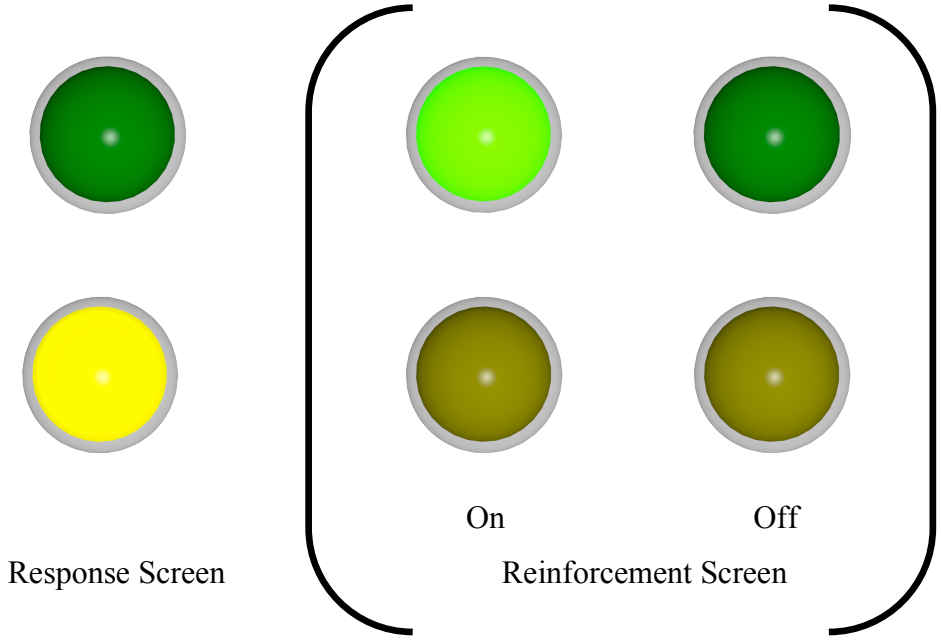

Figure 3.1. The computer graphics sequence.

Measures

Judgements of Control Scale. The dependent measure was the 'Judgements of Control' questionnaire (see Appendix C), completed after the learning phase, which consisted of five questions with scales from 0% to 100%. These questions were "how much control did you have over the green light?", "how frequently did you press the space bar?", "how frequently did the green light come on?", "on the trials where you pressed the space bar, how often did the green light come on?" and "on the trials where you did not press the space bar, how often did the green light come on?". Question six on the questionnaire was related to the 10-trial maximisation task, and asked the participants "how many times did the green light come on out of the 10 trials?". The number of green lights that they received in the maximisation task was not of interest; it was the pattern of responding that they made to maximise the desired outcome.

Control Measures. There are three important terms: explicit control, actual control and implicit control. Explicit control is how much control the participant reported that they had, and is provided by question one on the 'Judgements of Control' scale. The actual degree of control (also called objective control or delta P; ΔP), reflects the actual sequence of responses and outcomes as recorded by the computer program. It is the size of the

difference between the actual conditional probability of the outcome (green light onset) when the response is made (space bar press; *P*(O/R)) and the actual conditional probability of the outcome when the response was not made (no press; *P*(O/~R)), i.e. ΔP = *P*(O/R) – *P*(O/~R). Therefore, as the experiment is arranged so that participants are reinforced with the outcome on 50% of the trials on which they pressed (*P*(O/R) = 50), and on 50% of the trials on which they did not press (*P*(O/~R) = 50), these numbers can be entered into the equation (ΔP = 50 – 50), which equals 0% control.

The implicit control is the difference between the participants' estimates of the conditional probabilities described above. By answering questions four and five, participants estimated *P*(O/R) and *P*(O/~R) respectively, which allowed the calculation of their implicit measure of control. For example, a participant may estimate that they were reinforced with green light onset on 60% of the trials on which they made the response, and on 45% of the trials on which they did not make the response, which would give them an implicit value of 15% control (ΔP = 60 – 45). In previous studies, the estimates of the conditional probabilities have been compared to their objective counterparts (Alloy & Abramson, 1979; Carson et al., 2010), but have not been entered in to the formula ΔP = *P*(O/R) – *P*(O/~R), to calculate the value of control, as will be implemented in this research. Although the implicit measure of control is calculated using explicit judgements, it is reasoned to be more implicit, as the questions about the conditional probabilities do not mention the word 'control', and participants are unlikely to perceive the use of these judgements in a calculation of control. Therefore, it is believed that people will not be motivated to inflate these estimates in the same way as their explicit estimates of control.

With sufficiently large numbers of trials, actual control should approximate 0. However, over a sample of 100 trials, a participant, by chance, would most likely experience something slightly different from this asymptotic value. For example, a participant may receive the outcome on 52% of the trials on which he or she made the response, and on 49% of the trials on which he or she did not make the response. In which case, this would result in a participant experiencing 3% control (ΔP = 52 – 49), having experienced slightly more reinforcement for active responding. Rather than assuming that every participant experienced 0% control (perfect noncontingency), and comparing the explicit and implicit estimates to this, the actual individual experience of control was used. .However, due to the random nature of outcome reinforcement, the observed variability of the actual control data was unexpected and therefore, two groups emerged: participants

who experienced positive values of actual control and participants who experienced negative values of actual control. Therefore, the study became a between-groups design post-hoc. The participants in the positive actual control group received more green light onset when pressing the space bar, i.e. the actual values for the conditional probability responding to question four on the Judgements of Control questionnaire were higher, and therefore, these participants were reinforced more for active responding. The participants in the negative actual control group received more light onset when not pressing the space bar, i.e. the actual values for the conditional probability responding to question five on the questionnaire were higher, and so these participants were reinforced more for passive responding. These two groups will be referred to from here on as the ACT and PAS groups respectively. The ACT and PAS groups were analysed separately as different patterns may have emerged in the data

The data in each group were analysed in terms of the more reinforced response. Therefore, actual control and estimates of implicit control were both calculated by subtracting the less reinforced response from the more reinforced response. Therefore, for the ACT group, the value for the frequency of green light onset when the space bar was not pressed was subtracted from the value of frequency of green light onset when the space bar was pressed, i.e. $\Delta P = P(O/R) - P(O/\sim R)$. For the PAS group, the equation was reversed so that the frequency of outcome when the space bar was pressed was subtracted from the frequency of outcome when the space bar was not pressed, i.e. $\Delta P = P(O/\sim R) - P(O/R)$. The values of actual control were always positive, but it was possible for participants to get negative values of implicit control. For example, if the participant was in the PAS group, but estimated that they were reinforced more for active responding ($P(O/R) = 60$) than passive responding ($P(O/\sim R) = 45$), then this would result in a negative score ($45 – 60 = -15$), i.e. the participant was incorrect in their judgements. In the 10-trial maximisation task, the value represents how often (%) the participants in each group made the more reinforced response. In the ACT group, the score indicated the percentage of times that participants pressed the space bar, and in the PAS group, the percentage of times that they did not press the space bar. For example, a value of 80% in the ACT group signifies that the participant pressed the space bar on 80% (8 out of 10) of the trials, whilst in the PAS group, it indicates that the participant did not press the space bar on 80% of the trials.

Illusion of Control. The IOC is calculated by subtracting the mean for actual control from the mean for reported explicit control; hence it is the difference.

Maximisation Task. The aim of this short 10-trial behavioural task was to maximise the outcome, allowing the experimenter to study the participants' subsequent response pattern. Whilst there is technically no correct response in a noncontingent problem when the conditional probabilities are equal, if the conditional probabilities are unequal, it may provide converging evidence regarding their understanding of their control estimates.

Procedure

Participants were seated in the testing room, and given a couple of minutes to read through the participant information sheet, and to sign the consent form (see Appendix D). The standardised instructions were presented on the computer screen prior to commencing the judgement of noncontingency task, and participants were given the opportunity to clarify any queries. They then completed five practice trials in the presence of the experimenter to experience the graphics. The 100-trial learning phase was then set up and the participants were instructed that their aim was to learn how much control they had over the green light, and to treat it as an exploratory task. Although stated in the instructions, the experimenter emphasised to the participants, prior to starting the task, that when they chose to press the space bar, they had to respond during the 1.5s period of yellow light onset, otherwise the trial would be counted as a no-press trial. If they chose to not press the space bar on the trial, they were instructed to do nothing and to wait for the response screen to timeout.

Following their completion of the learning phase, the participants filled in the Judgements of Control questionnaire, and then called the experimenter back in to the room to set up the next phase of the experiment. Participants then completed the 10-trial maximisation task, in which they were instructed that their aim was to maximise green light onset based on their knowledge from the learning phase. They were asked to keep a tally of the number of green lights that they received, and to write their totals in answer to question six on the Judgements of Control scale. Afterwards, the participants were debriefed (see Appendix E).

3.3 Experiment 1: Dissociation of Control Judgements

It is important to state that this initial study is not looking at depressive realism, and therefore no measures of depression were completed. Instead, the task was

investigating whether the IOC and the explicit/implicit dissociation can be successfully observed using this task setup. The aim of this study was to investigate a system where self-deception may be demonstrated via the ability of students to detect the degree of contingency between their responses and outcomes. Firstly, in support of the literature investigating IOCs, it was predicted that participants would show an IOC by overestimating their degree of control in a noncontingent task. Secondly, it also aimed to demonstrate that participants were aware of the co-variations simultaneously, to demonstrate that the system was implicitly processing the information accurately. This is essential to support the concept of a dissociation, as theorised by the traditional and evolutionary approaches to self-deception (Gur & Sackeim, 1979; von Hippel & Trivers, 2011). Finally, it aimed to explore whether later response decisions in the subsequent behavioural (maximisation) task would be related to their inaccurate explicit judgements of control or the more accurate knowledge of the conditional probabilities. It has been previously suggested that judgements of contingency may affect future behaviour (Crocker, 1981), and this is important because if people based their decision-making on inaccurate information, they can make incorrect and potentially costly decisions.

3.3.1 Methods

See 'General Methods' section.

Participants

Fifty-two undergraduate and postgraduate students (39 women) at Bangor University were recruited via SONA, and received one course credit for their participation. The data of 5 additional participants were removed because they failed to follow the experimental instructions. Participants were then split into the ACT (n = 27) and PAS (n = 25) groups.

3.3.2 Results

Illusions of Control

Firstly, I will discuss the analysis of the IOCs that were experienced during the 100-trial learning phase. Participants in both the ACT and PAS groups showed a higher estimate of explicit control (M = 32.96, SD = 22.03 and M = 21.32, SD = 20.59

respectively) compared to the actual control (M = 10.93, SD = 7.55 and M = 7.78, SD = 5.86 respectively). In addition, the explicit judgements of the ACT participants were almost significantly greater than the PAS participants, $t(50) = 1.97$, $p = .06$. As both groups overestimated their control, they both displayed an IOC. As can be seen in Figure 3.2, the participants in the ACT group showed a higher IOC (M = 22.04, SD = 23.64) than participants in the PAS group (M = 13.54, SD = 20.77), although this did not reach significance, $t(50) = 1.37$, $p = .18$.

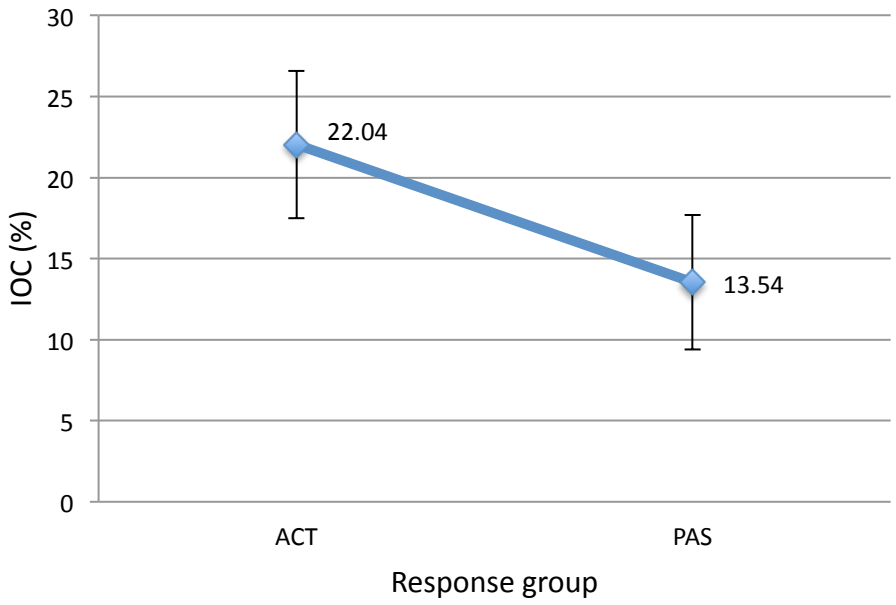

Figure 3.2. Comparison of IOCs across the active and passive groups. Error bars represent the standard error of the means.

However, a between-groups ANOVA with ACT/PAS as the between-subjects factor and the IOC as the dependent variable did not find a significant main effect, $F(1, 50) = 1.89$, $p = .18$. Therefore, this suggests that the IOCs were similar.

T-tests were carried out to analyse whether the IOCs were significantly different from zero. The IOCs shown by the participants in both the ACT and PAS groups were significantly different, $t(26) = 4.84$, $p < .001$ and $t(24) = 3.26$, $p = .003$ respectively. Therefore, regardless of whether participants experienced more green light onset for pressing or not pressing the space bar, it seems that they perceived their control to be greater than it was.

Additionally, the lack of a significant correlation between the explicit judgements and the actual control was found in both the ACT and PAS groups, $r(25) = -.05$, $p = .80$ and $r(23) = .11$, $p = .59$ respectively (see Figure 3.3). Therefore, these results suggest that not only did the participants overestimate their control, but also that their explicit judgements did not track their actual control. As a comparison, the black lines in the graphs indicate where accurate responses would lie if the explicit judgements perfectly matched with the actual experience.

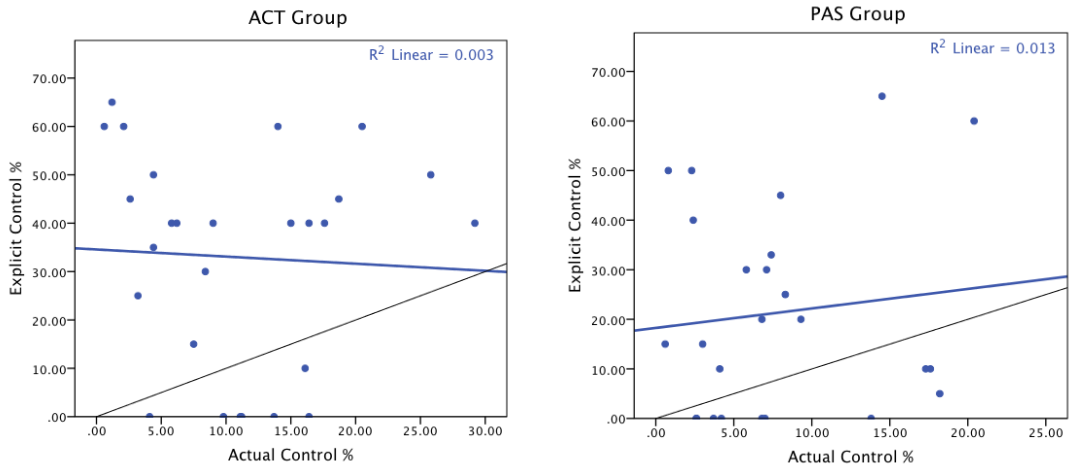

Figure 3.3. Participants' explicit judgements compared to their actual experiences.

Dissociation of Explicit and Implicit Judgements

The previous section presented the IOC and the relationship between the participants' judgements of explicit control and their actual experience. This section will analyse the relationship between the participants' implicit judgements of control and their actual experience, and discuss the explicit/implicit dissociation.

The difference between the implicit judgements and the actual control was calculated for each group. As can be seen in Figure 3.4, the difference in the ACT group was negative ($M = -9.44$, $SD = 26.00$), which means that compared to the actual control that was experienced ($M = 10.93$, $SD = 7.55$), the implicit judgement was underestimated ($M = 1.48$, $SD = 28.95$). In the PAS group, the implicit judgement ($M = 7.8$, $SD = 31.03$) and the actual control ($M = 7.78$, $SD = 5.86$) were very similar, so the difference was very small ($M = 0.02$, $SD = 28.43$).

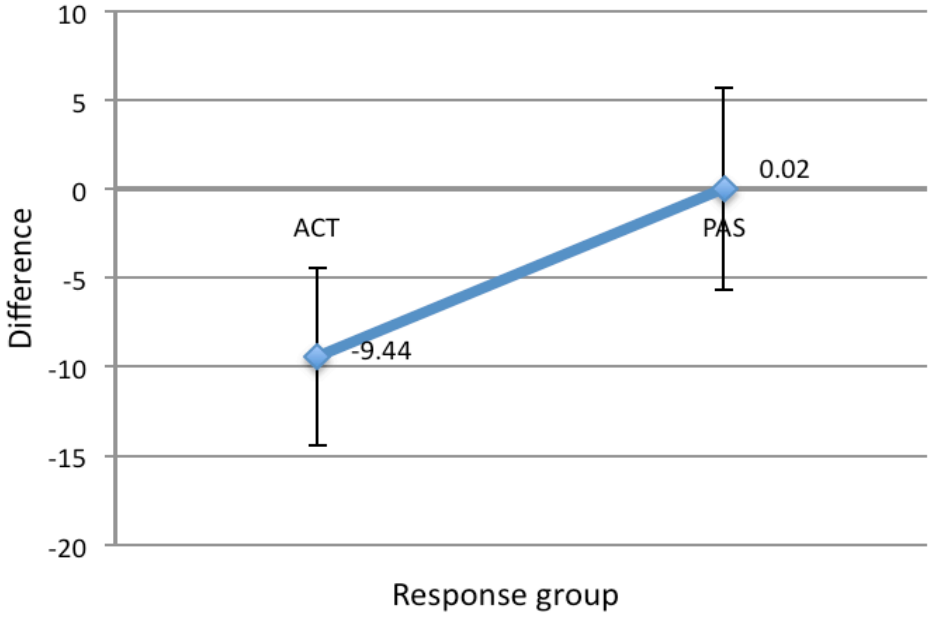

Figure 3.4. Comparison of the differences between the implicit judgements of control and actual control across ACT/PAS groups. Error bars represent the standard error of the means.

T-tests were run to analyse the similarity between the implicit judgements and the actual control. The differences in both the ACT and PAS groups were not significantly different from zero, $t(26) = 1.89$, $p = .07$ and $t(24) = -0.003$, $p = .998$ respectively. This suggests that the participants had an accurate understanding of the conditional probabilities that underlie the control that they experienced, although the difference was trending towards significance in the ACT group, which suggests that the participants in this group may not have been as accurate in their knowledge as those in the PAS group.

In the interest of analysing whether the implicit estimates tracked the actual control experienced, the correlations between these measures were tested. Figure 3.5 shows that there was a significant positive correlation between the implicit judgements and the actual control in both the ACT and PAS groups, $r(25) = .51$, $p = .007$ and $r(23) = .52$, $p = .008$ respectively. Therefore, it appears that the participants' implicit estimates tracked the actual control that they experienced. As in the previous section, the black lines in Figure 3.5 indicate where accurate responses would lie if the participants' implicit judgements perfectly tracked the actual degree of control.

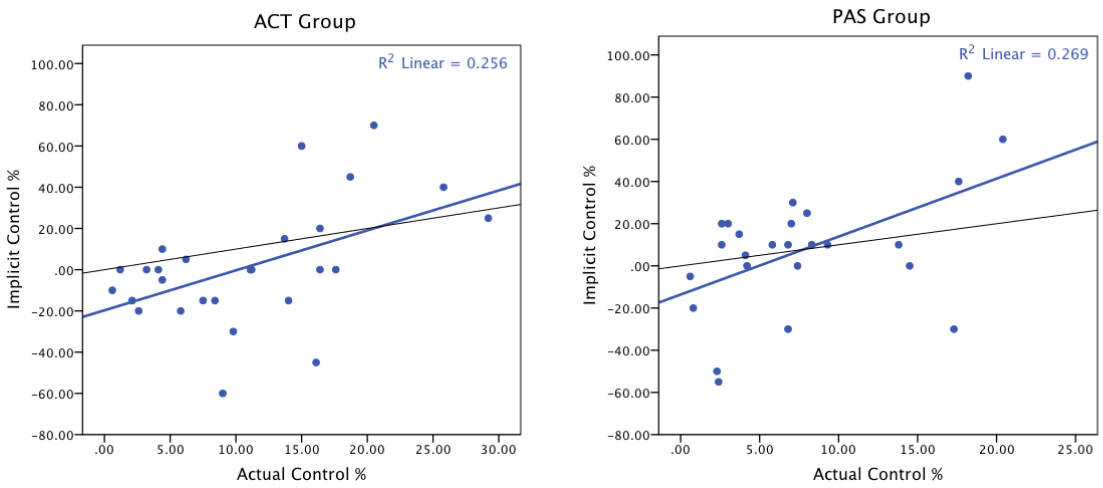

Figure 3.5. Participants' reports of implicit control compared to their actual experience.

I will now discuss the dissociation between the explicit and implicit systems. In the ACT group, the difference between the explicit/actual and the implicit/actual correlations was significant, $Z = -2.10$, $p = .04$, although it did not reach significance in the PAS group, $Z = -1.53$, $p = .12$. However, the explicit/implicit dissociation was very apparent, as the participants in both groups significantly overestimated their explicit judgements, whilst concurrently displaying accurate implicit knowledge of the underlying conditional probabilities.

An alternative method to test for an explicit/implicit dissociation is to use an ANOVA where the distinction is used as a factor in the analysis. A mixed-design ANOVA with judgement (explicit and implicit) as a within-subjects factor and ACT/PAS as a between-subjects factor revealed a significant main effect of judgement, $F(1, 50) = 19.86$, $p < .001$. In particular, estimates of explicit judgements ($M = 27.14$, $SE = 2.96$) were higher than estimates of implicit judgements ($M = 4.64$, $SD = 4.16$).

However, there was not a significant main effect of ACT/PAS, $F(1, 50) = 0.27$, $p = .61$. Nor was there a significant interaction between judgement and ACT/PAS, $F(1, 50) = 3.16$, $p = .08$ (see Figure 3.6), although it was trending towards significance. In fact, a *t*-test showed that there was a significant difference between explicit and implicit judgements in the ACT group, $t(26) = 5.13$, $p < .001$, with estimates of explicit control significantly greater than estimates of implicit control, whilst the *t*-test for the PAS group did not reach significance, $t(24) = 1.66$, $p = .11$. Additionally, a *t*-test for the difference between the explicit judgements in the ACT and PAS groups was approaching significance, $t(50) = 1.97$, $p = .06$, which would suggest that participants who were

rewarded for active responding perceived themselves to have more control. However, a non-significant difference between estimates of implicit control across the ACT and PAS groups suggests that the implicit judgements remained more consistent, $t(50) = -0.76$, $p = .45$.

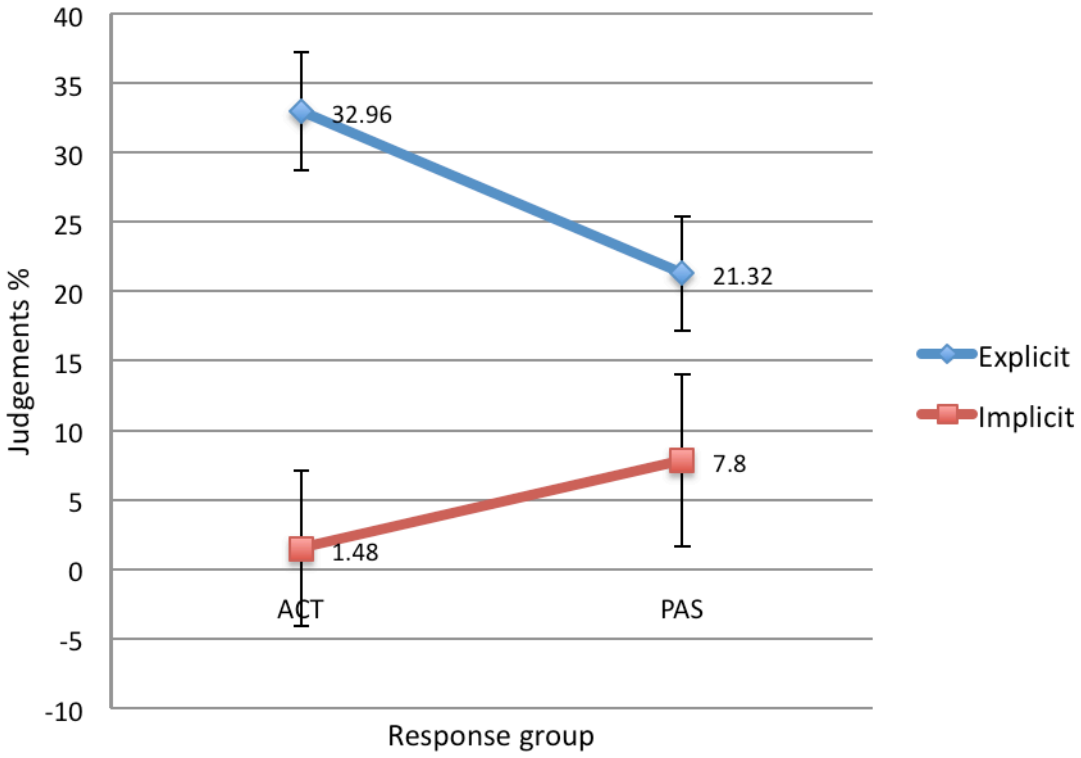

Figure 3.6. Comparison of explicit and implicit judgements across the active and passive groups. Error bars represent the standard error of the means.

Maximisation Task Behaviour

The previous analyses suggested important differences between the explicit and implicit measures of control. Compared to the estimates of implicit control, the reported explicit control was systematically high, and scaled poorly with actual control, but did either of the measures predict subsequent performance? This section will discuss the data in regards to the participants' choice of response in the task and also as to how the explicit and implicit reports of control guided pressing behaviour in the subsequent 10-trial maximisation tasks, where participants were asked to maximise green light onset.

In terms of future choice of response, the maximisation rate (%) in the ACT group ($M = 55.97$, $SD = 22.13$) was greater in comparison to the PAS group ($M = 39.95$, $SD = 17.52$). This suggests that when participants were rewarded more for active responding

(pressing the space bar), they made the more reinforced response more often in the subsequent task than the participants who were rewarded more for passive responding.

A multiple regression, with explicit, and implicit judgements of control entered as independent variables, was run for each group to estimate which variable was a better predictor of future press behaviour. Firstly, I will present the model for the ACT group, followed by the model for the PAS group.

In the ACT group, the two-factor model gave a significant prediction of maximisation rate, $R = .48$, $R^2 = .23$, $F(2, 24) = 3.55$, $p = .05$. Furthermore, tests of the predictor betas showed that explicit judgements significantly and positively predicted space bar press, $\beta = .42$, $t(26) = 2.25$, $p = .03$, but implicit estimates were not a significant predictor, $\beta = .16$, $t(26) = 0.85$, $p = .41$. However, in the PAS group, the two-factor model was not significant, $R = .12$, $R^2 = .02$, $F(2, 22) = 0.17$, $p = .84$, and neither the explicit nor the implicit estimates emerged as significant predictors of future passive responding, $\beta = .02$, $t(24) = 0.08$, $p = .94$, and $\beta = .13$, $t(24) = 0.59$, $p = .56$ respectively.

3.3.3 Discussion

Different patterns emerged depending on whether the participants were rewarded for active or passive responding. Both groups overestimated their subjective explicit reports in comparison to the objective control during the learning phase, which supports the hypothesis that participants would display an IOC, as shown in previous research (Alloy & Abramson, 1979). Furthermore, although not significantly so, the IOC and particularly the explicit judgements in the ACT group were higher than in the PAS group, which suggests that when participants were rewarded more for active responding than passive responding, they estimated that their control was greater. Therefore, this supports the notion that involvement is a factor that induces the IOC, as suggested by Langer's (1975) research (see also Golin et al., 1977, 1979). In particular, it could be that the action of pressing the space bar leads the participants to feel more involved in generating green light onset. However, regardless of the more reinforced response, an IOC was evident, so it seems that in general, they treated almost noncontingent situations as contingent situations. In other words, they appeared to believe that there was a higher probability of obtaining the desired outcome through their actions, than the objective probability allowed. However, both groups more accurately estimated the conditional probabilities of reward for their responses, so it appears that participants registered the true co-variations, as was

proposed by Seligman, Maier & Solomon (1971), and supporting Alloy and Abramson (1979). Therefore, their implicit judgements of control accurately reflected their actual experience. Yet, when explicitly asked to estimate their degree of control, they did not call upon this information, and instead reported an inflated estimate.

In the maximisation task, when participants were asked to maximise green light onset, participants who were rewarded for active responding (ACT) more frequently made the response that had been more reinforced with green light onset in the learning phase, which supports the results found in Alloy and Abramson's (1979) behavioural task. Additionally, the subsequent behaviour of the participants was related to their inaccurate estimates of explicit control rather than their more accurate knowledge of the conditional probabilities. In other words, as the explicit estimates of control increased, the number of space bar presses made on the maximisation task increased. However, the pattern was unclear for participants who were rewarded for passive responding (PAS), as neither explicit nor implicit judgements predicted responses. In fact, even though they were rewarded more for not pressing the space bar, they chose to press the space bar more often than not in the maximisation task whilst trying to achieve maximum green light onset. Therefore, despite their knowledge, they still associated having control with active responding and chose to overrule what they had learnt. It is also possible that press behaviour may have been random for these participants as neither the overestimations of explicit judgements, nor the more accurate knowledge of the conditional probabilities seemed to influence behaviour. It is possible that participants who were rewarded more for being active attributed more responsibility, and more control to themselves, whereas those who were rewarded for being inactive may not have felt that they were having as much influence. It is apparent that adopting a between-groups approach for analysis was appropriate, as different patterns of results emerged depending on whether participants received the desired outcome more for active or passive involvement. Therefore, the between-groups approach, where the participants are split into ACT and PAS groups will be utilised in each study in which the active-passive version of the 0% noncontingency task is used.

Research on self-deception has implications for the literature on consciousness, particularly whether the dissociation between explicit and implicit processing exists. This study aimed to provide evidence for Trivers (2000) dissociation theory, and the findings that the inaccurate explicit judgements of control appeared to be held simultaneously with the more accurate knowledge of the conditional probabilities, which make up the implicit

judgements of control, provide support for this concept. The belief that two contradictory beliefs can coexist without undermining each other has been deemed paradoxical by some researchers (Mele, 1997, 2001). This process could facilitate the functioning of self-deception, as it would allow information to be held in the explicit (conscious) and the implicit (unconscious) minds at the same time.

The IOC could be viewed as a facilitator of self-enhancement, allowing the individual to self-deceive so that they believe they have more control than they actually do. This would allow them to maintain a positive illusion, in contrast to the reality of a lack of control. This would support the previous literature that a sense of control is important for the improvement and maintenance of physical health and psychological well-being (Whitson & Galinsky, 2008). This false sense of control, which is presumed true, could then be beneficial to the self-deceiver if it is able to convince others to believe it, therefore gaining resources such as the confidence and support of others, and the ability to have power and influence in the future. However, as was seen in the ACT group, the explicit information was more accessible when called upon at a later time in the maximisation task. This would be in line with Trivers (2000) dissociation theory, as the explicit information is purportedly held in the conscious mind, which is more accessible to the individual. So it seems that whilst this dissociation may have facilitated self-deception, a consequence was that the overinflated estimates of explicit control predicted future behaviour, which could be potentially costly in terms of resources and sustaining the confidence and trust of other people, particularly in the long-term. Self-deception would be more beneficial to people if they were able to deceive themselves, yet make decisions based on the implicit (unconscious) information, as these would be, theoretically, more accurate decisions with better consequences. It would be valuable to ascertain whether there are particular conditions that lead to the occurrence of this. It may be possible that the use of the explicit system is specific to noncontingent situations where the outcomes are random, so it would be useful to investigate a contingent situation where there is more information available to people to see whether this encourages the use of the implicit system.

This research can be applied to specific domains such as employment, where self-deception and illusions of control can lead to potentially costly decisions and errors within the workplace, costing time and resources. For example, in the trading profession, if a stock trader has not accurately appraised the information available in the environment and possesses a high IOC, he or she could possibly make a costly trade, losing a large amount

of money. However, there may be other factors influencing the IOC and how it affects behaviour, such as personality traits. For example, it would be logical to conceive that someone with a narcissistic personality might possess a greater IOC, and someone with a high-risk appetite may be more likely to sustain behaviour that is consistent with their judgements of control, even if it does not yield desirable outcomes. Future research is also needed to investigate this possible link between personality traits, self-deception and judgements on the contingency task.

CHAPTER FOUR

JUDGEMENT OF CONTINGENCY: EXPERIMENT TWO

As discussed in Chapter Two, many theories of learning and mental health posit that normal, healthy individuals perceive reality accurately, and therefore should form accurate subjective judgements that mirror the objective contingencies in their environment (Maier & Seligman, 1976). However, in Experiment 1, which investigated the dissociation between explicit and implicit judgements of control in a noncontingent task, the results found that whilst people were accurate at estimating the conditional probabilities, they still displayed an IOC. Therefore, when outcomes were not contingent on responses, they did not explicitly report independence; supporting the possibility that noncontingency may be a more difficult relationship to perceive than contingency (Allan, Siegel & Hannah, 2007). With this understanding, it may be reasonable to suppose that accuracy of control judgements increases as the contingent control increases. This chapter will explore the lesser-researched area of contingency tasks, in which there is an objective amount of control. I will first outline research that has examined the accuracy of judgements in contingent situations, followed by Experiment 2, which studies the explicit/implicit dissociation when participants possess a small amount of contingent control (25%).

4.1 Review of Contingency Literature

Whereas Langer (1975) concluded that people have difficulty distinguishing between chance-based and skill-based situations, Seggie (1975) concluded that people are able to differentiate between noncontingent and contingent situations. Based on the recovery rates of previous patients, participants were asked to decide on either hospitalisation or nonhospitalisation for a new patient. There were three noncontingent situations in which there was no relationship between hospitalisation and recovery, and three contingent situations where recovery was related to hospitalisation. In line with the literature regarding noncontingent tasks, participants were inaccurate at judging the

contingent control. On the other hand, participants' judgements in contingent tasks were more accurate and were based on the relevant probabilities.

As well as investigating depressive realism in noncontingent situations, Alloy and Abramson's (1979) research also studied three contingent situations: 25%, 50%, and 75% control. These were counterbalanced so that there were six problems: 75-50, 50-75, 75-25, 25-75, 75-0, and 0-75. The first number in the pair represents the probability of the outcome for active responding, and the second number represents the probability for passive responding. Therefore, the sign of the contingency could be positive or negative. The contingency is considered positive when active responding increases the probability of receiving the desired outcome, which occurs in the 75-50, 75-25, and 75-0 problems. When passive responding increases the probability of the outcome, the contingency is considered negative, which occurs in the 50-75, 25-75 and 0-75 problems. They found that in all problems, both depressed and nondepressed subjects accurately estimated the contingencies between their responses and green light onset, and that judgements of control tracked the actual control (ΔP) experienced. Therefore, there was no effect of sign. However, there was a tendency for the participants to overestimate their control in the 75-50 problem, although it was not significant. This supports the notion that individuals' subjective representations parallel the actual contingencies, contradictory to findings that they are uncorrelated (Jenkins & Ward, 1965), but does not support the concept of depressive realism. Additionally, the results from the 10-trial behavioural task, where participants were asked to maximise green light onset, supported this, as they were more likely to make the response that they had been more reinforced for in the 40-trial main task. So, if participants received green lights more often for pressing the button (75-50, 75-25, and 75-0), they would press the button more often than not in the behavioural task in order to maximise light onset, and vice versa for participants who received the desired outcome more often for not pressing the button (50-75, 25-75, and 0-75). However, they also found that as the contingent control decreased, the accuracy of the judgements of the conditional probabilities decreased, so they were more erroneous in the 25% problem, compared to the 50% and 75% problems. Whilst this supports the notion that the closer the actual control gets to 0%, the more difficult it is to understand the relationship between responses and outcomes, it is not consistent with Alloy and Abramson's (1979) findings that participants were able to accurately estimate the conditional probabilities in noncontingent tasks.

An extension of this work was conducted by Vasquez (1987), who concentrated on two problems: a 75% problem (75-0), and 25% problem (50-25), which is a low-reinforcement density version of the 75-50 problem examined in Alloy and Abramson (1979). Consistent with previous literature, they found that participants accurately estimated both their control over the light, and the conditional probabilities, which supports the notion that people are sensitive to contingencies in the environment. Unlike in the 75-50 problem in Alloy and Abramson (1979), there was no overestimation trend in the 50-25 problem, which suggests that high reinforcement of outcome (successes) can encourage inflated control estimates.

When Lennox, Bedell, Abramson, Raps, and Foley (1990) included four of Alloy and Abramson's (1979) contingency problems in their research (± .25 and ± .75), they found supporting evidence that judgements of control increased as ΔP increased. However, unlike in Alloy and Abramson (1979), where the sign of the contingency was not found to be a factor, they found that control judgements were higher in the positive contingency problems than in the negative contingency problems (see also Allan & Jenkins, 1983). Therefore, the sign of the relationship had a significant effect. Likewise, Kapçi and Cramer (1999) found the same pattern of findings when they investigated two contingent situations: 50% (75-25 and 25-75) and 100% (100-0 and 0-100).

In their 50% contingency task (75-25, 25-75), Carson et al. (2010) also found that nondepressed participants were rather accurate in their estimates of control over the appearance of a circle (54%), compared to depressed participants who significantly underestimated their control (32%). There were mixed results for knowledge of the conditional probabilities. When active responding was more reinforced (75-25), nondepressed were fairly accurate in their estimates of both active response and passive nonresponse, whilst depressed participants significantly underestimated both probabilities. Therefore, this provides converging evidence that depressives are not more accurate than nondepressives. When passive responding was more reinforced (25-75), both groups were relatively accurate at judging the probability of active responding, but significantly underestimated the probability of passive responding. There was also a significant interaction between which response was more reinforced and judged control, with greater estimates of control when active responding was more reinforced. Therefore, it appears that there was an effect of the sign of the contingency with perceived control being associated with taking action (positive contingency).

In line with previous literature, Thompson et al. (2007) also found IOCs in a no-control (0%) situation, and aimed to show that people show IOCs even in contingent situations: medium control (25%) and high control (50%). In the 25% condition, participants did not significantly overestimate their amount of control, regardless of whether they experienced low or high reinforcement of outcome (27.4% and 30.3% respectively). In the 50% condition, participants who received high reinforcement displayed an IOC (67.7%), whilst those in the low reinforcement group slightly underestimated, although not significantly so (42.7%), which supports previous research that a high number of successes (receiving the desired outcome) leads to inflated perceptions of control (Alloy & Abramson, 1979). Therefore, the hypothesis that people would show IOCs in situations with actual control was supported in the high control condition, which is inconsistent with previous research (Alloy & Abramson, 1979; Carson et al., 2010). It was unclear as to why there were overestimations in the no-control and high control condition, but not in the medium control condition. One reason may be that it is difficult to discern between low amounts of control and no control, so the results found in both conditions are similar, i.e. overestimation of control, except that this overestimation becomes accurate in the 25% situation, but becomes an IOC in the no-control situation. Therefore, more research is needed to explore judgements of control in contingent situations.

In summary, it appears that the accuracy of control judgements increases as the contingent control increases (Colvin & Block, 1994), with no effect of mood on judgements, i.e. no evidence of depressive realism in contingent situations. Therefore, it appears that cognitive biases are more evident in noncontingent situations than in contingent situations (Vasquez, 1987). However, there are mixed results suggesting that IOCs may be evident in high contingency situations (Thompson et al., 2007), which is meaningful as there is likely to be an amount of contingent control present in most real life situations. Likewise, there are mixed results regarding the importance of the sign of the contingency on control judgements. In Chapter Three, Experiment 1 found that there was an effect of whether participants were reinforced with the outcome more so for active or passive responding, with higher judgements of control in the active condition. Therefore, it appears that there was an effect of sign in that experiment, so it will be of interest to investigate whether the same pattern is evident when the objective control is increased.

4.2 Experiment 2: Contingency Effects on Control Judgements

The aim of this study is to explore how judgements are influenced by an increase in control (25%), where the density of the outcome reinforcement is high or low, and the sign of the contingency is counterbalanced, so that participants are either more reinforced for active or passive responding. Based on the literature review, it can be hypothesised that by adding contingent control, this may lead to more accurate explicit judgements. However, an alternative hypothesis, in line with Thompson et al. (2007) is that the introduction of actual control could have the opposite effect, leading to higher explicit judgements and therefore an IOC. Additionally, it is predicted that participants in the high frequency outcome group may display a greater IOC than those in the low frequency outcome group. It is expected that both groups will have an accurate understanding of the conditional probabilities, enabling the examination of the explicit/implicit dissociation, as in Experiment 1. However, if the explicit judgements are more accurate, the difference between these two systems would be expected to be less significant, whereas if the explicit judgements are more inflated, the IOC would be greater and the dissociation would be expected to be clearer. This study will systematically vary the effects of outcome and response (ACT/PAS).

4.2.1 Methods

See 'General Methods' section for 'Measures' and 'Procedure' (section 3.2).

Participants

In total, 159 undergraduate and postgraduate students at Bangor University were recruited via SONA, and received one course credit for their participation. Seventy-nine participants (60 females) took part in the high frequency outcomes experiment, and 80 participants (60 females) took part in the low frequency outcomes experiment (see Design for description of the frequency outcomes). The data of eight additional participants were removed because they failed to follow the experimental instructions. The data of two additional participants were removed from the high frequency outcomes condition, as they were rewarded more for being passive when they were in the active group.

Design

Frequency outcomes. The design of the experiment was between-groups. The contingent control in the task was 25%, and the groups were counterbalanced so that half

of the participants experienced positive contingency (more green light onset for active responding), whilst the other participants experienced negative contingency (more green light onset for passive responding). Therefore, the ACT/PAS groups distinction that was found by chance in Experiment 1, was manipulated to occur in this experiment to investigate the effects of sign. In the high frequency outcomes experiment, 40 of the participants were in the active group (ACT; +25%, 75-50), so they experienced positive contingency, and there was a 75% probability of receiving the outcome (green light onset) when they pressed the space bar, and 50% probability when they did not press the space bar. The other 39 participants were in the passive group (PAS; -25%, 50-75), so they experienced negative contingency, where there was a 50% probability of receiving the outcome when the participant pressed the space bar, and 75% probability when they did not press the space bar.

In the low frequency outcomes experiment, 40 of the participants were in the active group (ACT; +25%, 50-25), so they were rewarded with a green light 50% of the time when they pressed the space bar, and 25% of the time when they did not press the space bar, hence experiencing positive contingency. The other 40 participants were in the passive group (PAS; -25%, 25-50), so they were rewarded with a green light 25% of the time when they pressed the space bar, and 50% of the time when they did not press the space bar, thus experiencing negative contingency. As in Experiment 1, the actual control varied around 25% based on the individual experiences in the task.

4.2.2 Results

Illusions of Control

This section will discuss the analysis of the IOCs shown in the 100-trial learning phase. As can be seen in Figure 4.1, the largest IOC was experienced in the high frequency outcomes ACT group (M = 21.35, SD = 25.76), who greatly overestimated their estimate of explicit control in comparison to the actual control (M = 43.38, SD = 24.69, and M = 22.03, SD = 9.41). Participants in the low frequency outcomes ACT group displayed a smaller IOC (M = 7.65, SD = 25.14), whilst participants in both the high and low frequency PAS groups did not show an IOC (M = 2.78, SD = 23.36 and M = -3.51, SD = 24.16 respectively). Therefore, the judgements of participants in the PAS groups were more accurate, which is confirmed by the ANOVA below.

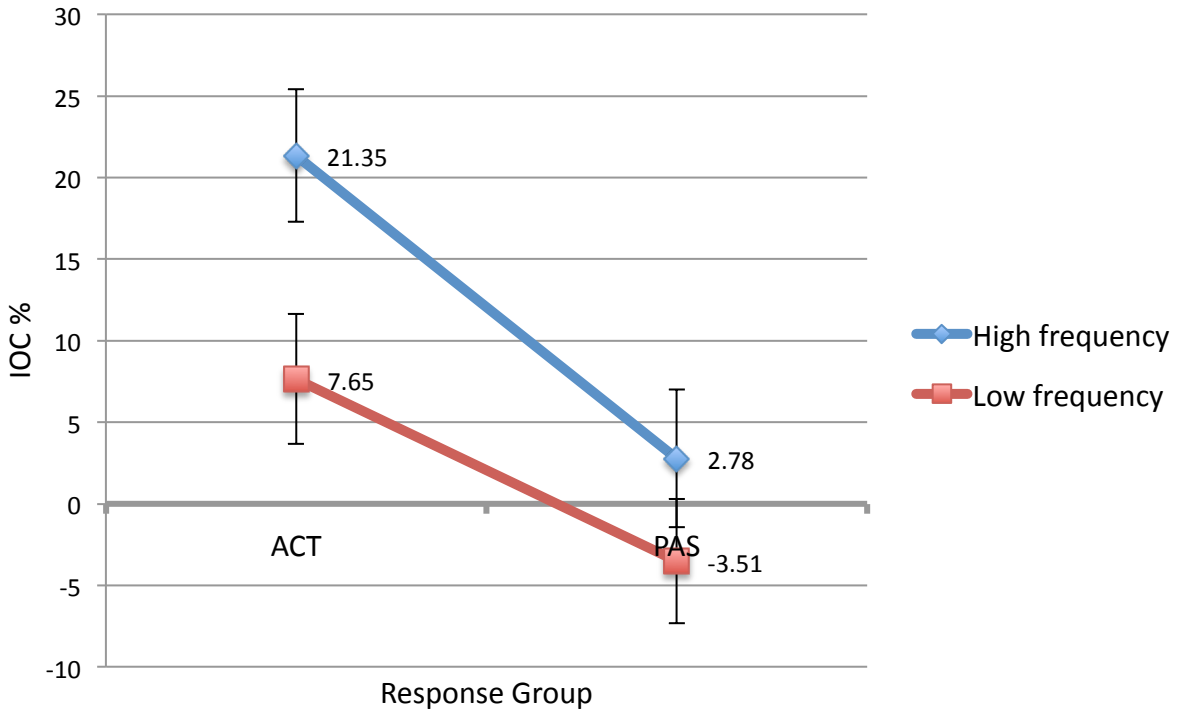

Figure 4.1. Comparison of the differences between the explicit judgements and the actual control (IOCs) across ACT/PAS responding and frequency of outcomes. Error bars represent the standard error of the means.

A between-groups ANOVA with frequency and ACT/PAS as between-subjects factors, and the IOC as the dependent variable found a significant main effect of frequency, $F(1, 155) = 6.17$, $p = .01$. Specifically, the IOC was greater in the high frequency group ($M = 12.06$, $SE = 2.85$) than in the low frequency group ($M = 2.07$, $SE = 2.84$).

There was also a significant main effect of ACT/PAS, $F(1, 155) = 13.65$, $p < .001$, with a greater IOC displayed by participants in the ACT groups ($M = 14.50$, $SE = 2.84$) compared to participants in the PAS groups ($M = -0.37$, $SE = 2.85$). However, there was not a significant interaction between frequency and ACT/PAS, $F(1, 155) = 0.85$, $p = .36$

T-tests were carried out to analyse whether the IOCs were significantly different from zero. Only the IOC shown by the participants in the high frequency ACT group was found to be significant, $t(39) = 5.24$, $p < .001$, although it is worth mentioning that the IOC in the low frequency ACT group was approaching significance, $t(39) = 1.93$, $p = .06$. Therefore, in both of the ACT groups, it seemed that participants perceived their control to be greater than it was, compared to participants in the high and low frequency PAS groups,

whose perceptions of control were similar to their actual experiences, $t(38) = 0.66$, $p = .51$ and $t(39) = -0.92$, $p = .36$ respectively.

In Experiment 1 in Chapter Three, it was found that explicit judgements were uncorrelated with the actual events in a noncontingent task. As illustrated in Figure 4.2, the lack of a significant correlation between explicit judgements and actual control was a consistent pattern found across all groups. Therefore, these results suggest that the participant's explicit judgements did not track their actual experience, particularly in the high frequency ACT group which showed the largest IOC, $r(38) = .08$, $p = .65$, and the low frequency PAS group which displayed a negative IOC, $r(38) = -.04$, $p = .79$. However, the correlation was approaching significance in the low frequency ACT group, $r(39) = .28$, $p = .08$. As a comparison, the thin black lines in the graphs indicate where accurate responses should lie if the explicit judgements perfectly matched with the actual experience.

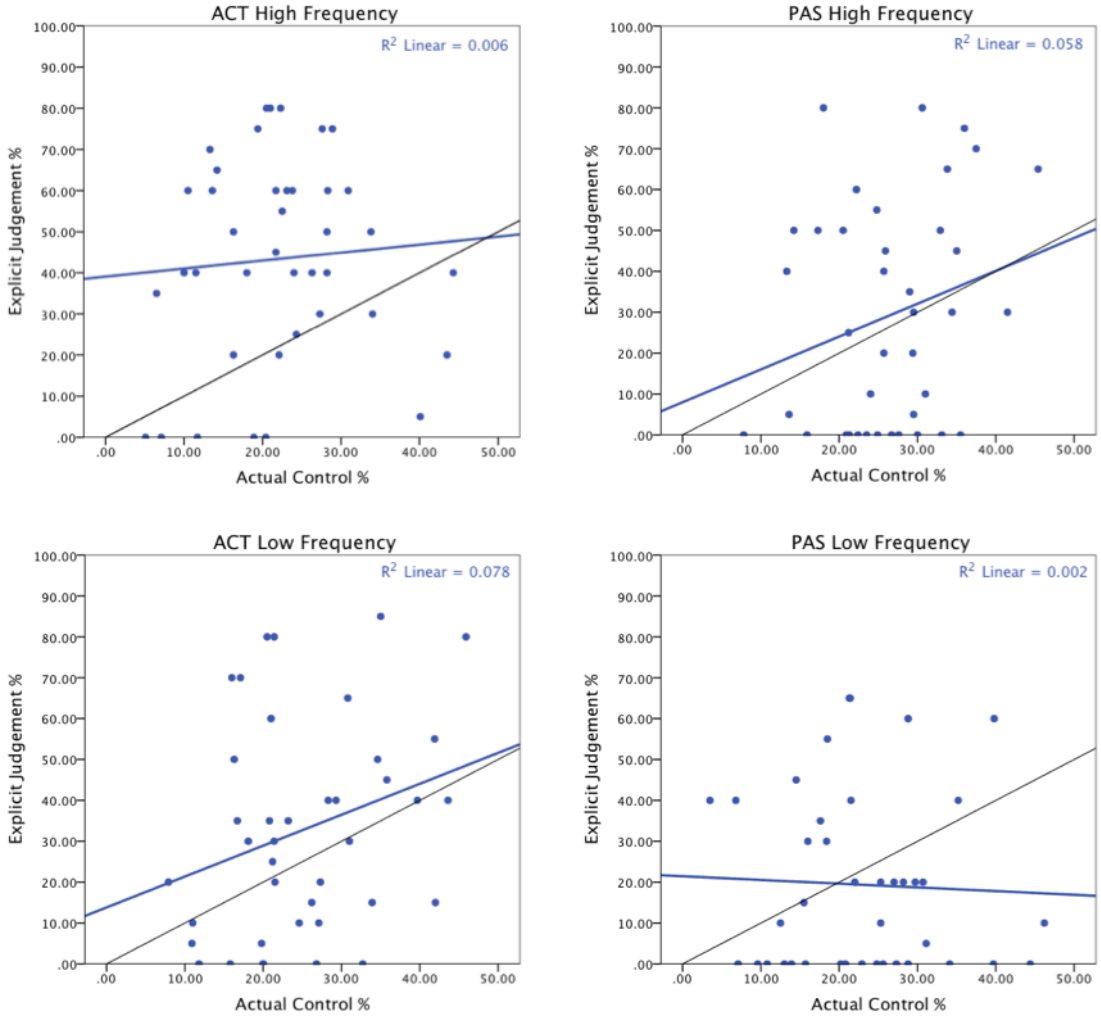

Figure 4.2. Participants' explicit judgements compared to their actual experiences.

Therefore, the results suggest that, in general, explicit perceptions of control are not well matched with the actual control that was experienced. The factors that appear to contribute to experiencing an IOC are high frequency of reward, and receiving the reward for active behaviour.

Dissociation of Explicit and Implicit Judgements

The previous section presented the IOC and the relationship between the participants' explicit judgements of control and their actual experience. This section will analyse the relationship between the participants' implicit judgements of control and their actual experience, and discuss the explicit/implicit dissociation.

The difference between the implicit judgements and the actual control was calculated for each group. As can be seen in Figure 4.3, all the differences were negative, which means that compared to the actual control those participants experienced, the implicit judgements were somewhat underestimated in all of the groups. Ideally, actual control and implicit judgements should be similar and the smallest difference was in the high frequency outcomes ACT group (M = -1.03, SD = 25.65), followed by the difference in the low frequency PAS group (M = -5.14, SD = 18.35). However, the greatest differences were in the high frequency PAS and the low frequency ACT groups (M = -10.81, SD = 24.25, and M = -13.47, SD = 25.27 respectively).

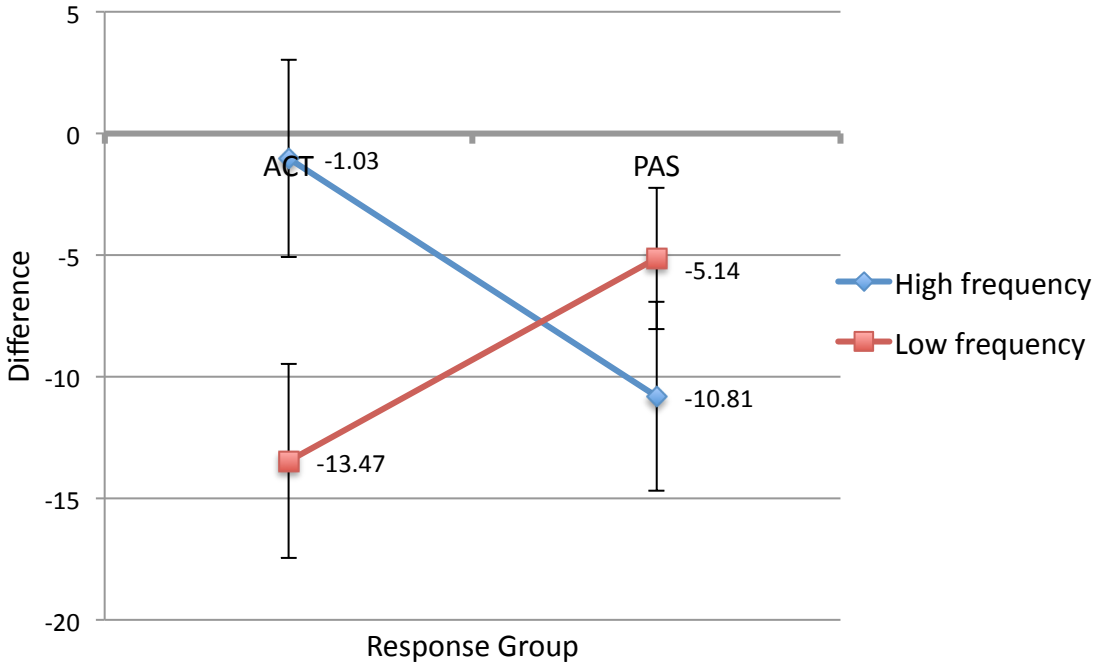

Figure 4.3. Comparison of the differences between the implicit judgements and actual control across ACT/PAS responding and frequency of outcomes. Error bars represent the standard error of the means.

A between-groups ANOVA with frequency and ACT/PAS as between-subjects factors, and the difference between the implicit judgements and the actual control as the dependent variable did not find a significant main effect of frequency, $F(1, 155) = 0.82$, $p = .37$. Additionally, there was not a significant main effect of ACT/PAS, $F(1, 155) = 0.04$, $p = .85$. However, there was a significant interaction between frequency and ACT/PAS, $F(1, 155) = 5.87$, $p = .02$. Specifically, knowledge of the conditional probabilities was best when high frequency of outcomes was associated with active responses, and when low frequency of outcomes was associated with passive responses.

T-tests were run to analyse the similarity between the implicit judgements and the actual control. Only the differences in the high frequency ACT group and the low frequency PAS group were non-significantly different from zero, $t(39) = 0.25$, $p = .80$ and $t(39) = 1.77$, $p = .08$ respectively. Therefore, these calculations of implicit judgements were similar to the actual experience, although the latter correlation was trending towards significance. However, in the high frequency PAS and low frequency ACT groups, the differences were significant, $t(38) = 2.78$, $p = .01$ and $t(39) = 3.37$, $p = .002$ respectively. Therefore, in these groups, the knowledge of the conditional probabilities was lacking.

In addition to looking at the accuracy of the implicit judgements in comparison to

the contingent control, we also tested whether the implicit judgements tracked with the contingent control. Figure 4.4 displays the correlations between the implicit judgements and the actual control. Only the correlation in the high frequency ACT group was significant, $r(38) = .32$, $p = .05$, although it is worth mentioning that the correlation in the low frequency ACT group was approaching significance, $r(38) = .30$, $p = .06$. Therefore, in both of the ACT groups, it appears that the participants' implicit estimates tracked the actual control that they actually experienced. The black lines on the graphs indicate where accurate responses would lie if the participants' implicit judgements perfectly tracked the contingent control.

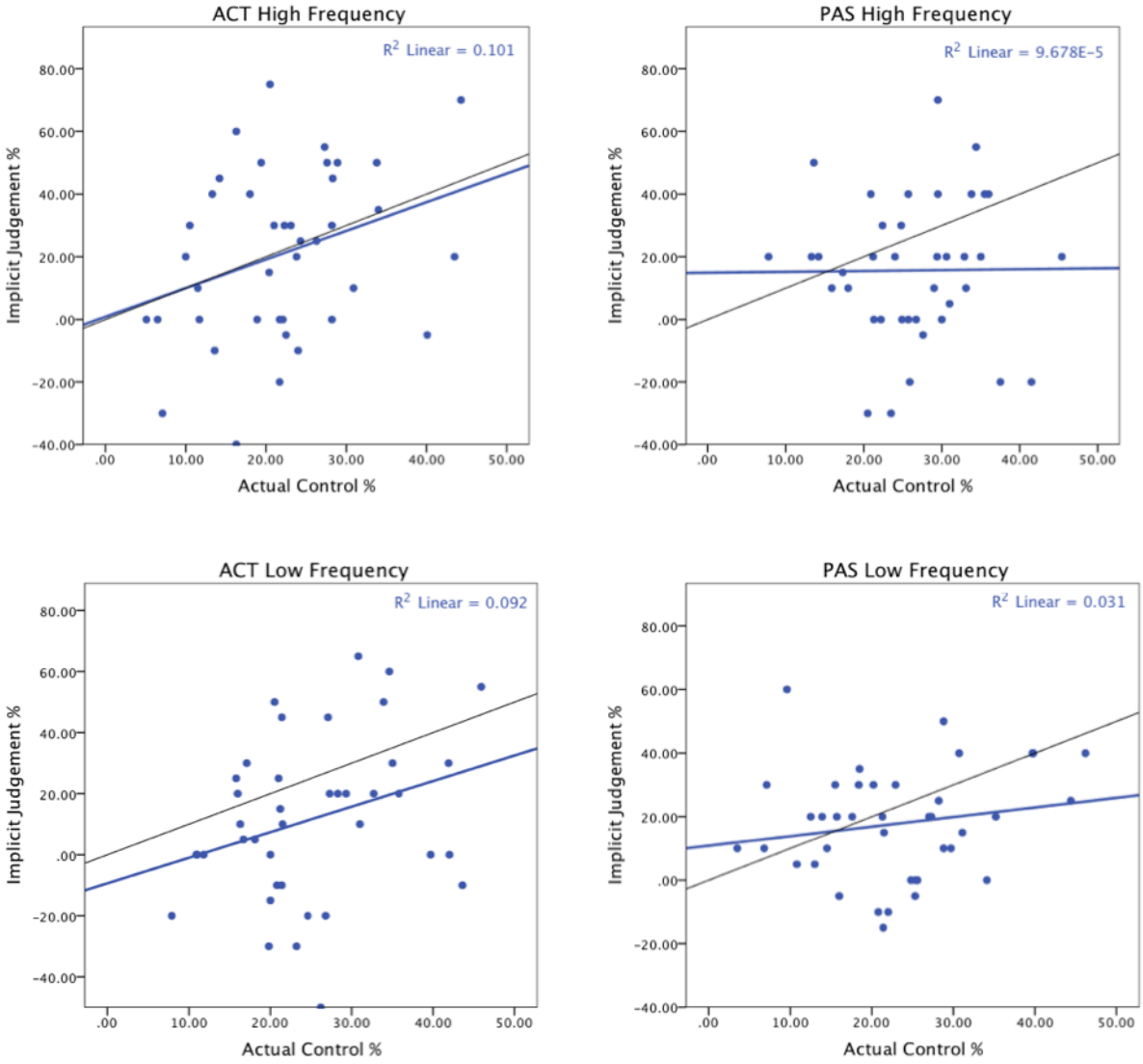

Figure 4.4. Participants' reports of implicit control compared to their actual experience.

The line graphs below (see Figure 4.5) compare the explicit and implicit

judgements, in both the ACT and PAS groups. In both of the high and low frequency outcomes studies, the explicit judgements of control were consistently higher than the implicit judgements. Whilst it was not a significant difference in the low frequency PAS group, $t(39) = 0.38$, $p = .70$, the differences were significant in the low frequency ACT group, $t(39) = 5.45$, $p < .001$, and the high frequency ACT and PAS groups, $t(39) = 4.99$, $p < .001$ and $t(38) = 2.34$, $p = .03$, respectively.

Additionally, in both the high and low frequency conditions, the means for explicit judgements were higher in the ACT groups compared to the PAS groups, $t(77) = 2.43$, $p = .02$ and $t(78) = 2.53$, $p = .01$ which suggests that when participants were rewarded more with green light onset for pressing the space bar (active responding) than not pressing the space bar (passive responding), they estimated that their control was greater. Conversely, the implicit judgements in the high and low frequency conditions were not significantly different across the ACT and PAS groups, $t(77) = 0.95$, $p = .35$ and $t(67) = -1.20$, $p = .23$. Therefore, the implicit judgements were similar regardless of whether they were more reinforced for active or passive responding.

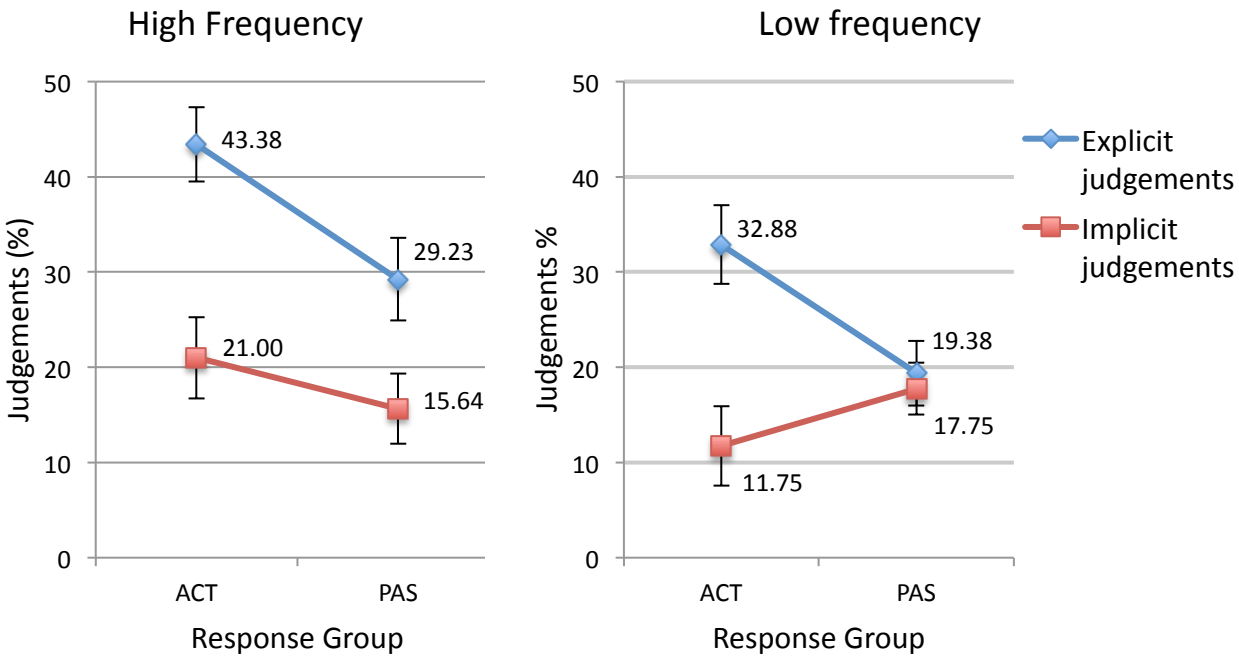

Figure 4.5. Line graph comparisons of the explicit and implicit judgements across the high and low frequency ACT and PAS groups. Error bars represent the standard error of the means.

A mixed-design ANOVA with judgement (explicit and implicit) as a within-

subjects factor and frequency and ACT/PAS as between-subjects factors revealed a significant main effect of judgement, $F(1, 155) = 39.91$, $p < .001$. Therefore, estimates of explicit judgements ($M = 31.21$, $SE = 1.98$) were higher than estimates of implicit judgements ($M = 16.54$, $SE = 1.88$).

There was a significant main effect of frequency, $F(1, 155) = 4.97$, $p = .03$. Specifically, judgements of control were greater in the high frequency outcomes experiment ($M = 27.31$, $SE = 2.19$) compared to the low frequency outcomes experiment ($M = 20.44$, $SE = 2.17$).

There was also a significant main effect of ACT/PAS groups, $F(1, 155) = 4.80$, $p = .03$. Particularly, judgements of control were greater in the ACT group ($M = 27.25$, $SE = 2.17$) compared to the PAS group ($M = 20.50$, $SE = 2.19$).

There was also a significant interaction between judgement and ACT/PAS group, $F(1, 155) = 9.26$, $p = .003$. The line graph below (see Figure 4.6) plots both explicit and implicit judgements across the ACT and PAS groups. A *t*-test showed that explicit judgements in the ACT group ($M = 38.13$, $SD = 25.77$) were significantly greater than in the PAS group ($M = 24.24$, $SD = 24.78$), $t(157) = 3.46$, $p = .001$. However, a *t*-test showed that implicit judgements were not significantly different across ACT ($M = 16.38$, $SD = 27.00$) and PAS ($M = 16.71$, $SD = 20.13$) groups, $t(146.10) = -0.09$, $p = .93$. There was a significant difference between explicit and implicit judgements in the ACT groups, $t(79) = -7.38$, $p < .001$. Additionally, there was a significant difference between explicit and implicit judgements in the PAS groups, $t(78) = -2.08$, $p = .04$, although the effect was less significant than for the ACT groups. To summarise, estimates of explicit control were higher in both the ACT and PAS groups compared to the implicit judgements, and explicit judgements were greater in the ACT group than in the PAS group. Therefore, estimates of explicit judgements were influenced by whether participants experienced positive or negative actual control whereas calculations of implicit judgements did not appear to be affected and remained consistent.

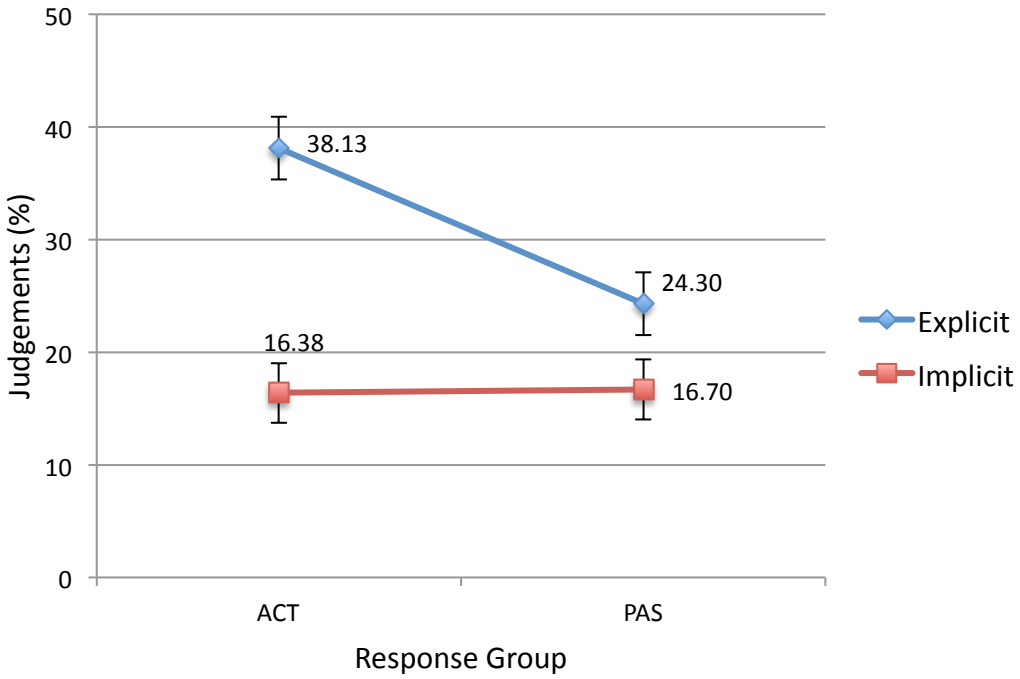

Figure 4.6. Comparison of explicit and implicit judgements across the ACT/PAS groups. Error bars represent the standard error of the means.

However, there was no significant interaction between judgement and frequency, $F(1, 155) = 2.02$, $p = .16$ (see Figure 4.7), which suggests that estimates of explicit and implicit judgements did not differ across the high and low frequency outcomes experiments. However, the pattern was similar to what was seen in the interaction between judgement and ACT/PAS (see Figure 4.7). Explicit judgements were greater in the high frequency experiment compared to the low frequency experiment, and were greater than implicit judgements across both levels of frequency. Therefore, although not significantly so, explicit judgements appeared to be influenced by frequency outcomes whereas implicit judgements did not appear to be affected and remained consistent.

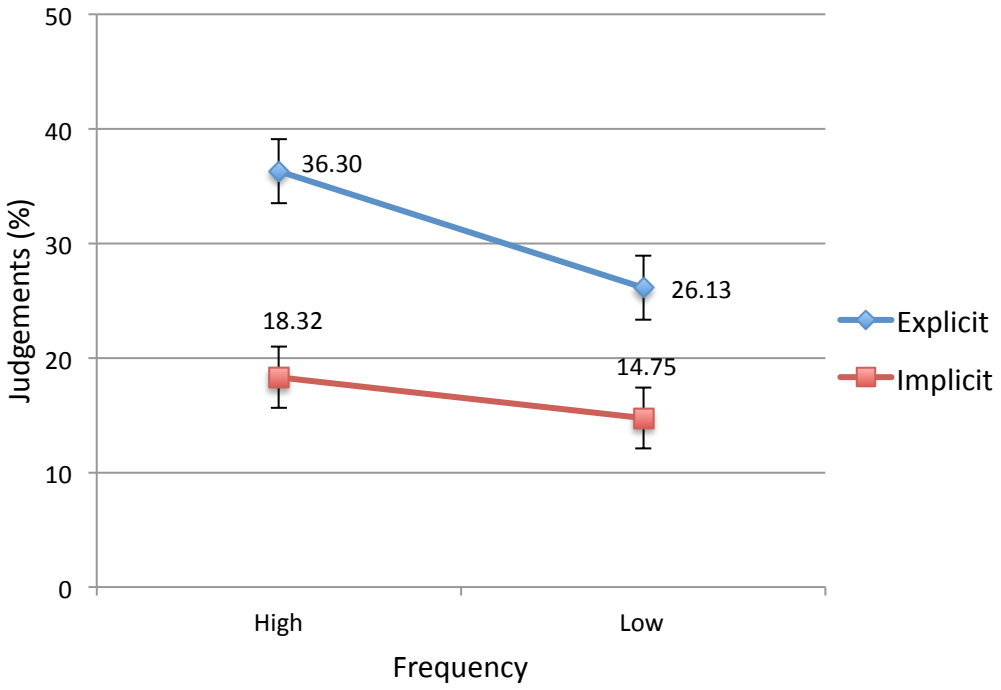

Figure 4.7. Comparison of explicit and implicit control across the levels of frequency. Error bars represent the standard error of the means.

There was not a significant interaction between frequency and ACT/PAS, $F(1, 155) = 0.95$, $p = .33$, but this was irrelevant to the hypotheses as it collapsed across the judgement variable.

However, the 3-way interaction between judgement, frequency and ACT/PAS was not significant, $F(1, 155) = 1.33$, $p = .25$, which indicates that the judgement by ACT/PAS interaction described previously was not different in the high and low frequency experiments.

Maximisation Task Behaviour

This section will discuss the data in regards to how the explicit and implicit reports of control guided pressing behaviour in the subsequent 10-trial maximisation tasks, where participants were asked to maximise green light onset. In a contingent situation, one response is more reinforced with the desired outcome than the other response. When the sign of the contingency is positive, the active response (space bar press) is more reinforced, whereas the passive response (no press) is more reinforced when the sign of the contingency is negative. Therefore, there is a correct response associated with control, and the maximisation task may provide converging evidence that the participants understand

the contingency.

In both of the high and low frequency experiments, the maximisation rate (%) was higher in the ACT groups, (M = 70.28, SD = 17.52, and M = 64.68, SD = 19.12, respectively), than in the PAS group (M = 54.84, SD = 27.22, and M = 51.81, SD = 20.46, respectively). This suggests that when participants were rewarded more for active responding, they learned the more reinforced response more effectively than the participants who were rewarded more for passive responding.

A multiple regression, with explicit judgements and implicit judgements entered as independent variables, was run for each group to estimate which variable was a better predictor of the more reinforced response. Firstly, I will present the models for the ACT groups, followed by the models for the PAS groups.

In both of the high and low frequency ACT groups, the two-factor models were trending towards a significant prediction of future active responding, R = .38, R^2 = .14, $F(2, 37) = 3.04$, p = .06, and R = .37, R^2 = .13, $F(2, 37) = 2.87$, p = .07, respectively. Furthermore, tests of the predictor betas showed that implicit judgements significantly predicted space bar press in the high frequency group, β = .41, $t(39) = 2.43$, p = .02 compared to the explicit judgements, β = -.10, $t(39) = -0.60$, p = .55. Likewise, the implicit judgements were significantly predictive in the low frequency group, β = .43, $t(39) = 2.33$, p = .03, compared to the explicit judgements, β = -.16, $t(39) = -0.85$, p = .40.

In the high frequency PAS group, the model was not significant, R = .13, R^2 = .02, $F(2, 36) = 0.31$, p = .74, and none of the judgements emerged as significant predictors of future passive responding. However, the model significantly predicted future passive responding in the low frequency PAS group, R = .50, R^2 = .25, $F(2, 37) = 6.18$, p = .005. Tests of the predictor betas showed that both explicit and implicit judgements significantly predicted future response behaviour, β = -.37, $t(39) = -2.57$, p = .02, and β = .36, $t(39)$ = 2.53, p = .02 respectively. There was no correlation between these two variables, $r(38)$ = .05, p = .76, which supports the notion that they are two distinct measures.

Therefore, it seems that when participants were rewarded for active responding, regardless of frequency, they pressed the space bar more often that not and their subsequent behaviour was based on their knowledge of the conditional probabilities. However, the pattern was not clear for participants who were rewarded for passive responding, who failed to maximise on the 10-trial task.

4.2.3 Discussion

As seen in Experiment 1 where the events were largely noncontingent, different patterns were evident for the active and passive groups. Participants in both of the active groups, who received more green light onset for pressing the space bar, overestimated their reports of explicit control, whilst the explicit judgements of participants in the passive groups, who received more green light onset for not pressing the space bar were similar to the actual experiences of control. Therefore, when contingent control was introduced, it seems that people in the passive groups were more accurate than those in the active groups. This emphasises the findings from the first experiment that more active involvement leads to greater feelings of control compared to passive involvement, and is consistent with previous literature regarding the presence of skill-based factors (Langer, 1975). This also supports previous literature that there was an effect of the sign of the contingency (Carson et al., 2010; Lennox et al., 1990).

Additionally, different patterns emerged depending on frequency, although there appeared to be somewhat of an interaction between frequency and active/passive involvement. Particularly, participants in the high frequency ACT group displayed a greater IOC than those in the low frequency ACT group. Additionally, although neither of the passive groups showed an IOC, participants in the high frequency PAS group still overestimated their control compared to those in the low frequency PAS group who underestimated their control. Therefore, it appears that participants who experienced a higher frequency of outcome displayed greater IOCs, even though the explicit judgements in the low frequency ACT group were more accurate than in the high frequency ACT group. This supports the hypothesis that frequency of outcome would emerge as a factor for inducing the IOC, even when the contingent control is constant, in line with Alloy and Abramson (1979). It is conceivable that a high frequency of the desired outcome led people to believe that they were successful in the task, and this perceived level of skill reinforced the belief that they were in control. These findings contradicted research by Thompson et al. (2007), who did not find an effect of outcome reinforcement when the contingent control was set to 25%, but instead found that judgements were accurate.

Therefore, it seems that the optimal method to induce an IOC is a combination of active involvement and high frequency of the desired outcome. Indeed, in the group that experienced passive involvement and low frequency of the desired outcome, the

underestimation of control suggests that those participants thought that had less control than they actually did.

Apart from the participants in the high frequency ACT group, peoples' explicit judgements appeared to be closer to the actual experiences than in the noncontingent situation in Experiment 1, although they were still out of line with reality as there was no correlation between the two variables. This is in line with previous findings that explicit judgements were more accurate in contingent than in noncontingent tasks (Alloy & Abramson, 1979; Colvin & Block, 1994; Seggie, 1975). Although, Alloy and Abramson (1979) found that explicit judgements tracked with the actual control, which was not found in this study. However, when contingent control was introduced, the estimations of implicit control were slightly underestimated in comparison to the actual control. The participants' knowledge of the conditional probabilities was most accurate in the high frequency ACT and the low frequency PAS groups. Additionally, in the active groups, the implicit reports better tracked the actual control, and in particular, the high frequency group was more accurate than the low frequency group. However, implicit reports were similar in the passive groups, regardless of frequency, and did not appear to track with actual control. Comparable to Experiment 1, the implicit judgements appeared to remain consistent regardless of active/passive involvement and frequency of outcome.

The explicit/implicit dissociation was less clear in this study when contingent control was introduced. It was most apparent in the high frequency ACT group, which has the factors that facilitate an IOC, as they significantly overestimated their explicit judgements, whilst concurrently displaying accurate knowledge of the underlying conditional probabilities. However, the dissociation was not evident in the other groups, as the participants either did not show an IOC as their explicit judgements were more accurate, or their implicit judgements of control were less accurate, as their knowledge of the conditional probabilities was poor. This appears to support the hypothesis that in a contingent situation, people are more accurate at estimating their control, so the difference between the two systems is less significant.

In the maximisation task, when asked to maximise the outcome, participants in the active groups made the more reinforced response from the learning phase more often than those in the passive responding groups. Specifically, participants in the active groups pressed the space bar more often, whereas those in the passive groups made both responses equally. As discussed in Experiment 1, it is possible that when people are rewarded for active involvement, they may attribute more responsibility and control to themselves,

whereas when people are rewarded for passive involvement, i.e. being inactive, they may not feel as though they are having much influence. This supports the earlier finding from the learning phase that the explicit judgements in the active groups were greater than those reported in the passive groups. Additionally in the active groups, there did appear to be an effect of frequency of desired outcome, as participants in the high frequency group made the more reinforced response more often than participants in the low frequency group.

Unlike in the noncontingent problem-solving task, where subsequent response decision-making in the active groups was predicted by the inaccurate estimates of explicit control, it appeared to be predicted by the implicit control, which is calculated using the knowledge of the conditional probabilities in this contingent task. In Trivers' (2000) dissociation concept, the explicit information held in the conscious mind is considered to be more accessible than the implicit information in the unconscious mind. Therefore, in line with this, it would be expected that future response behaviour would be predicted by explicit perceptions, which means that the findings that the implicit judgements were predictive are unanticipated. Still, the literature on explicit and implicit attitudes and beliefs has shown that both can be influential on future behaviour (Maier & Seligman, 1976; Nardone et al., 2007).

It would be beneficial in evolutionary terms for the individual if the implicit system did override the explicit system when faced with decision-making opportunities, as they could still retain their overinflated beliefs about their contingent control, whilst unconsciously being guided to make correct and beneficial decisions based on the more accurate information. This would be an adaptive advantage and endorse the evolutionary approach to self-deception, and would provide a sound argument for the natural selection of self-deceptive behaviour. This is applicable in the high frequency ACT group, where the estimations of the conditional probabilities more accurately reflected the actual probabilities, and therefore resulted in accurate estimates of implicit control. However, it is less applicable in the low frequency ACT group, where the implicit judgements were significantly underestimated, so basing future responses on this knowledge would result in more imprecise decisions. Indeed, the finding from the maximisation task, that the participants in this group did not make the more reinforced response as often as those in the high frequency group may provide support for this.

A possible reason for the implicit judgements predicting future behaviour over the explicit judgements may be due to the introduction of contingent control. As briefly discussed in Experiment 1, the noncontingent problem could potentially be a special case,

where the random nature of the conditional probabilities and therefore the absence of control encourage people to base their decisions on their overestimated beliefs. The presence of contingent control, with differing values for the frequency outcomes where there is a more reinforced response, could have encouraged people to spend more time deliberating about the probabilities, which could explain why the implicit estimates were a better predictor. This only seemed to be the case when people were rewarded for active involvement, irrespective of whether frequency of desired outcome was high or low, even when a large IOC was displayed.

However, future decision-making was unclear in the passive groups. In the high frequency group, neither the explicit nor the implicit estimates of control emerged as a predictor, which replicates the findings for the passive group in the 0% control experiment. Whilst the explicit estimates were more accurate in this group, the knowledge of the conditional probabilities in this group was quite poor, with the participants underestimating the frequency of reward for the more reinforced response. Therefore, this lack of understanding may have contributed to the seemingly random subsequent response behaviour. Conversely, in the low frequency PAS group, both the explicit and implicit judgements emerged as predictors. However, the participants were rather accurate in their explicit judgements and did not show an IOC, as well as being accurate in their knowledge of the conditional probabilities. Therefore, the explicit and implicit judgements were similar, which may have contributed to the emergence of both of the measures as predictors.

CHAPTER FIVE

EVENT-EVENT INPUTS: EXPERIMENT THREE

In the previous two chapters, it was apparent that people who received more positive feedback for active responding on the task reported greater explicit judgements of control, and therefore displayed higher IOCs than people who received more positive feedback for passive responding. I discussed the possibility that people attribute more responsibility to themselves when they feel that their responses are actively influencing the environment. This chapter presents Experiment 3, which revisits the noncontingency task, exploring the explicit/implicit dissociation when the response format is modified to comprise of two active responses, rather than one active and one passive response.

As discussed in Chapter Two, many of the contingency studies that have been conducted use the two response–outcome format, consisting of an event-nonevent input, and an event-nonevent output (Alloy & Abramson, 1979, Carson et al., 2010, Tang & Critelli, 1990). Fewer studies have investigated control judgements when the two responses are both events. Research conducted by Jenkins and Ward (1965), investigating conditional probabilities in contingent and noncontingent problems used an event-event input (press Button R1 or R2) and an event-nonevent output (score or no score). They found that the subjective judgements of control were not related to the actual contingency (ΔP), but were instead positively correlated with the frequency of the "score" outcome. Similarly, Allan and Jenkins (1980, 1983) compared an active-passive (event-nonevent) task with an active-active (event-event) task, and found that in the former format, judgements of control were related to the conditional probabilities, whilst control judgements were more inaccurate and influenced by the frequency of the desired outcome in the latter task. However, neither of these studies calculated the values of implicit control from the conditional probabilities, to compare the reports of explicit judgements against. Therefore, the following experiment is of interest to investigate the explicit/implicit dissociation when the mode of representation is manipulated.

5.1 Experiment 3: Effects of event-event inputs on the explicit/implicit dissociation

By modifying the response format on the judgement of noncontingency task, so that both responses require the participant to be active (event-event), it is predicted that the active-active format will encourage participants to display higher judgements of explicit control, and therefore also show greater IOCs than have been reported in the previous experiments. As the explicit judgements are expected to be greater, a clearer explicit/implicit dissociation could be expected if the participants are accurate at estimating the conditional probabilities. As in Experiments 1 and 2, the explicit judgements are not expected to be related to the actual contingency, but the event-event input format may instead result in the explicit judgements being related to the total frequency of green light onset (Allan & Jenkins, 1980, 1983; Jenkins & Ward, 1965).

5.1.1 Methods

Participants

Forty-eight undergraduate and postgraduate students (39 females, age range: 18-39, $M = 22.38$) at Bangor University were recruited via SONA, and received one course credit for their participation.

Design

The two responses in the judgements of noncontingency task were the Q-key and the P-key on the computer keyboard. Therefore, both responses required the participants to be active throughout the task. As described in the General Methods section (section 3.2), the degree of control was also 0% (50-50), so on each trial for both Q-key and P-key responses, there was a 50% chance of receiving green light onset.

Apparatus

As described in the General Methods (section 3.2), the response screen was presented for 1500ms, on which the yellow light onset indicated the time to make a response. However, unlike in the original format, where the timeout of the response screen indicated a no-press trial, the new design required the participants to make an active response on each trial. Therefore, if the participant did not make a response within the 1500ms timeframe, that trial was considered to be a “bad trial” and the following error message was displayed, “Make a response before the yellow light goes off”, and a new trial would follow. A “good” trial occurred when the participant made a response within

the 1500ms response screen. The learning phase would end when the participant had completed 100 "good" trials, and the maximisation task would finish when the participant had completed 10 "good" trials.

Measures

Judgements of Control Scale. The original measure was revised to substitute the press and no-press responses for the Q and P-key responses (see Appendix F). Question two became "how frequently did you press the 'Q' key?", question four became "on the trials where you pressed the Q-key, how often did the green light come on?" and question five became "on the trials where you pressed the 'P' key, how often did the green light come on?".

Personality measures. These measures were included to investigate the possible relationship between personality traits and displaying an IOC. The Mini IPIP (see Appendix G) is a 20-item version of the 50-item International Personality Item Pool – Five Factor Model measure. The items are rated on a Likert scale that runs from 1 (very inaccurate) to 5 (very accurate). It has 5 subscales that represent the Big Five traits: extraversion, agreeableness, conscientiousness, neuroticism and openness. The alphas for internal consistency are above .60 for all scales (Donnellan, Oswald, Baird & Lucas, 2006).

The Zuckerman-Kuhlman Personality Questionnaire Cross-Cultural (ZKPQ-50-CC) has 50 items and people can respond either true or false to each statement (see Appendix H). It contains 5 subscales: aggressiveness/hostile, activity, sympathy, impulsiveness/sensation-seeking, and neuroticism/anxiety. The alpha coefficients are above .70 for all scales (Aluja et al., 2006).

Depression measure. The Beck's Depression Inventory (BDI; see Appendix I) was included to investigate the relationship between mood and the IOC. The format was revised in order to make it quicker to administer, by removing the lengthy answers from the original format, so that the participants only rated each item on a Likert scale which ran from 0 (strongly disagree) to 3 (strongly agree). Question 9 was removed on the ethical basis of not wanting to know whether any of the participants were suicidal, so the measure consisted of 20 questions. The alpha for internal consistency for the BDI is .81 for nonpsychiatric subjects (Beck, Steer & Garbin, 1988).

Procedure

The procedure was identical to the description in the General Methods (section 3.2), apart from the following two changes. Firstly, revised standardised instructions were

presented on the computer screen prior to commencing the judgements task, which also explained that an error message would occur if they did not make a key-press during the response screen (see Appendix J). Secondly, the revised Judgements of Control Scale was presented after the noncontingency task was completed, followed by the BDI and personality measures, and demographics information (see Appendix K).

5.1.2 Results

Statistical Analysis

As expected, unlike in Experiments 1 and 2, where there was a difference between reports of explicit control and the IOCs shown in the active and passive groups, there was not a significant difference in explicit control between participants who pressed the Q-key more often (M = 37.50, SD = 23.74) and participants who pressed the P-key more often (M = 31.73, SD = 25.49), $t(46) = .81$, $p = .41$, nor in terms of the IOC (M = 29.51, SD = 24.71, and M = 25.02, SD = 26.93 respectively) , $t(46) = .60$, $p = .55$.

Therefore, the between-groups approach is not required here as the participants in the active Q-key and active P-key groups are assumed to have acted similarly, and the sample will be analysed as one group, with the Q-key response representing the P(O/R) conditional probability, and the P-key response representing the P(O/~R) conditional probability, using the equation $\Delta P = P(O/R) - P(O/\sim R)$. Hence, the implicit control will be calculated in terms of Q minus P. Performance on the maximisation task will also be analysed in terms of how often (%) the participants made the Q-response. This analysis will be utilised in all experiments in which the active-active version of the 0% noncontingency task is used.

The number of "bad" trials in the learning phase, where participants either made a response before the 1500ms timeframe (i.e. too quick) or after the 1500ms response screen (i.e. too slow), was low (M = 2.18, SD = 4.16). Therefore, participants only made these errors on 2.08% of the trials. Likewise, the number of "bad" trials in the maximisation phase was also low (M = 1.16, SD = 0.37), with participants making response errors on 1.54% of the trials.

Illusion of Control

Firstly, I will discuss the explicit judgements and the IOC experienced in the 100-trial learning phase. As can be seen in Figure 5.1, the participants reported a higher estimate of explicit control (M = 34.38, SD = 24.62) compared to the actual contingent control that was experienced (M = 7.30, SD = 5.21). Therefore, the participants displayed an IOC (M = 27.07, SD = 25.77), and a t-test found this illusion to be significantly different from zero, $t(47) = 7.28$, $p < .001$.

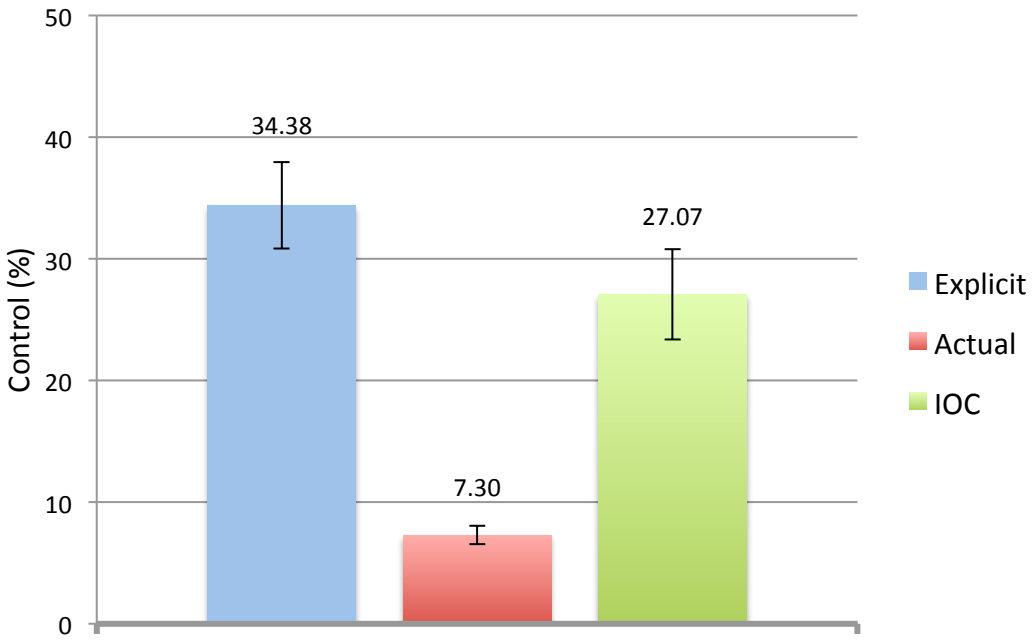

Figure 5.1. Comparison of the means of explicit judgements of control with the actual control and the IOC. Error bars represent the standard error of the means.

In addition, there was not a significant correlation between the explicit judgements and the actual contingent control, $r(46) = -.12$, $p = .42$ (see Figure 5.2). Consistent with Experiments 1 and 2, this indicates that as well as overestimating their judgements of control, the participants' explicit estimates did not track the actual experience of control. As a comparison, the black line in the graphs indicates where accurate responses would lie if the explicit judgements perfectly matched with the actual experience.

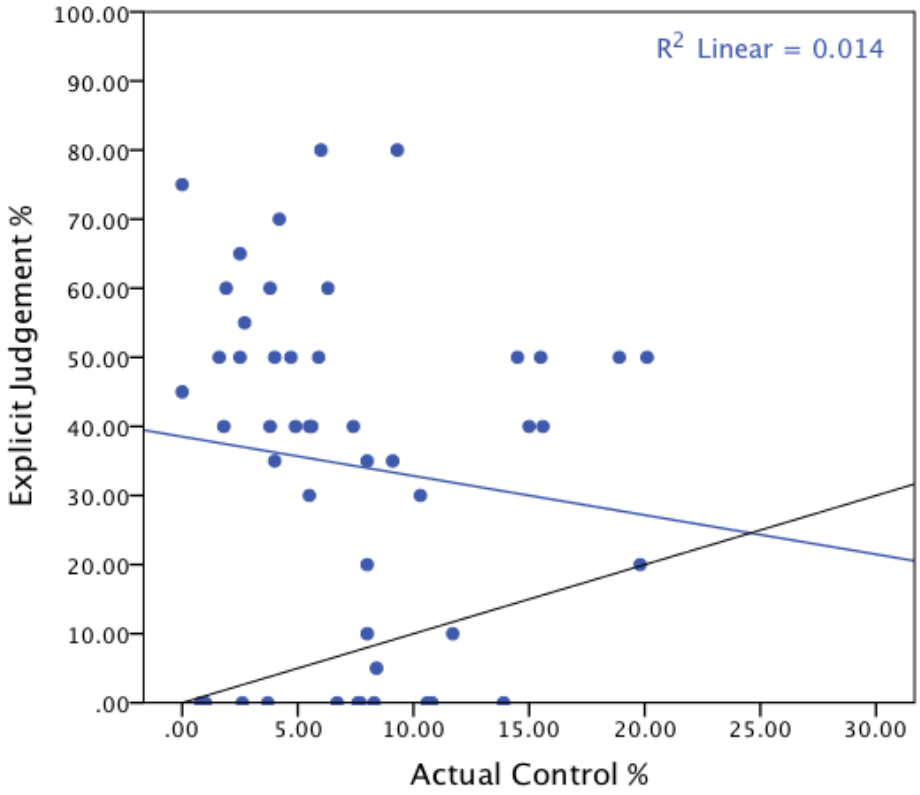

Figure 5.2. Participants' explicit estimates compared to the actual contingent control.

However, was the explicit judgement of control in this active-active version of the task significantly greater than in the active-passive version in Experiment 1 (M = 27.37, SD = 21.94)? No, it was not, as is supported by the following t-test, $t(98) = -1.51$, $p = .14$. Additionally, the IOC displayed in this experiment was not significantly greater than the IOC in Experiment 1 (M = 17.95, SD = 22.50), but it was trending towards significance $t(98) = -1.89$, $p = .06$ (see Figure 5.3).

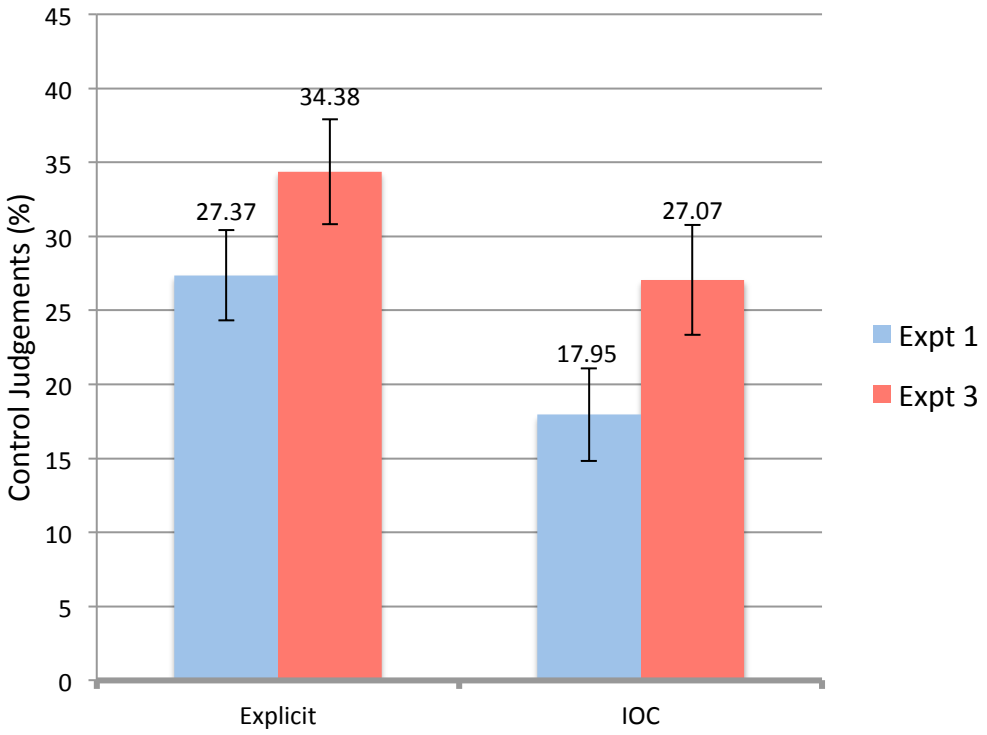

Figure 5.3. Comparison of the explicit judgements and IOCs in the active-passive (Experiment 1) and the active-active (Experiment 3) noncontingent tasks. Error bars represent the standard error of the means.

The participants' explicit judgements were also not correlated with the actual frequency of total green light onset, nor their judgements of total green light onset, $r(46) = .19$, $p = .21$ and $r(46) = .13$, $p = .38$, respectively. However, the explicit judgements were significantly correlated with the estimated number of successful trials when pressing the Q-key, $r(46) = .32$, $p = .03$, whilst there was no relationship with the successful number of trials when pressing the P-key, $r(46) = -.02$, $p = .91$.

Regarding the personality measures, the explicit judgements and the IOC did not correlate with any of the personality factors on the Mini IPIP and ZKPQ-CC. Likewise, the explicit judgements and the IOC were not significantly correlated with the self-report scores of depression from the BDI, $r(46) = -.15$, $p = .30$ and $r(46) = -.14$, $p = .33$, respectively. The negative correlations suggest that as depression scores decreased, the perceptions of control increased.

Dissociation of Explicit and Implicit Judgements

This section will examine the relationship between the participants' implicit

judgements of control, based on the conditional probabilities, and their actual contingent control, and discuss the explicit/implicit dissociation.

The difference between the implicit judgements and the actual control was calculated (M = -6.89, SD = 23.60), and the negative value shows that the implicit judgement (M = 0.42, SD = 24.03) was underestimated in comparison to the actual noncontingent control (M = 7.30, SD = 5.21). A t-test was run to analyse this difference, which found it to be significantly different from zero, $t(47) = 2.02$, $p = .05$. Therefore, it appears that the participants' knowledge of the conditional probabilities was lacking. This is similar to Experiment 2, in which implicit judgements were mostly underestimated in comparison to the actual control.

When the two conditional probabilities were analysed, t-tests showed that neither the Q-key estimate (M = 46.35, SD = 19.07) nor the P-key estimate (M = 45.94, SD = 17.19) were significantly different to the actual values (M = 50.31, SD = 7.74, and M = 50.28, SD = 6.18 respectively), $t(47) = -1.67$, $p = .10$, and $t(47) = -1.83$, $p = .07$ respectively. However, the participants' estimates were both trending towards being significantly underestimated compared to the actual conditional probabilities, particularly the P-key estimates. Additionally, a lack of correlation between the implicit judgements and the actual contingent control was found, $r(46) = .19$, $p = .19$, which suggests that the participants' implicit estimates did not track the actual control that was experienced (see Figure 5.4). This is dissimilar to Experiment 1 and the ACT groups in Experiment 2, in which the implicit/actual correlations were significant, but similar to the PAS groups in Experiment 2, which were not significant. In Figure 5.4, the green line represents the line of best fit, and, as previously stated, the black line denotes where responses would lie if the participants' implicit judgements accurately tracked the actual control that was experienced.

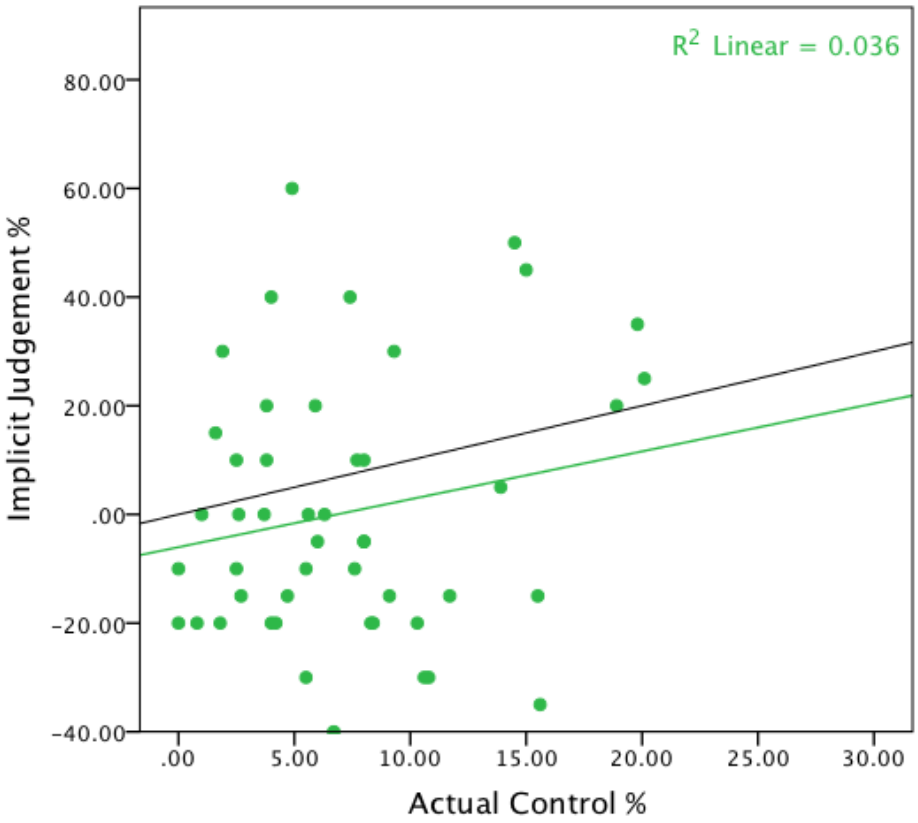

Figure 5.4. Participants' implicit estimates compared to the actual contingent control.

Regarding the explicit/implicit dissociation, the difference between the explicit/actual and implicit/actual correlations was not significant, $Z = -1.48$, $p = .14$. However, a repeated-measures ANOVA with judgement (explicit and implicit) as the within-subjects factor found a significant main effect of judgement, $F(1, 47) = 63.77$, $p = < .001$. Specifically, the estimates of explicit judgements ($M = 34.38$, $SD = 24.62$) were higher than the estimates of implicit judgements ($M = 0.42$, $SD = 24.03$; see Figure 5.5).

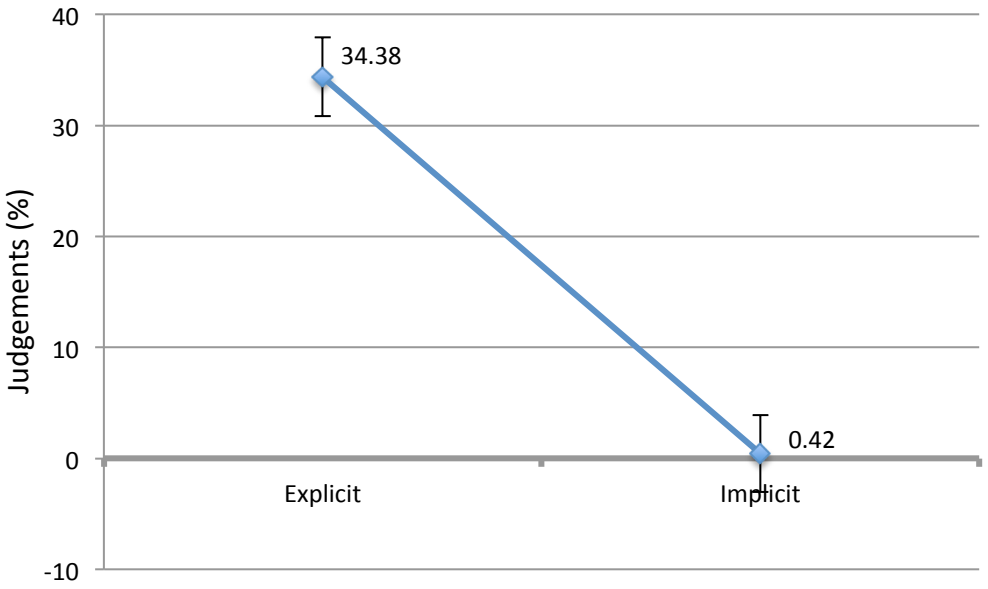

Figure 5.5. Comparison of explicit and implicit estimates of control. Error bars represent the standard error of the means.

Maximisation Task Behaviour

The previous analyses suggested that the reported explicit control was systematically high and did not track the actual contingent control, whereas the estimates of implicit control were somewhat underestimated and also scaled poorly with the actual experience of control. This section will discuss whether, despite these findings, either of the judgement measures predicted subsequent performance on the 10-trial maximisation task.

A multiple regression, with explicit and implicit judgements of control entered as independent variables, was run to determine whether either variable was a better predictor of future press behaviour. The two-factor model gave a significant prediction of maximisation rate of the Q-key response, $R = .54$, $R^2 = .30$, $F(2, 45) = 9.43$, $p < .001$. Furthermore, tests of the predictor betas showed that, despite the findings concerning their inaccuracy, the implicit judgements significantly predicted response maximisation, $\beta = .53$, $t(47) = 4.01$, $p < .001$, whilst explicit judgements were not a significant predictor, $\beta = .05$, $t(47) = 0.36$, $p = .72$.

5.1.3 Discussion

In contrast to Experiments 1 and 2, active key-pressing responses were always required in this experiment. It was hypothesised that active responding might increase the IOC, and also affect the power of explicit and implicit judgements of control to predict future maximisation behaviour.

Consistent with Experiments 1 and 2, the participants overestimated their explicit control judgements compared to the actual noncontingent control, so an IOC was evident, providing further support for the concept that people treat noncontingent situations as contingent situations (Langer, 1975; Thompson et al., 1998). In addition, implicit judgements showed no inflation, but instead a slight underestimate of control. In contrast, both the explicit and implicit judgements were uncorrelated with each other and with actual control. However, contrary to the hypothesis that making both responses in the noncontingency task active choices would lead to greater overestimations of control, the increase in explicit judgements of control was numerically but not significantly different from previous experiments. However, the IOC was almost significant, which provides further support for the notion that IOCs are associated with increases in active involvement (Langer, 1975). Future research is needed to explore manipulations that could significantly increase both explicit judgements and the IOC. Finally, this experiment together with Experiments 1 and 2, demonstrates the robust nature of the IOC with regard to response modality. The IOC effects are large and consistent across noncontingent experiments where the conditional probabilities are 50-50.

Whilst the estimates of explicit control did not appear to be related to the actual control or the total frequency of green light onset, they were significantly related to the frequency of reinforcement when pressing the Q-key. This is interesting and is supportive of the belief that people use incorrect heuristics such as confirming cases when making judgements (Jenkins & Ward, 1965). However, as reported in the statistical analysis above, there was no difference in perceptions of control across the two responses, and both responses were active. Therefore, it is not clear why green light onset for one key was related to increases in control over the other key.

Unexpectedly, this experiment did not find significant support for an association between perceptions of control, personality factors and depression. However, the negative relationships between the perception of control and the depression scores suggested that as reports of depression increased, the explicit judgements and the IOCs decreased. Although

not significant, this relationship is in line with the depressive realism literature, that people with depression are more accurate, whilst nondepressed people are more susceptible to positive illusions (Alloy & Abramson, 1979; Dobson & Franche, 1989).

Moving on to the conditional probabilities, when the two responses were both active, the participants did not appear to have as accurate an understanding of the conditional probabilities as they did in Experiment 1, and therefore, the estimates of implicit control were also less accurate. Indeed, the conditional probabilities were underestimated, although not significantly so, which when used to calculate the implicit control, resulted in a value that was significantly less than the actual noncontingent control. However, the implicit estimate was still more accurate than the explicit report of control. Additionally, unlike in the active-passive format in Experiment 1, the implicit control did not appear to track with the objective degree of control. Therefore, it could be suggested that the active-active task version could interfere with which rule/information people use to evaluate what occurs in their environment, relevant to making control judgements. This supports the findings that when the two responses are an event (active) and a nonevent (passive), people appear to make judgements using the objective contingency (Allan & Jenkins, 1983), whereas when the two responses are both events, they rely on incorrect heuristics such as the frequency of positive confirming cases, i.e. when they make a response and receive the green light (Jenkins & Ward, 1965). Alternatively, participants may have difficulty tracking the information regarding the responses and outcomes due to the similarity of the two responses. Rather than separate entities, press Q-key and press P-key might both be represented internally simply as a key press response. This would make it more difficult to estimate the conditional probabilities of outcomes caused from pressing one key or the other.

When responses and outcomes are both event-nonevent, it is natural for people to expect a response-event to correspond with an outcome-event, e.g. pressing the space bar and green light onset, and vice versa for nonevents (no press, no light). So, when the responses are both active (pressing Q-key and P-key), this emphasises this relationship between response-event and outcome-event more so. However, unlike the active-passive response-type version of the task, it does not allow the participants to observe the situation in which an outcome-event (green light) occurs after a response-nonevent (no press), so they are likely to assume that a response-nonevent would result in an outcome-nonevent (no light). Let me illustrate this with an example where a sick patient can either be administered medicine (response-event) or not (response-nonevent), and then the patient's

health either improves (outcome-event) or does not improve (outcome-nonevent). This is equivalent to the active-passive version of the noncontingency task, and it is natural for people to associate improved health with the receiving of medicine. To parallel the active-active version, a patient would be administered Medicine 1 or Medicine 2 (both response-events), and would either get better or not. However, this does not allow people to observe the situation in which the patient does not receive medicine, but still gets better. Instead, people are likely to assume that if the patient does not get medicine, then they will continue to be ill. Therefore, the mode of representation that is used appears to be important, and influential on performance, and the fact that all pairings are not possible in the active-active response format may be a limitation of this task, compared to the active-passive version.

I will now discuss what aspects of the results from this experiment fit and do not fit with Trivers (2000, see also von Hippel & Trivers, 2011) theories of explicit/implicit dissociation and self-deception. The recurring finding that people overestimate their explicit judgements of control fits in with the proposal that information held in the conscious (explicit) is often false, but welcome and self-enhancing. Control is viewed as socially desirable and therefore, it is logical that people will inflate their estimates of the amount of control they possess, in order to deceive themselves so that they can better deceive others. Furthermore, this was supported by the consistent finding that explicit judgements did not track the actual control, and so appeared to be out of line with reality.

In addition, although significantly underestimated compared to the actual amount of control experienced, the implicit judgements of control were more accurate than the explicit judgements. Therefore, this also fits with the proposal that true (accurate), but unwelcome information, such as a lack of control, is held in the unconscious (implicit). However, the implicit system was not consistent with expectations that it would track with the actual experience of control, and therefore was not in line with Trivers theory that the inflated, inaccurate explicit judgements are held simultaneously with accurate implicit judgements that correspond with the objective contingency.

In the maximisation task, participants made both responses equally, which would be expected in a noncontingent task, where the outcome reinforcement was equivalent across the two responses (Alloy & Abramson, 1979). Comparable to Experiment 2, but not to Experiment 1, subsequent response decision-making appeared to be predicted by the implicit judgements. Therefore, this does not fit with Trivers theory that the explicit judgements held in the consciousness should be more accessible for future decision-

making. As discussed earlier, an explanation for this could be that the participants had difficulties with the response-outcome mappings for the conditional probabilities, due to the similarity of the responses. However, this would not be applicable to Experiment 2, which used the active-passive version of the task. What both Experiments 2 and 3 have in common is that when there was a deviation from the original format of the task, i.e. the introduction of actual contingent control in Experiment 2, and the active-active format in Experiment 3, the implicit judgements appeared to be more accessible for future decision-making. This further supports the previously discussed notion that the 0% active-passive version of the noncontingency task is a special case, where people rely on the overestimated explicit information that is available.

CHAPTER SIX

THE IOC IN THE WORKPLACE: EXPERIMENTS FOUR AND FIVE

The previous chapters examined the IOC and perceptions of control in the student population, primarily psychology students. In the interests of external validity, this chapter will shift the focus from students to non-student populations. Firstly, Experiment 4 will test the active-active version of the noncontingency task from Chapter Five on staff members and volunteers from the Citizens Advice Bureau. This will be followed by Experiment 5, which introduces the DeXtraD iDP system, a subconscious personality profiling system that includes the active-passive noncontingency task, which will be tested on trainee traders, and discusses why traders are an interesting population to research.

6.1 Experiment 4: Citizens Advice Bureau

The Citizens Advice Bureau (CAB) is a charity that invested in this research. The organisation strives to influence policymakers and assists people in resolving their problems, including legal, debt, benefits, etc., with free advice and information. This experiment investigated the presence of the IOC and the explicit/implicit dissociation in the staff members and volunteers, and in addition, included a 12-month follow-up. As in Experiment 3, the active-active response format was utilised. This was primarily due to the lower rate of participants who had to be excluded from the analysis due to failing to follow the experimental instructions, which was 8.77% of participants in the active-passive version in Experiment 1, compared to 0% in Experiment 3. In the active-active task, participants were required to be more (involved) as they had to make a key-press to continue to the next trial, so they were more likely to sample both responses more, whereas in the active-passive task, participants could sit back and not engage with the task. Due to the limited number of participants available at CAB, the active-active task seemed to be the logical choice to maximise the number of participants that would be included in the analysis.

In the interest of increasing the external validity of this research, this experiment aimed to demonstrate that the IOC is not just limited to the student population that has been explored thus far. Therefore, in line with the previous experiments, the explicit judgements of the participants were expected to be greater than the actual control that is

experienced, whereas the implicit control, reflecting the knowledge of the conditional probabilities was expected to be more accurate. On the basis of the results from Experiment 3, it was hypothesised that implicit control might emerge as a better predictor of future response decision-making in the maximisation task.

The 12-month follow-up was included to investigate the repeatability of the IOC effect, when there was no intervention employed. It was expected that the follow-up results would be consistent with the baseline data, as IOCs (positive illusions) are purported to be pervasive and enduring tendencies (Taylor & Brown, 1988). However, if there are any increases or decreases, it will be of interest to explore whether there is any relationship with levels of depression, in line with the theory of depressive realism (Alloy & Abramson, 1979).

6.1.1 Methods

See the Methods section in Chapter Five (subsection 5.1.1).

Participants

Thirty-nine members of staff and volunteers (27 females, age range 19-67, *M* age = 39.67) from the Citizen's Advice Bureaux across the Isle of Anglesey, North Wales were recruited on a voluntary basis. They received £5 for their participation. The sample consisted of 17 staff members (13 females, age range 23-64, *M* age = 37.88) and 22 volunteers (14 females, age range 19-67, *M* age = 41.05). The data of 1 additional participant were removed because they failed to follow the experimental instructions. Eleven members completed the one-year follow-up (7 females, age range 25–65, *M* age = 43.82) due to a high turnover of volunteers.

Design

The noncontingency task and the questionnaires were the same as described in Chapter Five, but they were completed at two time points (T1 and T2). T2 occurred one year after T1.

6.1.2 Results

Statistical Analysis

There were no significant differences between explicit reports of control between staff members (M = 25.88, SD = 27.17) and volunteers (M = 32.27, SD = 29.71), $t(37)$ = -

0.69, $p = .49$, or the IOCs of staff members ($M = 18.00$, $SD = 29.40$) and volunteers ($M = 20.63$, $SD = 29.34$), $t(37) = -0.28$, $p = .78$ (see Figure 6.1). Therefore, the staff members and volunteers could be analysed as one group.

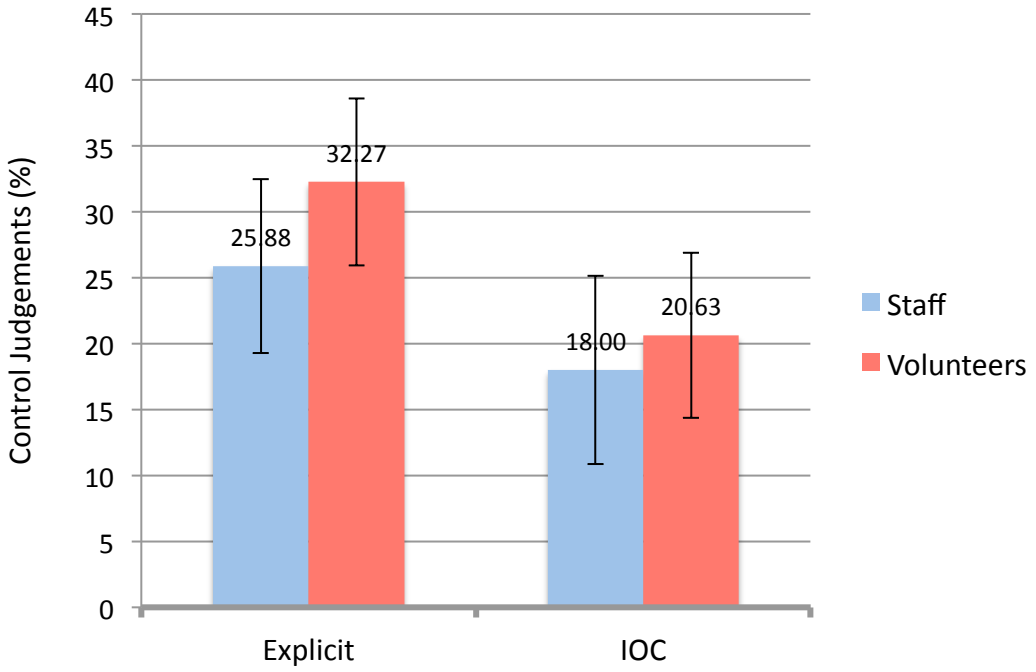

Figure 6.1. Comparison of explicit judgements of control and IOCs across staff and volunteer groups. Error bars represent the standard error of the means.

Also, in line with Experiment 3, there were no significant differences in explicit judgements between participants who were reinforced with green light onset more for pressing the Q-key ($M = 31.76$, $SD = 33.44$) and those who were more reinforced for pressing the P-key ($M = 27.73$, $SD = 24.58$), $t(28.38) = 0.42$, $p = .68$. Likewise, there were no differences between the IOCs ($M = 22.68$, $SD = 33.99$ and $M = 17.01$, $SD = 25.06$), $t(37) = 0.60$, $p = .55$. Therefore, the data could be analysed as one group, in the same manner as Experiment 3.

Illusions of Control

In line with the previous experiments in the thesis, the participants' judgements of explicit control ($M = 29.49$, $SD = 28.44$) were significantly greater than the actual control that was experienced in the 100-trial learning phase ($M = 10.00$, $SD = 7.78$), $t(38) = 4.20$, $p < .001$. Consequently, an IOC was present ($M = 19.48$, $SD = 29.01$; see Figure 6.2).

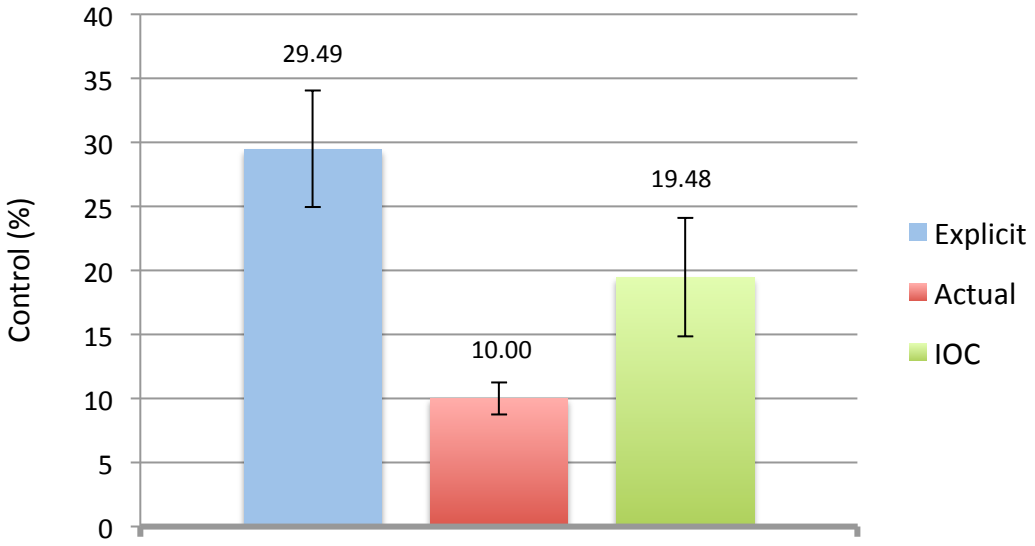

Figure 6.2. Comparison of the explicit judgements of control, the actual control and the IOC. Error bars represent the standard error of the means.

In comparison to this non-student sample, the explicit judgements of the student sample in Experiment 3 ($M = 34.38$, $SD = 24.62$) were not significantly different, $t(85) = 0.86$, $p = .39$. Likewise, the IOC in this experiment was not significantly different to the IOC in Experiment 3 ($M = 27.07$, $SD = 25.77$), $t(85) = 1.29$, $p = .20$ (see Figure 6.3).

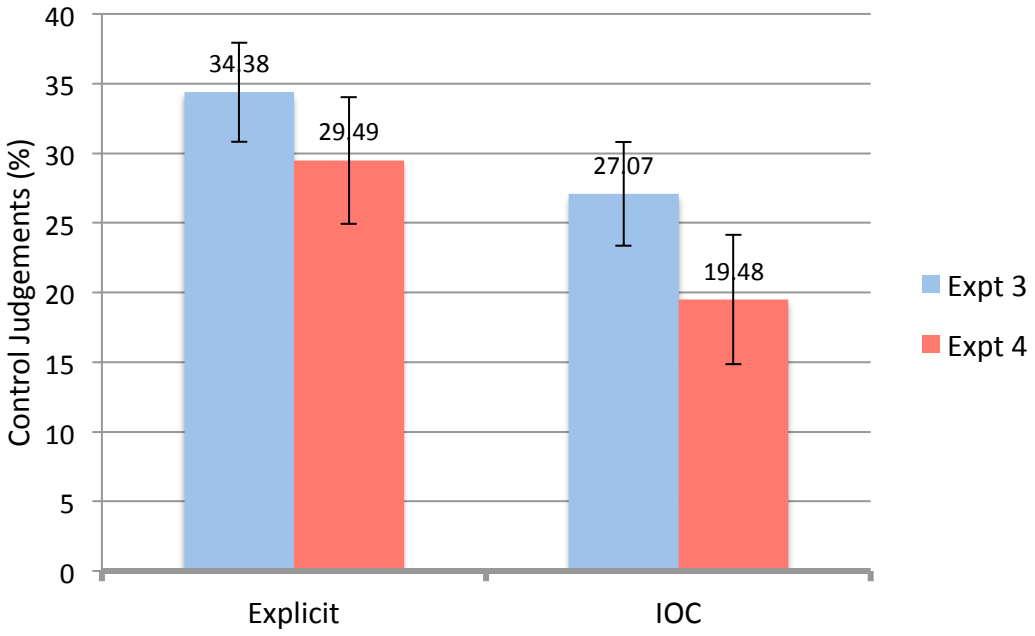

Figure 6.3. Comparison of the explicit judgements of control and the IOCs across the student (Experiment 3) and the non-student (Experiment 4) samples. Error bars represent the standard error of the means.

Furthermore, consistent with the previous experiments, the explicit reports of control did not appear to track with the actual amounts of control, as can be seen from the non-significant correlation between the two variables, $r(37) = .06$, $p = .70$ (see Figure 6.4). The black line on the graph shows where accurate responses would lie if the explicit judgements were perfectly in line with the actual control.

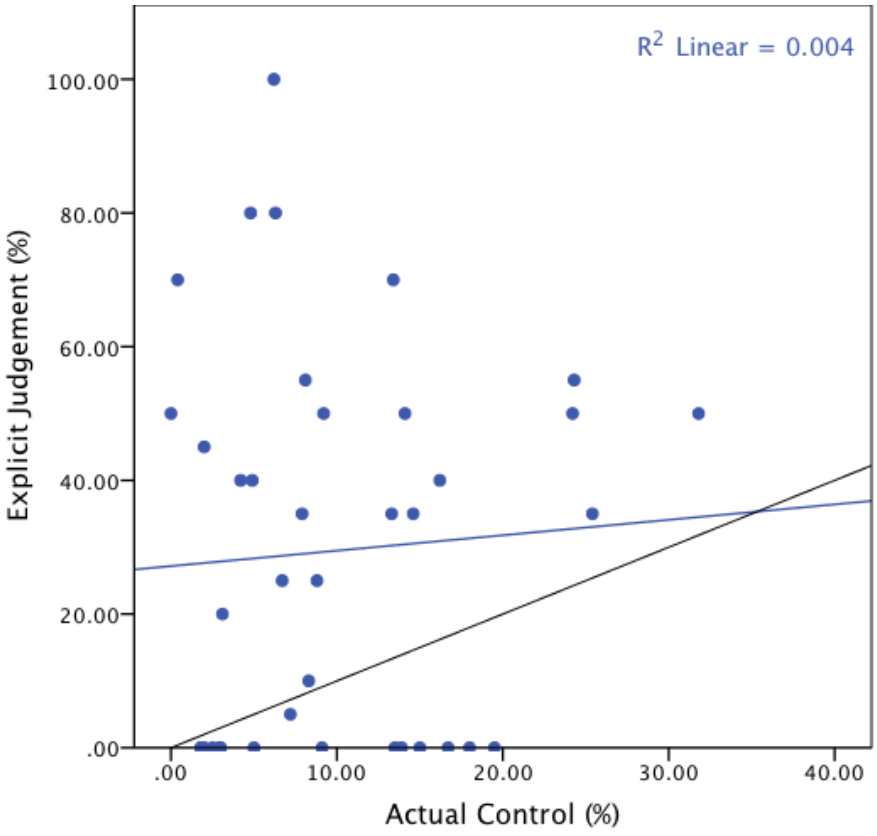

Figure 6.4. Participants' explicit control estimates compared to the actual control.

In addition, the explicit judgements and IOCs did not correlate with the actual frequency of total green light onset that the participants experienced, $r(37) = .08$, $p = .63$, and $r(37) = -.02$, $p = .90$. However, the explicit judgements and IOCs were positively and significantly correlated with the participants' judgements of total green light onset, $r(37) = .57$, $p < .001$, and $r(37) = .51$, $p = .001$ (see Figure 6.5). Therefore, as the perceived number of green lights increased, so did the perceptions of control.

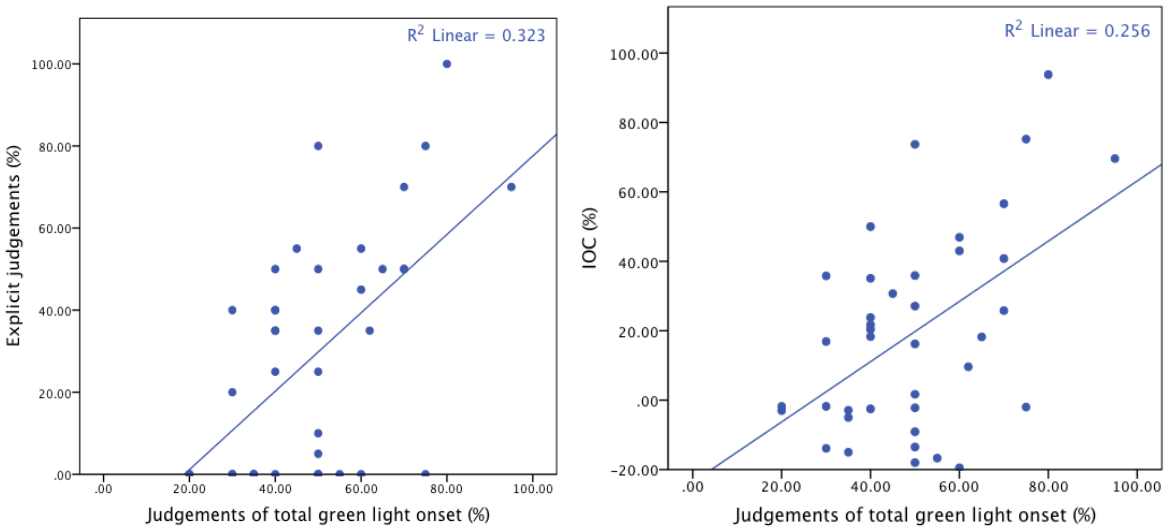

Figure 6.5. Explicit judgements of control compared to subjective and objective values of total green light onset.

The relationships between the personality measures and depression scores will now be discussed. The only significant correlation that emerged was between the explicit judgements of control and the neuroticism-anxiety scale on the ZKPQ-50-CC, $r(37) = .33$, $p = .04$. Similarly, the relationship between this scale and the IOC was trending towards significance, $r(37) = .28$, $p = .09$. Therefore, these correlations suggested that as perceptions of control increased, so did self-reports of neuroticism and anxiety. However, the explicit judgements and IOCs were not correlated with the BDI scores, $r(37) = .09$, $p = .62$ and $r(37) = .10$, $p = .55$, respectively.

Dissociation of Explicit and Implicit Judgements

This section will discuss the relationship between the implicit control and the actual control, as well as the explicit/implicit dissociation.

The negative value of the difference ($M = -15.69$, $SD = 25.63$) between the implicit judgements ($M = -5.69$, $SD = 24.56$) and the actual control ($M = 10.00$, $SD = 7.78$) indicates that the implicit judgements were underestimated. Furthermore, this difference was found to be significant from zero, $t(38) = 3.82$, $p < .001$. Therefore, parallel with Experiment 3, the participants' knowledge of the conditional probabilities was less accurate than expected.

Further analysis of the conditional probabilities showed that judgements of the frequency of green light onset when pressing the Q-key (M = 38.92, SD = 20.07) were significantly underestimated compared to the actual value (M = 48.42, SD = 8.50), $t(38)$ = -3.04, p = .004. However, when pressing the P-key, the judgements (M = 44.62, SD = 21.16) were not significantly underestimated in comparison to the actual frequency of green light onset (M = 50.51, SD = 7.86), $t(38)$ = -1.57, p = .12. In addition to the underestimation, the implicit estimates were also not in line with the actual control, as can be seen by the non-significant correlation, $r(37)$ = .02, p = .91 (see Figure 6.6). The difference between the explicit/actual and implicit/actual correlations was not significant, Z = 0.19, p = .85. This is similar to Experiment 3, when the active-active version of the task was also used, but dissimilar to Experiment 1 with the active-passive noncontingent task. In Figure 6.6, the green line represents the line of best fit, whilst the black line represents where responses would lie if the participants' implicit judgements perfectly matched the actual noncontingent control.

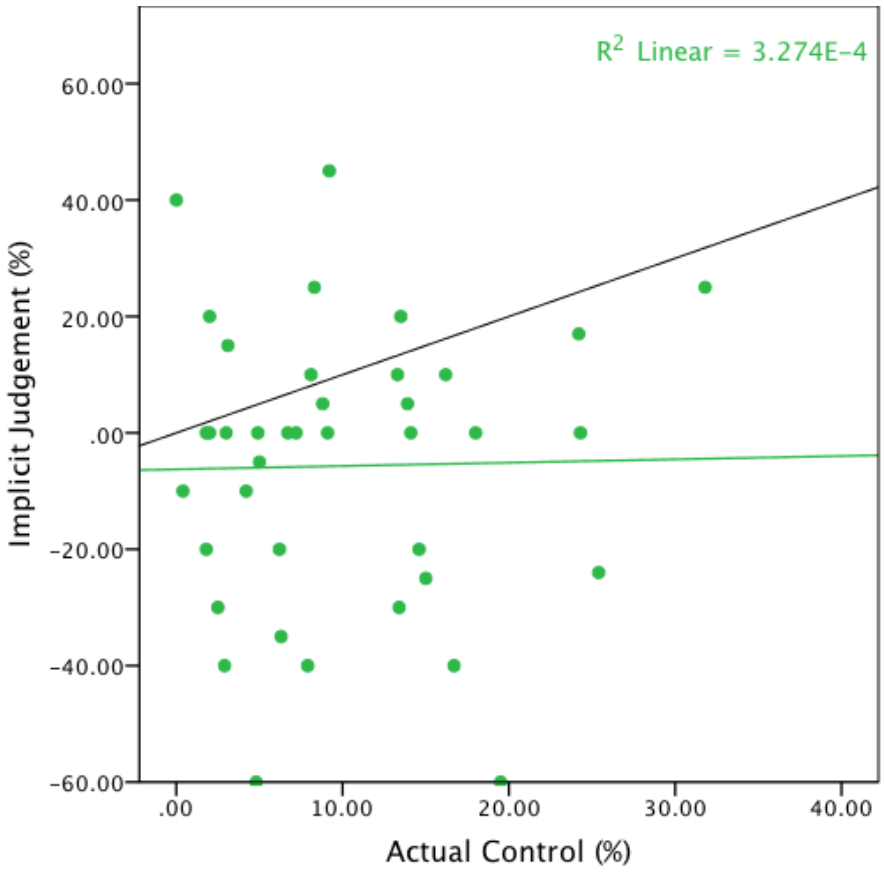

Figure 6.6. Comparison of the implicit estimates of control and the actual control.

Next, I will discuss the explicit/implicit dissociation. A repeated-measures ANOVA with judgement (explicit and implicit) as the within-subjects factor reported a significant main effect of judgement, $F(1, 38) = 34.22$, $p = < .001$. Therefore, the explicit judgements ($M = 29.49$, $SD = 28.44$) were significantly greater than the implicit judgements ($M = -5.69$, $SD = 24.56$; see Figure 6.7).

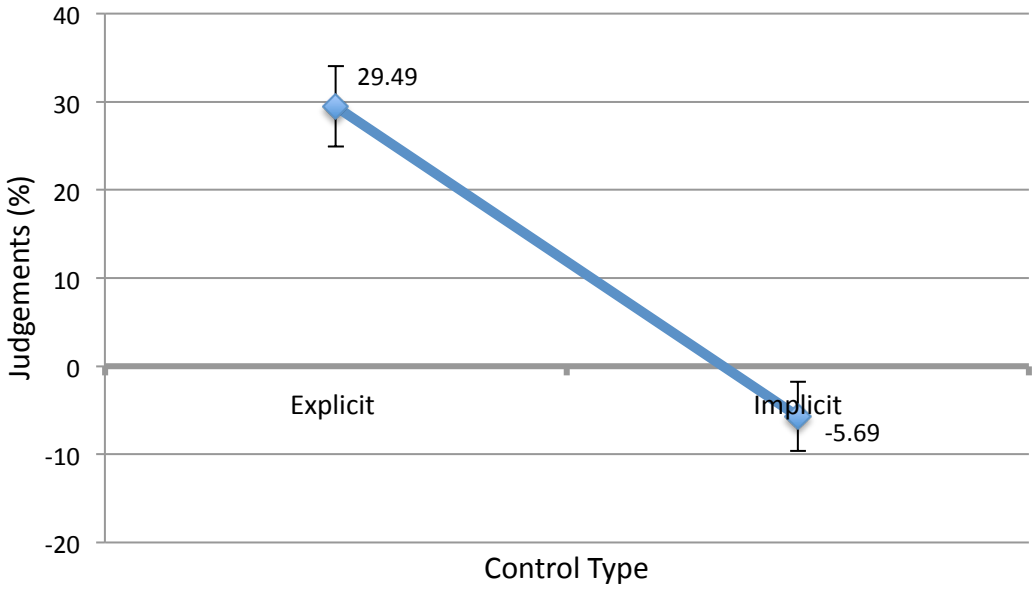

Figure 6.7. Comparison of the explicit and implicit judgements of control. Error bars represent the standard error of the means.

Maximisation Task Behaviour

The preceding analyses indicated that the explicit judgements of control were inflated and not in line with the actual control that was experienced, whilst the implicit judgements were underestimated and also scaled poorly with actual control. Despite these findings, this section will discuss whether subsequent response decision-making was predicted by these variables.

A multiple regression was run with the explicit and implicit judgements of control entered as the independent variables, to determine whether either was a better predictor of future responses. The two-factor model did not give a significant prediction of the Q-key press response, $R = .31$, $R^2 = .09$, $F(2, 36) = 1.86$, $p = .17$. Tests of the predictor betas showed that neither the explicit nor the implicit judgements were significant predictors of Q-key press, $\beta = .15$, $t(38) = 0.93$, $p = .36$ and $\beta = .27$, $t(38) = 1.69$, $p = .10$, respectively. However, it appears that the implicit judgements were better predictors.

One-year Follow-up

Comparable to the pre-test, the participants' explicit reports of control (M = 18.64, SD = 18.45) were significantly greater than the actual experiences of control in the learning phase (M = 4.17, SD = 2.42), $t(38) = 4.20$, $p < .001$. Therefore, the participants displayed an IOC (M = 14.46, SD = 17.67; see Figure 6.8).

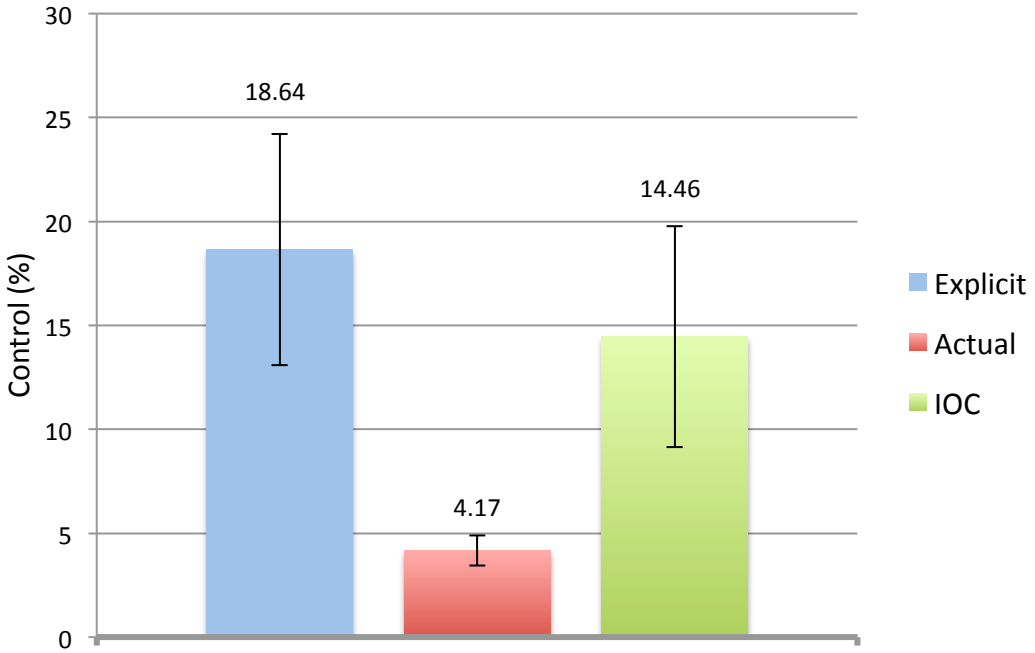

Figure 6.8. Comparison of the explicit control judgements, the actual control and the IOC. Error bars represent the standard error of the means.

In addition, the non-significant correlation between the explicit judgements and the actual control suggests that these two variables were not in line with each other, $r(9) = .38$, $p = .25$ (see Figure 6.9).

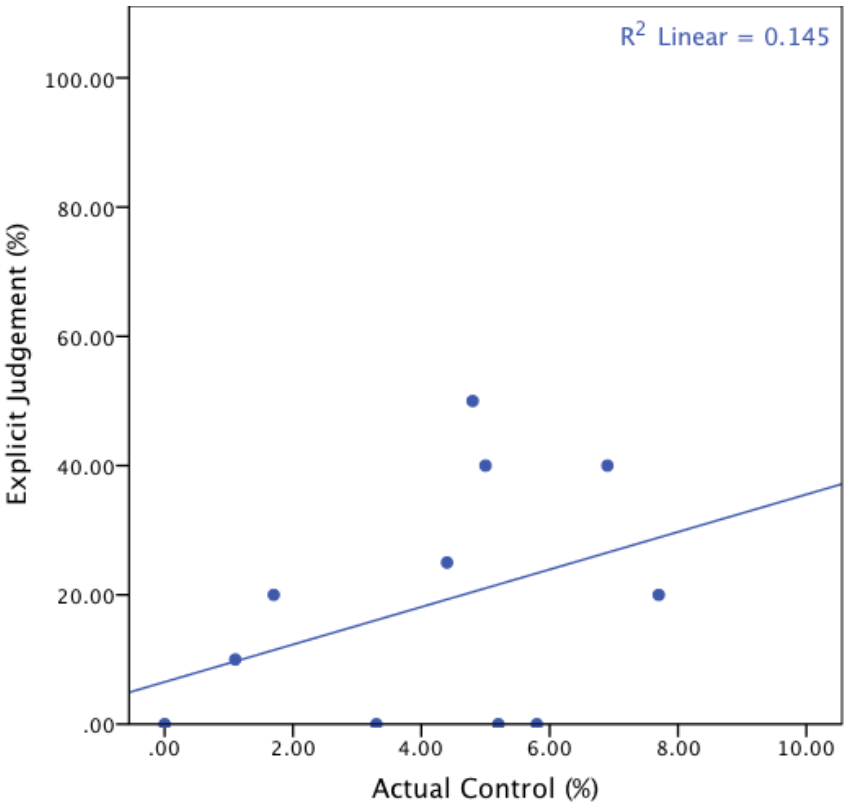

Figure 6.9. Comparison of the explicit judgements with the actual experiences of control.

Using the data of the eleven participants who completed the experiment at both T1 and T2, a paired-samples *t*-test found that the IOC at T2 was similar to the IOC at T1 (M = 18.24, SD = 30.18), $t(10) = 0.64$, $p = .54$ (see Figure 6.10). In addition, there was a significant correlation for the test-retest reliability of the IOC, $r(9) = .79$, $p = .004$ (see Figure 6.10).

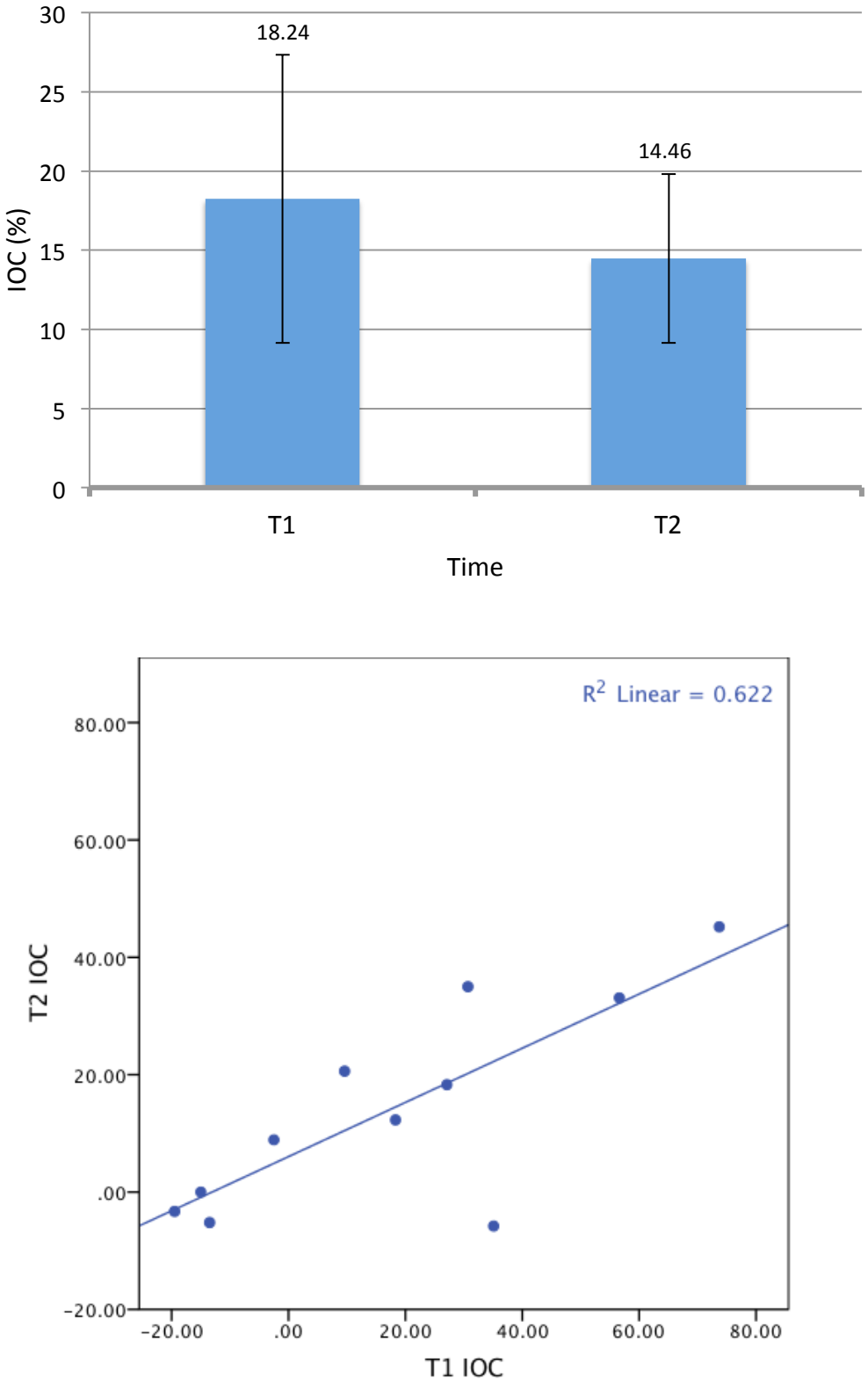

Figure 6.10. Graphs comparing the IOC across the T1 and T2. Error bars represent the standard error of the means.

Regarding the relationships with the personality and depression measures, there were significant negative relationships between explicit judgements and IOCs with extraversion on the Mini-IPIP scale, $r(9) = -.73$, $p = .01$ and $r(9) = -.74$, $p = .01$, which suggests that as self-reports of extraversion increased, the participants' perceptions of control decreased. Although not significant, the explicit judgements and IOC variables were negatively correlated with depression score, $r(9) = -.51$, $p = .11$ and $r(9) = -.44$, $p = .17$. Therefore, as feelings of depression increased, their perceptions of control decreased.

Analogous with the pre-test, the negative difference ($M = -12.81$, $SD = 17.43$) between the implicit judgements ($M = -8.64$, $SD = 17.48$) and the actual control suggested that the participants' implicit judgements were also underestimated at T2, and was found to be significantly different, $t(10) = 2.44$, $p = .04$. Furthermore, the two variables did not appear to track each other, $r(9) = .09$, $p = .80$ (see Figure 6.11). Additional analysis of the conditional probabilities showed that, parallel to T1, the judgements of the frequency of outcome at T2 were significantly underestimated for the Q-key, $t(10) = -2.55$, $p = .03$, and trending for the P-key, $t(10) = -2.17$, $p = .06$.

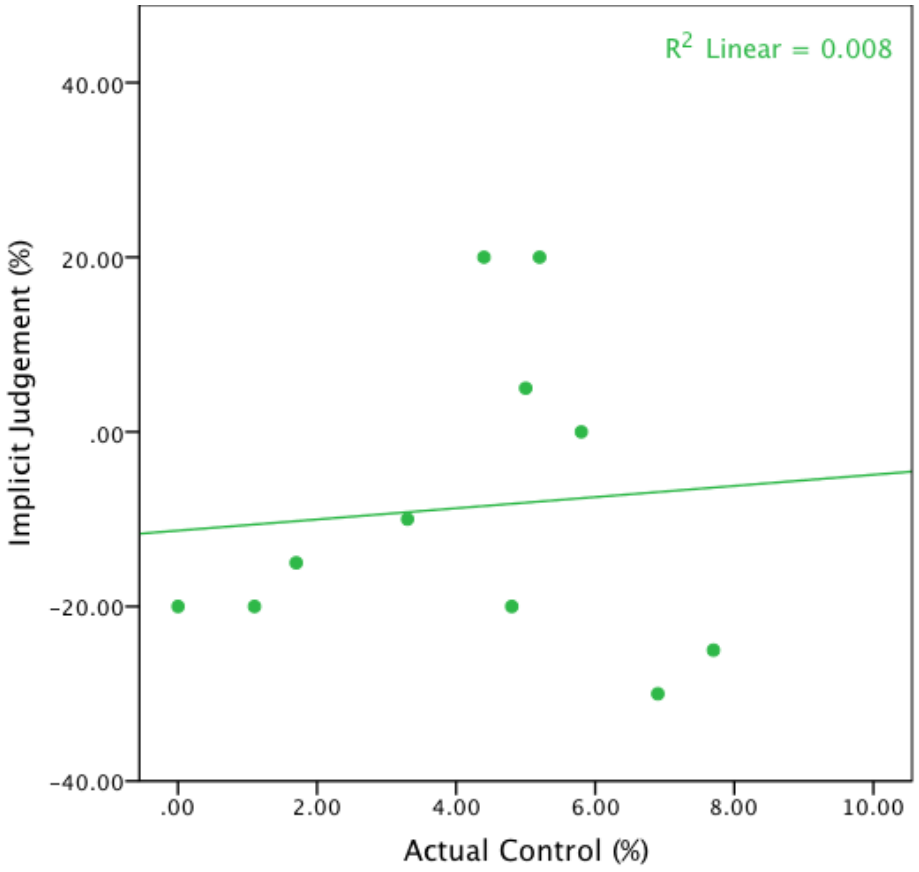

Figure 6.11. Comparison between the implicit judgements and the actual control.

A repeated-measures ANOVA with judgements (explicit and implicit) as the within-subjects factor also found a significant main effect, $F(1, 10) = 10.33$, $p = .01$ Therefore, consistent with T1, the explicit judgements were significantly greater than the implicit judgements (see Figure 6.12).

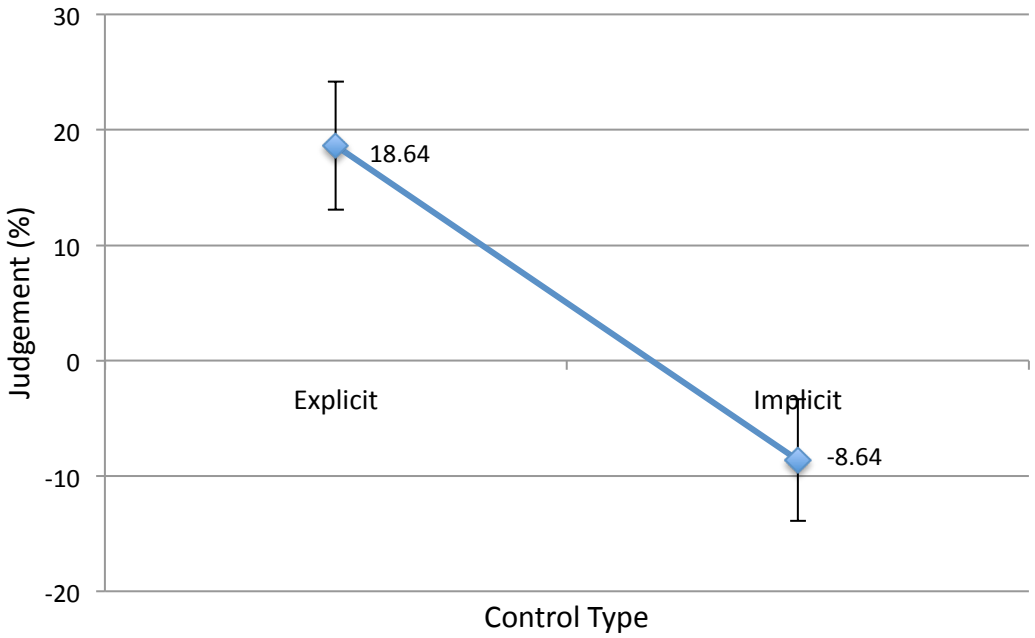

Figure 6.12. Comparison of the explicit and implicit judgements of control. Error bars represent the standard error of the means.

Finally, the explicit and implicit judgements of control were entered as independent variables in to a multiple regression to determine if either predicted future responses on the maximisation task. Consistent with T1, the model did not give a significant prediction, $R = .53$, $R^2 = .28$, $F(2, 8) = 1.59$, $p = .26$, and neither explicit nor implicit judgements emerged as significant predictors, $\beta = .16$, $t(10) = 0.52$, $p = .62$ and $\beta = .55$, $t(10) = 1.78$, $p = .11$, respectively. Although, it appears that the implicit judgements were still better predictors at T2.

6.1.3 Discussion

Analogous with the active-active task in Experiment 3, explicit judgements and the IOCs were not significantly different across the Q-and P-key responses. Therefore, this supports the proposal that this version of the task appears to remove the limitation of the

passive response in the active-passive version of the task, which led to smaller explicit judgements and IOCs in Experiments 1 and 2.

Consistent with the studies in this thesis, there was a tendency for individuals to significantly overestimate their perceptions of control, thereby resulting in an IOC. Furthermore, the explicit and actual control variables were not correlated, which suggests that as well as being inflated, the estimates were out of line with reality. These findings were also true at the one-year follow-up when the participants completed the task again. Although the experience for each participant was, by chance, different to his or her first encounter, the IOC displayed was similar. In addition, the test-retest reliability between the two time points was high, which suggests that this effect has good reliability. This is an important finding, as it supports the notion that the IOC is a pervasive and enduring tendency (Taylor & Brown, 1988).

As well as not being related to the actual amount of control, the explicit judgements in the pre-test were not related to the actual total green light onset. Instead, they were related to the participants' judgements of how many green lights they experienced. Therefore, the perceptions of control appeared to be connected to the frequency of successful outcomes, which is line with previous literature that when both responses are active, people rely on incorrect heuristics (Allan, 1980; Allan & Jenkins, 1983).

Similar to the active-active task in Experiment 3, the participants' knowledge of the conditional probabilities was lacking. At both time points, the participants' underestimated the amount of positive feedback, which lead to an underestimated value of implicit control. Although the differences between the implicit judgements and the actual control were less than the size of the IOCs, they were more similar, and therefore less accurate than in the previous noncontingent studies. Furthermore, in consonance with Experiment 3, the judgements of implicit control were not in line with the actual control experienced on the task. Although the results from the ANOVA suggested that the explicit judgements were significantly greater than the implicit judgements at both time points, it does not appear that the implicit system was more accurate than the explicit system. Therefore, the dissociation is not clear in this study, and so provides limited support for Trivers (2000) theory of self-deception. Additional relevant discussion information regarding the implicit system was examined in Chapter Five in subsection 5.1.3.

Regarding the responses made in the maximisation task, the regression models did not significantly predict responses at the baseline or the follow-up. Although in each

model, the implicit judgements of control were trending towards significance, and therefore appeared to be more predictive than the explicit judgements. This is comparable with Experiment 3, where future responses were more associated with the implicit judgements calculated from the conditional probabilities.

In terms of the size of the IOC, the results suggest that there was no difference between these nonstudents and the student sample in Experiment 3. Therefore, this supports the hypothesis that the IOC is a replicable phenomenon outside of the student population, and increases the external validity. It supports preceding studies that have also observed the IOC in nonstudent samples, such as in clinical settings (Golin et at., 1979), and the employment sector (Fenton-O'Creevy, Nicholson, Soane & Willman, 2003).

The perceptions of control were not significantly and negatively correlated with the BDI scores, as would be expected. Contrarily, at the pre-test, they were positively related with one of the neuroticism-anxiety measures, which suggests that as the participants' feelings of neuroticism increased, their perceptions of control increased. As neuroticism and anxiety are associated with depression, this finding would not be in line with the theory of depressive realism, and instead supports the traditional idea that poor mental health is associated with being out of touch with reality (Beck, 2005; Jahoda, 1958).

However, at the follow-up, there was a non-significant negative relationship between depression scores on the BDI and perceptions of control, which suggests a pattern consistent with depressive realism that as feelings of depression increase, IOCs decrease and reports of control become more accurate (Alloy & Abramson, 1979). However, the finding that greater levels of extraversion were associated with lower perceptions of control is not in line with expectations. It would be more logical for extraverted people to feel like they have more influence over their environment, as low levels of extraversion are often linked with greater anxiety and depression (Jylhä & Isometrä, 2006). Therefore, there were contradictory inconsistent results regarding the relationship between feelings of depression and perceptions of control.

In summary, there are two main findings from this experiment: that the IOC is observable in older, non-student individuals in the employment sector, and that it is a repeatable effect, when no intervention occurs. The second experiment in this chapter (Experiment 5) will focus on people training to become traders. This will be an interesting group to study, as individuals with this occupation could be expected to display particularly high IOCs, and therefore may be more susceptible to self-deception.

6.2 Experiment 5: Traders in The City

As discussed in Chapter One, everyone lies, despite people in general believing that deception is wrong (DePaulo et al., 1996; Nyberg, 1993). Particularly, people lie to gain a resource (DePaulo & Kashy, 1998), which is particularly salient in the employment process, where the possibility of gaining employment is an incentive to engage in deception. In the job application process, applicants are encouraged to present a positive impression of themselves to potential employers, whilst concealing undesirable attributes, in order to appear a more favourable applicant and to increase their probability of getting a job (Weiss & Feldman, 2006). Indeed, some people may actively lie on their CV, application forms and in the interviews to appear to be a more impressive candidate, with Armour (2002, see Weiss & Feldman, 2006) finding that 44% of CVs contained deceptive information. These may be considered conscious (explicit), motivated acts of deception, although it is possible that there may be unconscious instances of self-deception amongst these. In line with Trivers (2000), people may have deceived themselves into believing false but preferable information, the better to deceive other people, in this case potential employers. Therefore, it would be beneficial to access unconscious information that may be more accurate. As discussed throughout the thesis, I am interested in the dissociation between the explicit and the implicit (unconscious) systems.

The most widely used and reliable method for measuring implicit attitudes is the Implicit Association Test (IAT; Perugini, 2005). IATs measure the strength of association between a target concept and an attribute. They are purported to access automatic processes and are predominantly based on the reaction times of people when categorising stimuli (words and/or pictures) to these concepts. So, if there is a strong association between the target concept (e.g. extraversion) and an attribute (e.g. self), the participants' reaction times will be faster if they are assigned the same response key, than if they are assigned to different keys, (e.g. extraversion and the contrast attribute 'others' are on the same key). As the IAT is based on automatic processes, this implies that these responses are less influenced or susceptible to conscious intention and consequently to self-presentation effects and faking, unlike the self-report methods that explicit measures are traditionally based on (Nosek, Greenwald & Banaji, 2007).

Analogous to the evolutionary theory of self-deception proposed by Trivers (2000; see also Gur & Sackeim, 1979; von Hippel & Trivers, 2011), there is a dissociation between simultaneously held explicit and implicit attitudes, with explicit processes

manifesting as the social front and implicit processes reflecting the truth. Supportive of the notion that these are different measures is the finding that explicit and implicit measures of the same construct are poorly correlated (Greenwald, McGhee, & Schwartz, 1998; Greenwald, Nosek & Banaji, 2003).

In their interest in the dissociation between explicit and implicit measures, the company ESP Advance, a company partner that invested in my research, have designed and developed the DeXtraD iDP program in partnership with the psychology department at Bangor University. The DeXtraD iDP is a psychometrics testing system that has been designed as a subconscious personality-profiling tool, of which the main focus of the software is to provide supplementary information about unconscious (implicit) attitudes, which individuals are often not honest about, such as racism and sexism, as well as attributes such as risk-taking.

This research was conducted by ESP Advance to test the DeXtraD iDP software in a corporate environment, specifically in the recruitment process of a trading company. The tests particularly covered here address associations to risk-taking and error, as well as tests of illusions of control based on our previous studies. Traders are an interesting population to investigate, as their occupation constantly involves making decisions, and these decision-making processes frequently involve judgement of risk. Indeed, there are many factors and situational variables that are conducive to instigating an IOC. The trading environment is noted as a particularly competitive, unstable, and noisy one, where the market is continuously changing, and information about the markets on which the traders are trading is short-lived. Therefore, it would be difficult for the trader to conclude whether the outcome of the trade was conditional on his or her own knowledge and skill (Fenton-O'Creevy et al., 2003). However, despite this, traders are likely to believe that they influence their environment, and that they have the skill to predict/spot trends, which encourages an IOC. As identified in Langer's (1975) research, familiarity is a skill-related cue, and traders are very familiar with the tools in their field of expertise, which reinforces their control beliefs. Additionally, Langer (1975) concluded that competition is a skill-related factor that can induce an IOC in chance situations. Trading is highly competitive, which combined with the unpredictable market, deadline pressures and large workloads, can lead to high levels of stress. As discussed in Chapter Two, the experience of stress can evoke the need to recuperate perceived personal control, which can result in an IOC, part of a coping style to reduce the lack of control induced stress (Friedland et al., 1992).

In Chapter Two, the adaptiveness and maladaptiveness of IOCs were discussed. Particularly relevant to traders is the possibility that their false beliefs about personal control may lead them to persist with ineffective strategies that are unrewarding, and to ignore feedback that could reveal the reality of their actual control. This may be particularly probable when they misjudge random noise as factual information. However, even if the contradictory information is processed, it may be interpreted as consistent with their strategy, i.e. they may believe that a market fall may be transient, and that when it rises again, they will feel vindicated that their strategy was correct (Fenton-O'Creevy et al., 2003). Additionally, traders are very goal-focused on completing profitable trades, and Gollwitzer and Kinney (1995) found that when focused on obtaining a desired outcome (implementation stage), positive illusions were more likely to occur. Therefore, if traders have not initially made a balanced assessment of the market, then this could be problematic and costly, but if they have, then it could be advantageous and profitable.

Risk-taking is a necessary component of trading, and research has suggested an association between risk and perceptions of control, i.e. that people who possess a high IOC perceive less risk in a situation, and are therefore more likely to take risks, which can be both adaptive and maladaptive in the trading profession (Houghton, Simon, Aquino, & Goldberg, 2000). As the market is unstable and noisy, the acceptance that any information they are privileged to will be short-lived, and that the outcome of a trade may be random and not based on their decisions, knowledge or actions could lead to feelings of hopelessness, low job satisfaction and depression. Therefore, the IOC could be adaptive by motivating traders to continue persevering in their job and towards their goals, thereby maintaining job satisfaction and happiness (Taylor & Brown, 1988). However, a high IOC could infer that the trader would be even less able to accurately appraise the information available about the present and future market, and this combined with a high-risk appetite could lead to costly decisions and loss-making trades. Therefore, whilst a high-risk appetite may be valuable or even essential for some occupations, if combined with a high IOC, the results could be potentially disastrous.

In a study investigating the performance of traders in four City of London banks, Fenton-O'Creevy et al. (2003) examined the association between the IOC and job performance. The traders completed a computer task in which they had no control, and the following nine dependent measures were recorded: contribution to desk's profits, skill in managing risk, analytical ability, and people skills (as rated by the trader's supervisor), as well as total annual remuneration (salary), highest level of education, trading experience,

job level, and IOC. In support of the maladaptiveness of the IOC in traders, the authors concluded that traders with higher IOCs earn less money, and were rated as less effective at contribution to profits, at managing risk, and analytical ability in comparison to people who are more realistic in their control beliefs.

6.2.1 Aims and Hypotheses

This experiment aimed to explore the IOC and its connection to risk-taking and error in trainees undergoing a training course as part of the recruitment process of a trading company. As discussed in the introduction, the trading environment is an interesting one, where a degree of risk-taking and an understanding of the current financial environment, which is continuously fluctuating, are essential in order to make good trades. However, too much proclivity for risk-taking can potentially be detrimental, and result in costly trades. Therefore, it was important to ascertain the link between risk-taking and perceptions of control, whether there was a discrepancy between explicit self-reports of risk-taking and the implicit associations of risk, and whether either of these were predictive of beliefs of personal control. As risk-taking is a valuable trait in trading, it was hypothesised that the trainees' self reports of risk could be higher than the implicit scores. The realism module explores how realistic people are about the actual control experienced in a noncontingent task, and it was hypothesised that, in line with previous research (Houghton et al., 2000), traders who exhibit greater levels of risk-taking will show higher IOCs. In line with Trivers (2000), it was proposed that explicit reports of risk would be more influential on judgements of control. Moreover, as error is likely to lead to poor judgements and decisions, it was likely that as the bias towards error increased, the IOC would also increase. It will also be interesting to examine whether the trainee traders exhibit a higher IOC in comparison to the student sample studied in Experiment 1.

6.2.2 Methods

Ethical Approval

ESP Advance was responsible for the design of the experiment, and carried out the data collection alongside the trading company, and were not answerable to any Ethics Committees. My involvement was restricted to the data analysis of the pre-collated data,

for which I was sent the Excel spreadsheets containing the anonymous raw data of the participants and the mean scores.

Participants

Sixty trainees (5 females, age range 20-35) from a trading company in The City, London, were recruited on a voluntary basis on behalf of the company ESP Advance. The trainees had completed a four-month initial training period prior to carrying out the DeXtraD iDP modules, and if they completed all the modules, it was added on to their certificate of completion.

Design/Apparatus

The trainees completed four modules: implicit associations to risk-taking, implicit associations to error, the ZKPQ-50-CC, which includes an explicit scale of risk and sensation-seeking, and an IOC test modelled on Experiment 1 (although shortened). All modules were completed using a computer and keyboard setup, and onscreen instructions guided the trainees through the modules. The data was collected in three groups of trainees; two groups completed the modules in the same room at the same time, whilst the third group completed it individually from home. Every trainee completed the modules in the same order listed above, and was able to take breaks between the modules. The implicit and explicit modules were not counterbalanced, but Nosek, Greenwald and Banaji (2005) found that the order of completion of the modules had minimal impact on both measures.

Implicit Association Tests. The 7-block sequence of the IAT was used (see Greenwald et al., 2003). The category labels were presented in the left or right top corner of the screen throughout each block. There were three stimuli in each category. Each stimulus was presented in the centre of the computer screen, and the participants responded by pressing the 'A' key with their left index finger, or the 'L' key with their right index finger on the computer keyboard. When participants incorrectly categorised the stimuli, they experienced immediate feedback in the form of a red X, and were required to re-select the correct computer key to continue to the next trial.

Associations to risk-taking IAT. This subtest included the following categories and stimuli: me (me, mine, self), others (other, their, them), risk (dangerous, gamble, risk), and safe (cautious, safe, secure). See Table 6.1 for the 7-step sequence. The me vs. other concept has been utilised in many IATs (Gemar, Segal, Sagrati & Kennedy, 2001; Greenwald & Farnham, 2000; McDaniel, Beier, Perkins, Goggin & Frankel, 2009). Therefore, the design for these tests is well validated.

Table 6.1

7-Block Sequence in the Risk IAT.

Block	No. of Trials	Left-key response (A)	Right-key response (L)
1	30	Risk	Safe
2	30	Me	Others
3	60	Risk + Me	Safe + Others
4	60	Risk + Me	Safe + Others
5	30	Others	Me
6	60	Risk + Others	Safe + Me
7	60	Risk + Others	Safe + Me

Associations to error IAT. This subtest included the following categories and stimuli: me (me, mine, self), others (other, their, them), error (accidental, careless, incorrect) and accuracy (accurate, careful, verified). See Table 6.2 for the 7-step sequence.

Table 6.2

7-Block Sequence in the Error IAT.

Block	No. of Trials	Left-key response (A)	Right-key response (L)
1	30	Error	Accurate
2	30	Me	Others
3	60	Error + Me	Accurate + Others
4	60	Error + Me	Accurate + Others
5	30	Others	Me
6	60	Error + Others	Accurate + Me
7	60	Error + Others	Accurate + Me

ZKPQ-50-CC. See the Measures subsection in Chapter Five (5.1.1).

IOC. The IOC (or "realism") task was the active-passive version of the noncontingent problem-solving task with the same two responses-two outcomes format described in the General Methods section in Chapter Two, and the trainees were instructed to estimate how much control they had over the green light onset. It was a modified version of the one utilised throughout this thesis, and the measures of actual control and

implicit control were not available. As the task was conceptualised in terms of the participants' realism, rather than their IOC, a high score on the task indicated a high level of realism (and low IOC), whilst a low score was indicative of an individual who was unrealistic (and with high IOC). The task consisted of 10 exploration trials, after which participants gave their ratings of control.

Procedure

The DeXtraD iDP was completed on the computer over the internet, and the trainees were provided with the website address, and an individual login to access the modules. Each module had onscreen instructions for the trainees to follow.

Statistical Analysis

The participants were analysed as one group, as it was not possible to determine whether participants were more reinforced for active or passive responding, due to no data regarding the actual control and conditional probabilities. The realism reports were recoded in terms of the IOC by subtracting them from 100, so that they were comparable with the IOC results in Experiment 1. Finally, the IAT data was analysed by calculating *D*-scores, in accordance with Greenwald et al. (2003).

6.2.3 Results

Illusion of Control

As there was no recorded value of actual control to compare the explicit control against, it will be compared to zero, which is the assumed value of actual control in a noncontingent task. Therefore, the participants overestimated their amount of explicit control ($M = 29.50$, $SD = 27.52$), and the IOC is assumed to be equal to the explicit control (IOC = 29.50). A *t*-test found that the IOC was significantly different from zero, $t(59) = 8.30$, $p < .001$. When compared to the IOC displayed by the student sample in Experiment 1 ($M = 17.95$, $SD = 22.50$), the difference was found to be significant, $t(110) = 2.41$, $p = 02$. However, the explicit judgements were not significantly different than those in Experiment 1 ($M = 27.37$, $SD = 21.94$) , $t(110) = 0.45$, $p = .65$ (see Figure 6.13). There can be no discussion of the explicit/implicit dissociation, as estimates of the conditional probabilities were not requested, so judgements of implicit control could not be calculated.

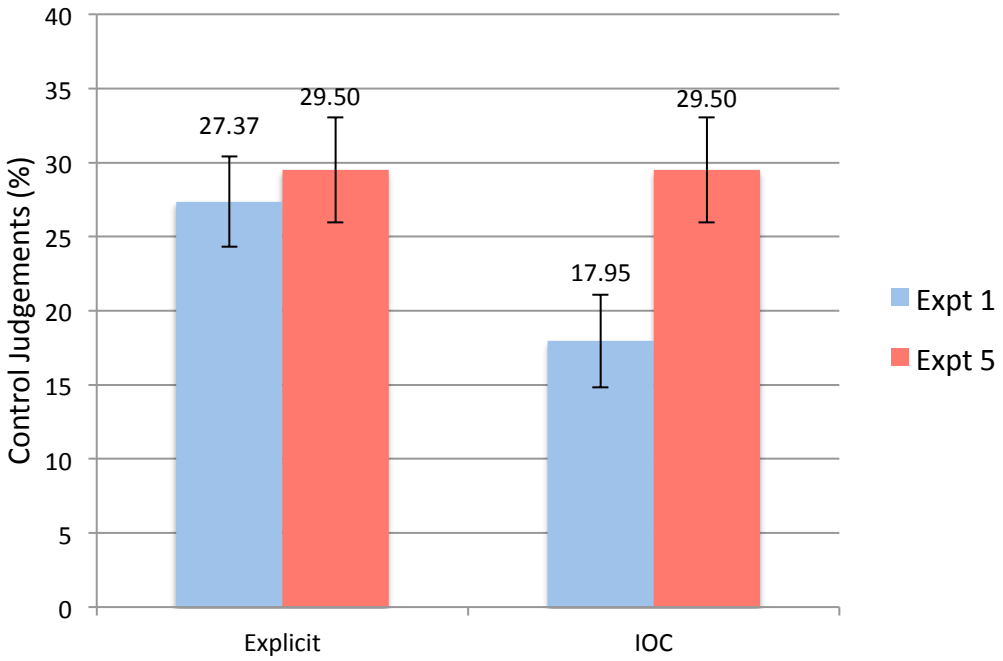

Figure 6.13. Comparison of the explicit judgements and the IOCs in the student population in Experiment 1 and the trainee traders in Experiment 5. Error bars represent the standard error of the means.

I will now discuss the relationships between the IOC, the five subscales of the ZKPQ-50-CC, and the IAT results. Regarding the ZKPQ-50-CC, the only subscale that was significantly correlated with the IOC was impulsivity/sensation-seeking ($M = 54.67$, $SD = 27.46$), $r(58) = .29$, $p = .03$ (see Figure 6.14). Therefore, the more impulsive and sensation-seeking a person reported themself as, the more they overestimated their amount of control, i.e. the greater their IOC.

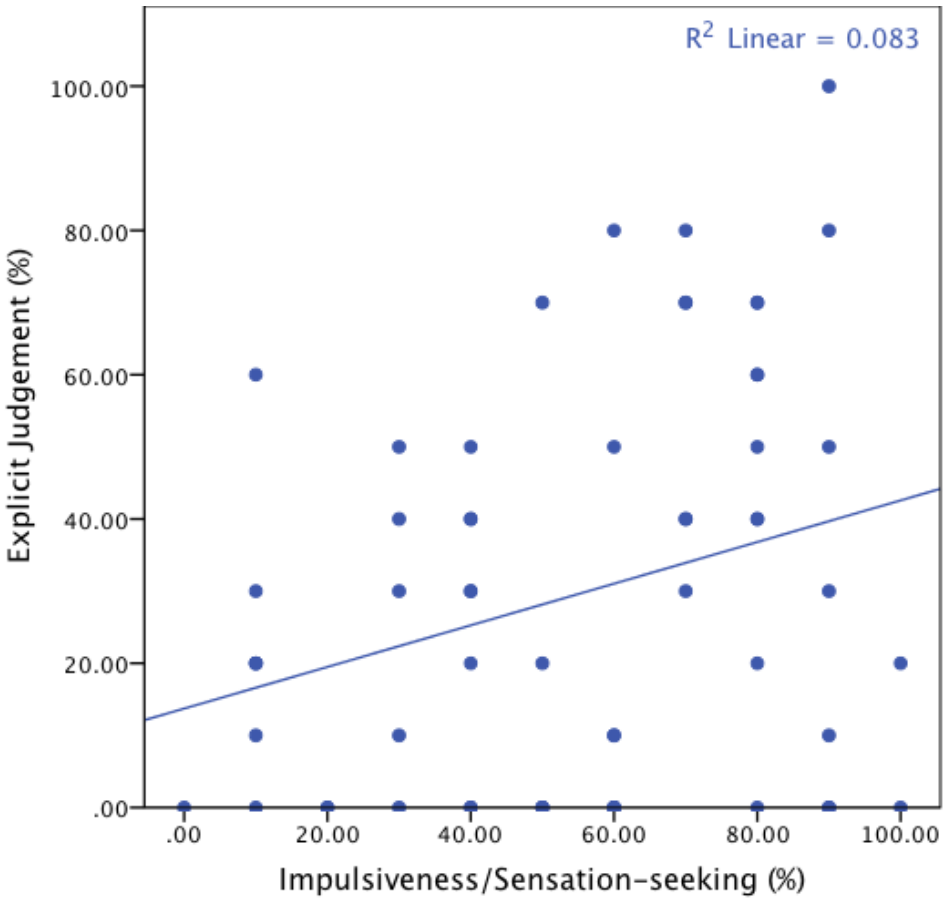

Figure 6.14. Comparison between the explicit measure of risk-taking (impulsiveness/sensation-seeking) and the explicit judgements of control/IOC.

However, the IOC was not significantly correlated with either the associations of risk or error IATs, $r(58) = -.05$, $p = .70$ and $r(58) = .14$, $p = .27$, respectively. The correlation between the risk and error IAT variables was trending towards significance, $r(58) = .23$, $p = .08$, which suggests that a bias towards safe was related to a bias towards accuracy. Furthermore, despite scores on the explicit measure of impulsiveness ($M = 54.67$, $SD = 27.46$) and the implicit measure of risk ($M = 50.72$, $SD = 30.33$) being similar, $t(59) = 0.74$, $p = .46$, there was no correlation between the explicit and implicit measures of risk, $r(58) = -.03$, $p = .84$.

Finally, I will discuss whether either of these variables predicted the participants' explicit judgements/IOC in a three-factor multiple regression model. The model did not give a significant prediction, $R = .35$, $R^2 = .12$, $F(3, 56) = 2.56$, $p = .06$, although it was trending. Moreover, tests of the predictor betas found that scores on the impulsiveness/sensation seeking scale significantly predicted the perceptions of control, β

= .31, $t(59) = 2.43$, $p = .02$, whilst the error and risk IATs were not significant predictors, $\beta = .20$, $t(59) = 1.51$, $p = .14$ and $\beta = -.09$, $t(59) = -0.68$, $p = .50$, respectively.

6.2.4 Discussion

As expected, the group of traders overestimated their judgements of control, which supports the hypothesis that they would show an IOC. In support of the assumption that traders are more likely to display an IOC than non-traders, the IOCs of traders in this experiment were significantly greater than the student sample in Experiment 1. However, this experiment did not provide data regarding the actual control experienced in the task, so it was assumed that this value was zero on the basis of the task being a 0% control noncontingent task. Therefore, the explicit judgements were also the IOCs. When the traders' explicit judgements of control were compared to those in Experiment 1, the estimates were found to be similar, suggesting that traders are not more likely to overestimate their perceptions of control than non-traders. Therefore, although the trainees showed higher IOCs, it appeared that they were no more likely to inflate their explicit judgements of control than non-traders, despite the person-based and situational-based factors that are likely to encourage illusions (Fenton-O'Creevy et al., 2003). Whilst this sample represents people who completed the four-month training period, an interesting follow-up, which we were unable to do, would be to assess the IOC of the participants, selected from the course to go on to regular employment as traders (or related occupations).

In terms of the association between risk-taking and the IOC, there was a positive and significant relationship between the two variables. This supports the hypothesis that the IOC increases as the propensity for risk-taking increases, consistent with previous research (Houghton et al., 2000). However, there were no relationships between explicit judgements of control/IOCs and error and risk associations on the IATs. Therefore, these implicit biases did not appear to affect explicit perceptions. Furthermore, the explicit and implicit measures of risk were uncorrelated, which is consistent with previous literature finding weak or no relationships between implicit measures and explicit (self-report) measures (Greenwald et al., 1998). However, a positive relationship between the error and risk IATs suggested that as associations with risk-taking increased, associations with error also increased. It is possible that, similar to risk-taking, reports of the IOC could be positively correlated with an explicit measure of error rather than the IAT measure.

However, it is possible that these traits (IOC, risk-taking and error) will become less influential, as the world of trading is changing. According to Patterson (2013), all trading will eventually be done algorithmically, and once the algorithm is decided, trading will be done without much human intervention. Therefore, this will reduce the likelihood of a costly trade being made based on the high levels of these combined factors.

In addition, it was the explicit measure of risk-taking that predicted the IOC. This does not support existing research that implicit/subconscious associations affect behaviour (Nardone et al., 2007), but does support von Hippel and Trivers (2011) theory that explicit/conscious associations are more influential. However, it has been proposed that the predictive validity of self-reports and IATs may be different across distinctive domains (Nosek et al., 2007), so it may be that IATs may not predict perceptions of control in this particular case.

As discussed in the introduction (subsection 6.2), explicit measures are subject to conscious intention, and are likely to be influenced by social desirability and faking. This is in line with Trivers (2000) idea that false, socially desirable information is present in the conscious/explicit system, whilst true, socially undesirable information is held in the unconscious/implicit system. It is contested as to whether people are aware of their implicitly held associations and attitudes, but choose to ignore them and present themselves in a better light, or whether they are actually unaware of the simultaneously held, contradictory beliefs (Nosek et al., 2007). The latter would be in line with both the traditional and evolutionary approaches to self-deception (Gur & Sackeim, 1979; von Hippel & Trivers, 2011).

There are ethical issues surrounding the sharing of the data collected with the CEO of the trading company. In the interests of anonymity and confidentiality, it is important and standard practice that data should not be associated with an individual, and instead participants should be assigned numbers. Therefore, despite the aim of the DeXtraD iDP system to afford supplementary information regarding implicit associations to businesses, the disclosure of individual data to the CEO is ethically questionable, particularly if the information was taken into consideration in decision-making regarding job suitability.

There are limitations regarding the realism task used by ESP Advance. One limitation is that the trainees only completed 10 trials on the task, and such a small number of trials is likely to result in contingent control by chance. Therefore, the trainees' individual estimates may have been more realistic than they were given credit for. Additionally, the only output from the task is the explicit judgement of control by the

trainees. Therefore, it cannot be compared with the actual control that the trainees experienced, and may be considered uninformative. Finally, the sample in this experiment cannot be fully compared to the sample in Experiment 1 in terms of the explicit/actual, implicit/actual, and explicit/implicit relationships.

6.3 General Discussion

6.3.1 Summary of experimental data

This chapter aimed to extend the research conducted thus far by demonstrating that the IOC is not just confined to the student population. Both the CAB and trainee traders samples overestimated their explicit judgements of control, and therefore displayed IOCs. Although actual data was not available for comparison in Experiment 5, the results of Experiment 4 had additional similarities with the previous experiments. The explicit and actual control did not track each other, so their perceptions were out of line with reality. Also, the implicit judgements were more predictive in the maximisation task, despite being significantly different to the actual data.

6.3.2 Real world applications

In the competitive world of job seeking, candidates may falsify or exaggerate information about themselves in order to increase their chances of gaining employment (Weiss & Feldman, 2006). Contrarily, they may have deceived themselves in to believing that they have the necessary attributes and experience necessary. Either way, the employers may not be getting an accurate impression of the candidate. Therefore, the IATs may provide supplementary information about the strengths of associations with particular attributes, alongside the explicit self-reports. For example, in Experiment 5, some trainees reported themselves as being high risk-takers, yet displayed a high bias towards being risk-averse (safe) on the IAT. However, it is important to acknowledge that this information should not be a determining factor in the job recruitment process.

Another potential application could be in gaining more insight in to people in order to support them in the process of gaining employment. Due to increasing pressure on the benefits system, there is great interest in how to motivate the unemployed, particularly the long-term unemployed to get back to work. Research conducted by the Department of Work and Pensions (DWP, 2011) identified eight subgroups of people through self-report: determined seekers, thwarted seekers, balanced seekers, status quo seekers, constrained by

circumstance, defeated by circumstance, benefits are better and home focused. Additional research concerning the subconscious profiling via IAT tests could provide more information about peoples' associations between themselves and getting back to work. Furthermore, information about their perceptions of control may be important in understanding their desire and motivation to find employment. Low perceptions of control may be associated with a lack of motivation. Therefore, they may benefit from interventions to increase the judgements of their influence (real or illusory) on the environment. An inflated sense of control may encourage them to be more active in seeking out job opportunities, as there is a positive relationship between control and active involvement (Langer, 1975).

6.3.3 Future research

The experiments in this chapter explored IOCs in the employment sector. An interesting comparison would be to investigate the perceptions of control in people who are unemployed. There is a high prevalence of depression in the long-term unemployed, which is likely to be a combination of many factors, including health issues and debt, as well as dependency on support services, such as benefits, food banks and advice centres (McKee-Ryan, Song, Wanberg & Kinicki, 2005; Rodriguez, Frongillo & Chandra, 2001).

The study could be conducted at CAB, with unemployed people who use their services. Participants would be expected to display smaller or no IOCs in comparison to the experiments conducted in this thesis. Whereas Experiment 4 explored the IOC at two time points when there was no intervention, this proposed experiment could include a control intervention similar to the 3 Good Things intervention. This intervention requires participants to write down three positive experiences and their causes from their day, and is used to improve well-being (Seligman, Steen, Park & Peterson, 2005). It could be adapted for this experiment, so that participants write down three situations per day where they have felt in control. At the follow-up, participants in the experimental group would be expected to have greater perceptions of control than those in the non-experimental group.

Whilst Experiment 4 studied the IOC when there was no intervention, the experiments in Chapters Seven and Eight will explore whether the IOC can be manipulated via priming techniques and an attribution retraining intervention, respectively.

CHAPTER SEVEN

MOTIVATION MANIPULATIONS: EXPERIMENTS SIX AND SEVEN

There is a wealth of literature on motive drive, which has been divided into three main subtypes of motives: the achievement/competence motive, the power motive and the affiliation motive. Seminal work conducted by McClelland and colleagues (1953, 1975, 1989) strived to modify and measure peoples' implicit motive dispositions and examined their effects on behaviour. The affiliation motive, which is defined as the need to establish and maintain positive, warm relationships with other people (Pang, 2010; Winter, 1994), will not be examined in this chapter, as from Trivers evolutionary perspective, there would be a weak association with self-deception. Instead, the aim of this review is to introduce the achievement/competence and power motives, and to outline and evaluate research that has investigated the effects of methods used to prime these motivations. Following this will be Experiments 6 and 7, which aim to manipulate the participants' perceptions of power and competence, respectively, in order to investigate whether these have an effect on individuals' perceptions of control.

7.1 Literature Review of Motive Drive and Priming Manipulations

7.1.1 The achievement motive

The achievement motive was coined by McClelland, Atkinson, Clark and Lowell (1953), who defined it as the need to continually improve one's skills. It is also described as a willingness to work, persistent effort towards a goal, with a focus on career attainment (Entwisle, 1972). Even though the term "achievement motive" is commonly used in the literature, it has been criticised for lacking coherence and clear parameters, which has led to varying definitions and operationalisations across investigators and research (Elliot & Dweck, 2005). Instead, the term "competence motive", is deemed by some researchers as a more empirical term as it has a precise meaning, and provides discernible criterion for empirical work, thereby addressing the limitations of the achievement motivation literature (Elliot & Dweck, 2005). The theory of competence motivation assumes that people are naturally driven to master tasks, and to have successful interactions with their environment

(White, 1959). However, for the purpose of this review, the two terms will be treated as interchangeable, as they measure the same construct.

7.1.2 Achievement/competence priming manipulations

McClelland et al. (1953) proposed that people have little or no understanding of what drives their behaviour, so researchers focused on devising methods to indirectly manipulate and assess motive dispositions. Researchers have investigated methods of priming competence and power in participants. Priming serves the purpose of implicitly activating knowledge stored within an individual, to examine the influence on behaviour and social perceptions in later tasks and situations (Utz, Ouwerkerk, & Van Lange, 2004).

Lang and Lang (2010) investigated the effects of priming competence on cognitive test anxiety and test performance. A measure of cognitive and emotional test anxiety was administered before the priming task. The priming task used instructed participants to envisage a person who was very competent at solving technical and scientific problems, and then to write 5-9 abilities/skills that he or she would possess, as well as 5-9 adjectives to describe the personality of the imagined person, and the values that they would hold. Finally, participants had to write three sentences to describe how the person would feel before beginning to solve complex problems. They then completed a verbal analogies task to measure test performance. The results found that the test performance of participants with high levels of cognitive test anxiety was improved when primed for competence, but worsened for those with low levels of cognitive test anxiety.

Bargh, Gollwitzer, Lee-Chai, Barndollar and Trötschel (2001) primed achievement implicitly by asking participants to find seven achievement-related words in a word-search puzzle (win, compete, succeed, strive, attain, achieve, and master), compared to seven neutral words for the neutral priming condition (ranch, carpet, river, shampoo, robin, hat, and window). They concluded that the priming technique was successful as the participants in the achievement condition performed better on a subsequent task, which involved locating as many words as possible across three additional word-searches in 10 minutes, i.e. they identified more words.

However, this study has been criticised for using ‘active’ verbs in the achievement priming condition and ‘static’ nouns in the neutral priming condition, which may be a confounding variable. Therefore, the active nature of the words may have been responsible for the increase in achievement performance, rather than the content. Engeser, Wendland and Rheinberg (2006) compared the priming manipulation tested by Bargh et al. (2001),

with a word-search puzzle in which participants had to find static achievement nouns, such as ‘competition’, ‘attainment’ and ‘success’, or active neutral verbs for the control group, such as ‘think’, ‘sweep’ and ‘pull’. However, there was no difference in performance on the subsequent word-searches for each of the word-class conditions. This supports the conclusions of Bargh et al. (2001), as it was the achievement content of the words that enhanced performance rather than whether the words were verbs or nouns.

Utz et al. (2004) studied the effects of priming competence on cooperative behaviours in prosocial and competitive participants. The procedure involved unscrambling 16 sentences, 10 of which contained a word to prime competence. Each unscrambled sentence contained five words, of which only four were to be used. An example is ‘she is talented the musician’, which could be unscrambled to read ‘the musician is talented’, with the prime word being ‘talented’. The other nine competence prime words included ‘ambitious’, ‘capable’, ‘smart’, ‘intelligent’, ‘businesslike’, ‘competent’, ‘clever’, ‘gifted’ and ‘experienced’. As hypothesised, the competence prime successfully led competitive individuals to exhibit lower levels of cooperation. However, it did not enhance the levels of cooperation in prosocial individuals as expected.

Jambekar, Quinn and Crocker (2001) predicted that overweight women who read a message emphasising achievement would experience reduced self-esteem compared to overweight women who read a message emphasising nonachievement. The achievement message stressed competitiveness, responsibility for success, determination and constant hard work and described the United States as a winner-takes-all society. The nonachievement message stressed the risks of overwork and a decrease in life satisfaction due to the competitiveness of the current economy, and encouraged readers to relax, spend time with family and friends and to enjoy more leisure time to improve their well-being. As hypothesised, the achievement prime led to lower levels of self-esteem in overweight women compared to the nonachievement prime, as well as higher anxiety, depression, and hostility. This effect suggests that in a highly competitive situation that emphasises achievement, overweight women experience negative outcomes because they feel like they are unlikely to succeed due to the perception that their weight does not meet the cultural “ideal”.

7.1.3 The power motive

The power motive has been defined as the capacity and desire to influence others, through aggression, persuasion, helping them, and the control of rewards and punishments,

without social interference (C. Anderson & Galinsky, 2006; Galinsky, Gruenfeld & Magee, 2003; McClelland, 1975; Winter, 1973). Therefore, the possession of power requires the presence of other people, in order for it to be recognised and understood (Emerson, 1962). As with the possession of power, the priming of power has been shown to affect a range of behaviour and beliefs. For example, people who possess power perceive fewer risks and greater stability of their resources and position, and therefore engage in more risk-taking behaviour (C. Anderson & Berdahl, 2002). Powerful people are likely to have greater self-esteem and optimism, and to take action (Galinsky et al., 2003). Power is also associated with greater beliefs surrounding levels of control (Fast et al., 2009), which will be discussed later in the review. Research has shown that these behavioural tendencies can also be activated through the priming of power (Galinsky et al., 2003).

7.1.4 Power priming manipulations

Similar to the competence priming task utilised by Bargh et al. (2001), Lammers and Stapel (2009) used a word-search puzzle to prime power. Participants were required to find eight words in the word-search, four of which were fillers, and the other four were assigned to either the high-power condition (control, influence, power, and authority) or the low-power condition (subordinate, powerless, dependent, and submissive). The manipulation was successful, with those in the high-power condition increasing rule-based thinking in moral decision-making.

In their power priming manipulation, C. Anderson and Galinsky (2006) presented participants with 15 words fragments and instructed them to complete the fragments (i.e. fill in the missing letters) with the first word that came to mind. Ten of the word fragments were fillers, with the other five corresponding to one of three priming conditions: high-power (authority, boss, control, executive, influence), low-power (subordinate, dependent, defer, underling, submit) and neutral (e.g. automobile, book). The manipulation found that participants primed with high-power were more prone to risk-taking, compared to participants in the other two conditions.

C. Anderson and Berdahl (2002) used a role-playing technique between dyads, where one participant was randomly assigned by coin-toss to a high-power role (committee leader), and the other participant to a low-power role (subordinate), where the leader was responsible for the committee's decision and performance on a decision-making task, as well as for evaluating the subordinate. They found that the manipulation

was successful, as participants assigned to the high-power condition were more likely to express their genuine attitudes and opinions, as well as experience positive emotion, in comparison to low-power participants who were more likely to inhibit themselves and experience negative emotion.

Galinsky et al. (2003; see also Duguid & Goncalo, 2011; Fast et al., 2009; Inesi, Botti, Dubois, Rucker & Galinsky, 2011; Lammers & Stapel, 2009) employed two types of power primes: role-playing and recall essays. In the role-playing task, adapted from C. Anderson and Berdahl (2002), participants were informed that assignment to the roles was based on their answers to a Leadership Questionnaire (C. Anderson & Berdahl, 2002). However, in actuality, one participant was randomly assigned to the position of manager (high-power), and the other participant was consequently assigned to the position of subordinate/employee (low-power). Similar to the original manipulation, the manager was informed that he or she would be completely in control of the task process and decision-making in a coordination task, as well as the evaluation of the other dyad member. However, after the roles were appointed, the participants were asked to complete a different, unrelated task (Blackjack), which they were told was for a future study, and were then informed that they had run out of time to complete the coordination task. To check that the power manipulation was successful, each participant rated the degree of power that they possessed on a 7-point Likert scale. The prime was found to be successful, as the high-power participants were more likely to take action in the subsequent Blackjack task.

Duguid and Goncalo (2011) used the same role-playing prime, but their power manipulation check required participants to report how influential, independent, powerful, unimportant and subordinate they felt. The authors also reported that the use of this prime was successful, with participants in the high-power condition overestimating their own heights, whilst low-power participants were more accurate in their judgements.

For the recall narratives priming task, Galinsky et al. (2003) asked participants to recall a situation in which they possessed or did not possess power. They then measured whether this affected the amount of action taken in a subsequent task. The participants in the high power condition were asked to write about a situation where they were in a position of power over someone, whereas participants in the low power condition wrote about a situation where someone else possessed power over them. For methodological similarity, participants in the control condition were asked to recall the events that had occurred in the previous day. To check that the manipulation was successful, a coder rated the stories using a 7-point Likert scale for how much power the participant reported

possessing. The power prime was successful as results showed that participants in the high power condition were more likely to take action on the following behavioural task.

This priming method requires the individual to recall a situation that they experienced (i.e. personally relevant), which differs from the competence priming task used by Lang and Lang (2010), which asked participants to imagine someone else who is competent. In line with this common priming task, the competence manipulation may be more effective if the individual is asked to relate the competency to his/herself, or to recall a situation where they showed a high or low level of competence, as it may make it more meaningful to the person (Galinsky et al., 2003). The success of the manipulation could then be checked using the 7-point Likert scale, but for rating the amount of achievement/competence reported.

7.1.5 Power and illusory control

There has long been a perceived and observed connection between power and control (Inesi et al., 2011). People who possess power are able to control other people and situations through status and control of resources. Therefore, it is probable that power (both real and perceived) is also associated with illusory control. Fast et al. (2009) looked at the effects of priming power on illusory control. They used the two common priming techniques of recall narratives and role-playing (manager/employee) to prime high and low power. Illusory control was measured using Langer's (1975) die-rolling task, in which participants could either choose to roll the die themselves or to nominate the experimenter (another person) to roll instead. As this is a purely chance game, where the odds of a desirable outcome are not affected by who throws the die, Langer (1975) assumed that if a participant chose to roll the die, then they were displaying an IOC. As expected, Fast et al. (2009) found that all participants in the high-power condition chose to roll the die, compared to half of the participants in the low-power condition, i.e. they were more likely to display an IOC. However, as discussed in Chapter Two, the die-rolling paradigm is not considered to be as valid as noncontingency tasks, as the judgements of control cannot be compared to an objective standard. Therefore, Experiment 6 will attempt to increase the validity of the findings from Fast et al. (2009), by demonstrating that priming high power leads to an increase in perceived control in the noncontingency task, compared to priming low power.

The general conclusion from this review is that implicit methods of priming power and competence appear to be successful at influencing performance and behaviour. Whilst

a range of priming methods have been described, it is decided that the recall essays prime will be the one utilised in the following studies, Experiments 6 and 7, looking at the effects of priming power and competence, respectively, on the IOC and the explicit/implicit dissociation. As the task asks participants to recall a personal experience, it is hoped that this will be a more robust manipulation than using wordsearches and word fragment tasks. It is also easier and less time-consuming to administer than the role-playing technique.

7.2 Experiment 6: Power Priming

Based on the findings of the literature review, the aim of this study is to implicitly prime participants with high power and low power, in order to investigate the influences of this motivation on their perceived sense of control. It is hypothesised that participants primed with high power will report greater estimates of control (i.e. display high IOCs) following the noncontingency task, than participants primed with low power. However, it is possible that these predicted results might not be so unambiguous. Participants primed with low power may exhibit low levels of control, and therefore appear more accurate on the noncontingency task, similar to the effects of mood that has been shown in studies of depressive realism (Alloy & Abramson, 1979). Alternatively, priming low power may lead participants to inflate their degree of perceived control, in an attempt to overcompensate for the loss of, or to reinstate their perceptions of power, reminiscent of previous literature exploring control (Friedland et al., 1992; Whitson & Galinsky, 2008), as there is a strong association between power and control (Fast et al., 2009). Additionally, in line with the previous experiments, it is hypothesised that judgements of the conditional probabilities will be accurate, and therefore the implicit reports of control will be more in line with the actual control compared to the explicit judgements. In terms of the explicit/implicit dissociation, it is proposed that the dissociation will be clearer in the high power condition, as the explicit judgements are expected to be greater than in the low power condition. Finally, in line with C. Anderson and Berdahl (2002), it is hypothesised that high power will be more associated with increased positive emotion and less depression.

7.2.1 Methods

Participants

Fifty undergraduate and postgraduate students (35 females, age range: 18-35, *M* = 20.4) at Bangor University were recruited via SONA, and received two course credits for their participation.

Design

A between-groups experiment where participants were randomly assigned to one of two experimental conditions: the high power condition (n = 25) or the low power condition (n = 25). A control group was not included, as Experiment 1 where there was no manipulation of motivations, and which is otherwise run under identical conditions, will be the control group.

Measures

The power manipulation used was Galinsky et al.'s (2003) recall task, which required participants to recall a particular incident that had occurred in their lives, and to write a detailed narrative of the incident within a 5-minute timeframe.

High-power condition. The participants assigned to the high-power condition received the following instructions (see Appendix L):

> Please recall a particular incident in which you had power over another individual or individuals. By power, we mean a situation in which you controlled the ability of another person or persons to get something they wanted, or were in a position to evaluate those individuals. Please describe this situation in which you had power – what happened, how you felt, etc.

Low-power condition. The participants assigned to the low-power condition received the following instructions (see Appendix M):

> Please recall a particular incident in which someone else had power over you. By power, we mean a situation in which someone had control over your ability to get something you wanted, or was in a position to evaluate you. Please describe this situation in which you did not have power – what happened, how you felt, etc.

The narratives were coded by the experimenter for how much power the participants reported, to check for the effectiveness of the manipulation. Additionally, they were coded for how much the participants appeared to like the incident that they had described. This check was included as it was unclear as to whether the experience of

power would be regarded as a positive or negative one, and whether these subjective emotions would influence the effectiveness of the manipulation. Both dimensions were coded on a Likert scale, which ran from 1 (very low power/likeability) to 7 (very high power/likeability), with 4 representing neutral. The narratives were coded on three separate occasions, and an average was calculated for each dimension.

Self-report manipulation check. Following the completion of the writing task, participants were asked to rate how powerful, dependent (reverse scored), and influential they felt (see Appendix N) on a Likert scale from 1 (very inaccurate) to 5 (very accurate). Therefore, the minimum score was 3, and the maximum score was 15. This was included as a second check to assess the effectiveness of the power manipulation as reported by the participants.

Personality and depression measures. The Mini IPIP, ZKPQ-CC and the BDI (see subsection 5.1.1) were completed to further examine the relationships between these traits and the perceptions of control.

Procedure

After the participants had read the participant information sheet (see Appendix O) and signed the consent form, they were given the recall task. The experimenter read the instructions to each participant, and explained that they would have 5 minutes to write as much detail as they could remember about their chosen experience, before leaving the room to allow the participants to complete their essays. After the 5 minutes, the experimenter re-entered the room, and the participants were given the self-report check to fill in before they completed the judgement of noncontingency task (see General Methods section). Finally, they completed the Judgements of Control scale, the Mini IPIP, the ZKPQ-CC and the BDI, and were debriefed (see Appendix P).

7.2.2 Results

Power Priming Checks

The experimenter's power and liking ratings were normalised from the 1 to 7 scale to a -3 to 3 scale. The power ratings reflected the conditions, with a significantly higher power rating in the high power condition (M = 2.68, SD = 0.47) compared to the low power condition (M = -2.68 SD = 0.45), $t(48) = 41.54$, $p < .001$. Whilst priming low power was associated with a low level of liking as expected (M = -2.43, SD = 0.92), priming high power resulted in a more neutral rating than may be expected (M = 1.11, SD = 2.16). As can be seen in the top left corner of Figure 7.1, the liking rating in the high power

condition was due to a small number of participants (n= 6) who did not like the experience of power (M = -2.39, SD = 0.39), compared with the majority of participants (n = 19; M = 2.21, SD = 0.92). Further analysis of the data found that this subgroup reported being significantly less impulsive and sensation-seeking (M = 2.83, SD = 1.83) compared to the majority group (M = 5.26, SD = 2.58), $t(23) = 2.13$, $p = .04$. Furthermore, although not significant, the trending results suggest that these participants reported less extraversion and aggression/hostility, $t(23) = 1.90$, $p = .07$, and $t(23) = 1.66$, $p = .11$ respectively. However, running the analyses without this subgroup of participants did not significantly affect the data, so they were not excluded from the analysis. A t-test showed that there was a significant difference between liking in the high and low power groups, $t(32.41) = 7.51$, $p < .001$. Additionally, there was a significant positive correlation between the experimenter's ratings in the high power group, $r(23) = .41$, $p = .04$, so as the ratings of power increased, so did the liking ratings. However, the positive relationship between the variables in the low power group was not significant, $r(23) = .29$, $p = .16$.

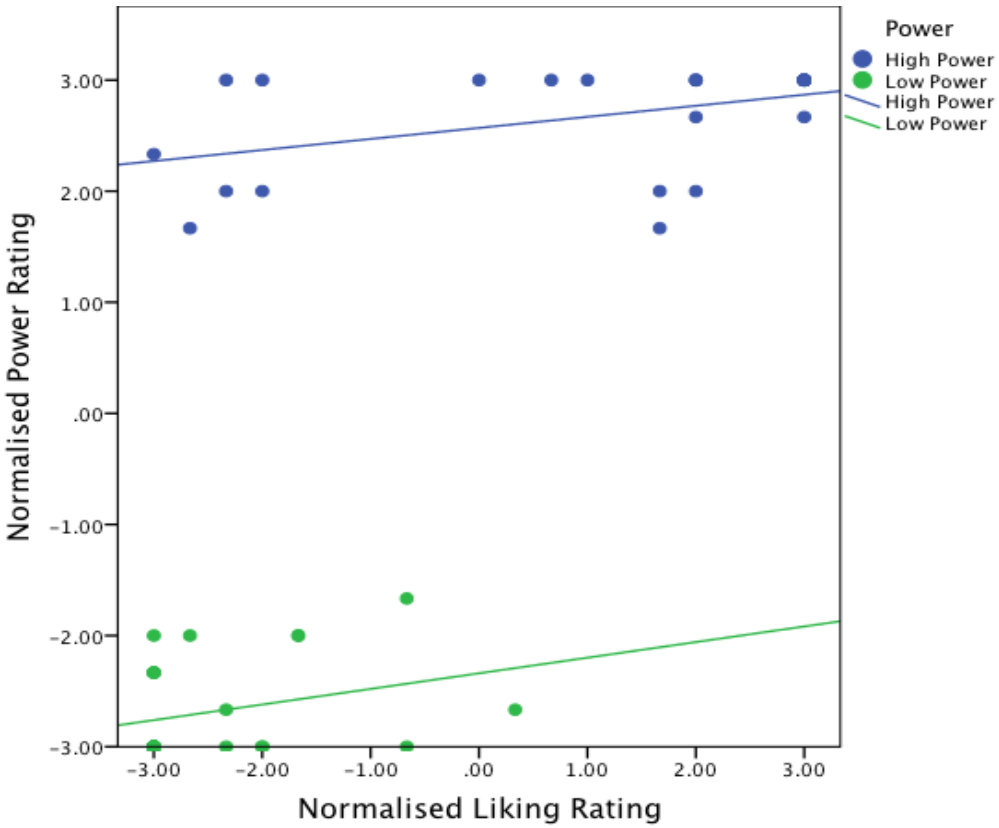

Figure 7.1. Comparison of the experimenter's ratings of power and liking in the high and low power conditions.

In terms of the participants' subjective reports of power on the manipulation check, there was a significant difference between the high and low power conditions, $t(48) = 2.17$, $p = .04$. As expected, participants primed with high power reported feeling more powerful than participants primed with low power ($M = 9.64$, $SD = 2.50$ and $M = 8.32$, $SD = 1.73$ respectively). However, the subjective reports of power did not correlate with the experimenter's ratings of power in the high power condition, $r(23) = .09$, $p = .68$, or the low power condition, $r(23) = .35$, $p = .09$, although it was trending in the latter group (see Figure 7.2). The subjective ratings of power on the manipulation check were also not correlated with the experimenter's ratings of liking in both the high power condition, $r(23) = .35$, $p = .09$, and the low power condition, $r(23) = .25$, $p = .23$, although it was trending in the high power group (see Figure 7.2). Therefore, it seems that the participants' power ratings tracked power when low power was primed, but tracked the liking experience when high power was primed.

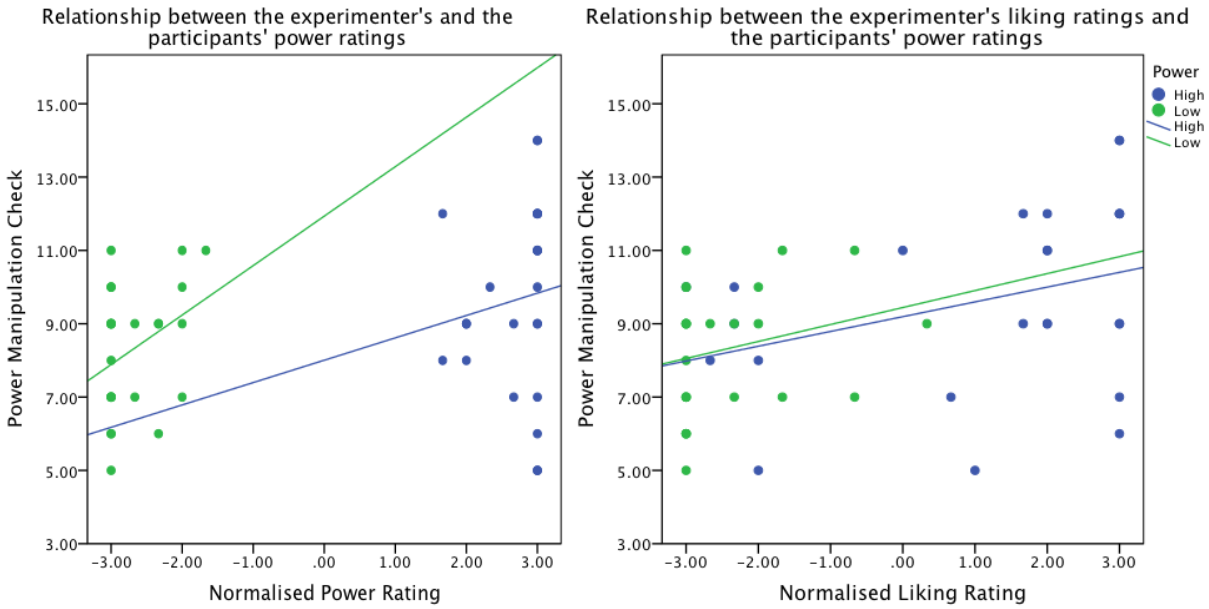

Figure 7.2. Participants' power ratings on the manipulation check compared to the experimenter's normalised power and liking ratings in both the high and low power conditions.

The normalised power and liking variables were multiplied to create a 'power x liking' (PxL) variable. The PxL scale runs from -9 to 9, where 9 signifies that the two variables were completely in alignment, such as low power and low liking, and -9 signifies complete misalignment, such as high power and low liking. As can be seen in Figure 7.3,

PxL in the high power condition (M = 3.36, SD = 5.79) was positively correlated with the manipulation check, although it did not reach significance, $r(23) = .36$, $p = .07$. Therefore, as the participants' power ratings increased, so did the experimenter's PxL score, with participants who did not enjoy the experience of power (negative PxL score) rating lower power on the manipulation check. In the low power condition (M = 6.62, SD = 2.85), there was a non-significant negative correlation, $r(23) = -.31$, $p = .13$, which also suggests that participants who disliked the lack of power rated lower power on the manipulation check.

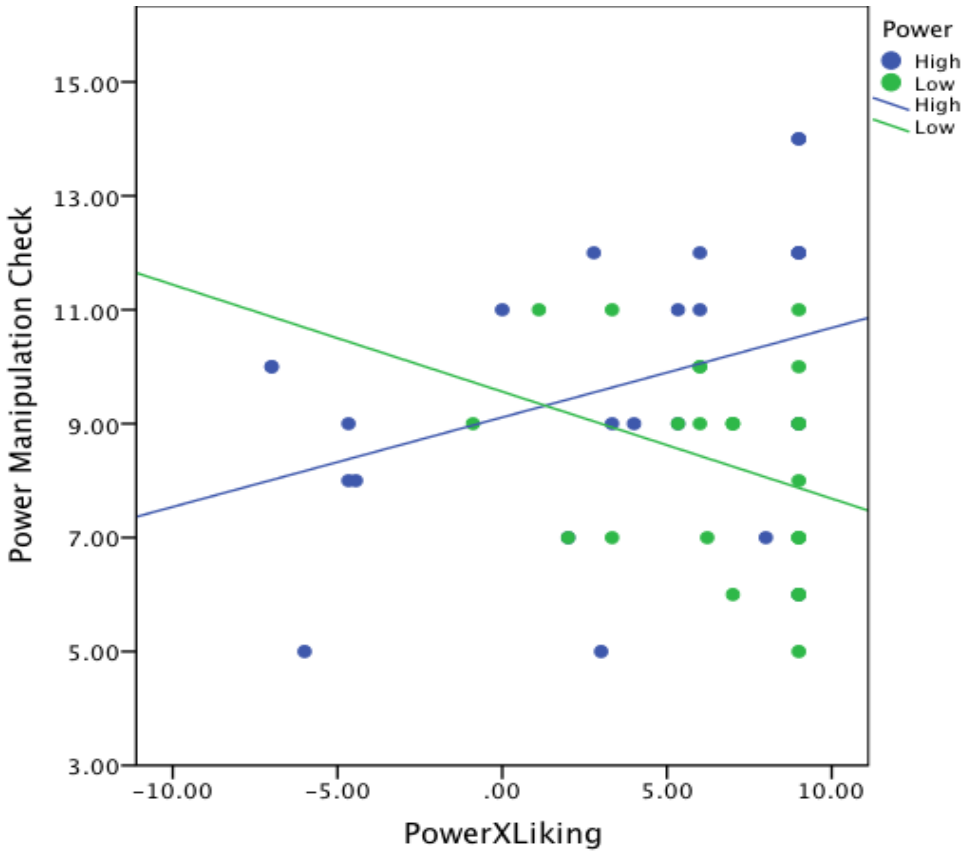

Figure 7.3. Comparison between the subjective power ratings on the manipulation check and the normalised power x liking variable in the high and low power conditions.

Power Priming, Explicit Control Judgements and Illusions of Control

This section will discuss the effects of priming high and low power on the explicit judgements of control that were reported after the 100-trial learning phase of the noncontingency task, and the IOCs displayed by participants. As the important factor in this experiment was the effects of the power prime, the power conditions were not divided in to the active and passive responding groups at this stage. Moreover, the pattern of

results was similar in both conditions, and there was no difference in explicit judgements between the ACT and PAS groups in the high or low conditions, $t(23) = -1.40$, $p = .18$, and $t(23) = .11$, $p = .91$ respectively. In the high power condition, participants overestimated their explicit perceptions of control ($M = 32.20$, $SD = 24.16$) compared to the actual control ($M = 11.68$, $SD = 8.00$), $t(24) = 5.02$, $p < .001$, and therefore showed an IOC ($M = 20.52$, $SD = 20.45$). Likewise, in the low power condition, participants also overestimated their explicit judgements ($M = 25.20$, $SD = 27.06$) compared to the actual control ($M = 8.33$, $SD = 5.28$), $t(24) = 2.92$, $p = .01$ and therefore also displayed an IOC ($M = 16.87$, $SD = 28.93$). There was not a significant difference between the explicit judgements, $t(48) = 0.97$, $p = .34$, nor the IOCs, $t(48) = 0.52$, $p = .61$, across the power conditions. Therefore, explicit judgements and IOCs were not significantly greater in the high power group, compared to the low power group.

As can be seen in Figure 7.4, there was not a significant relationship between explicit judgements of control and the PxL variable in either the high or low power conditions, $r(23) = -.19$, $p = .37$ and $r(23) = .05$, $p = .82$ respectively. Likewise, there was not a significant relationship between the IOC and the PxL variable in either the high or low power groups, $r(23) = -.19$, $p = .36$ and $r(23) = .05$, $p = .81$ respectively. Therefore, there were no relationships in the low power group, and low negative relationships in the high power group, which suggests that explicit perceptions of control and IOCs decreased as PxL increased (i.e. as power and liking ratings were more consistent). Therefore, it does not appear that participants' perceptions of control tracked the experimenter's ratings of the power essays. Additionally, the graph shows that even participants who had a negative PxL score had a varied distribution of explicit judgements of control.

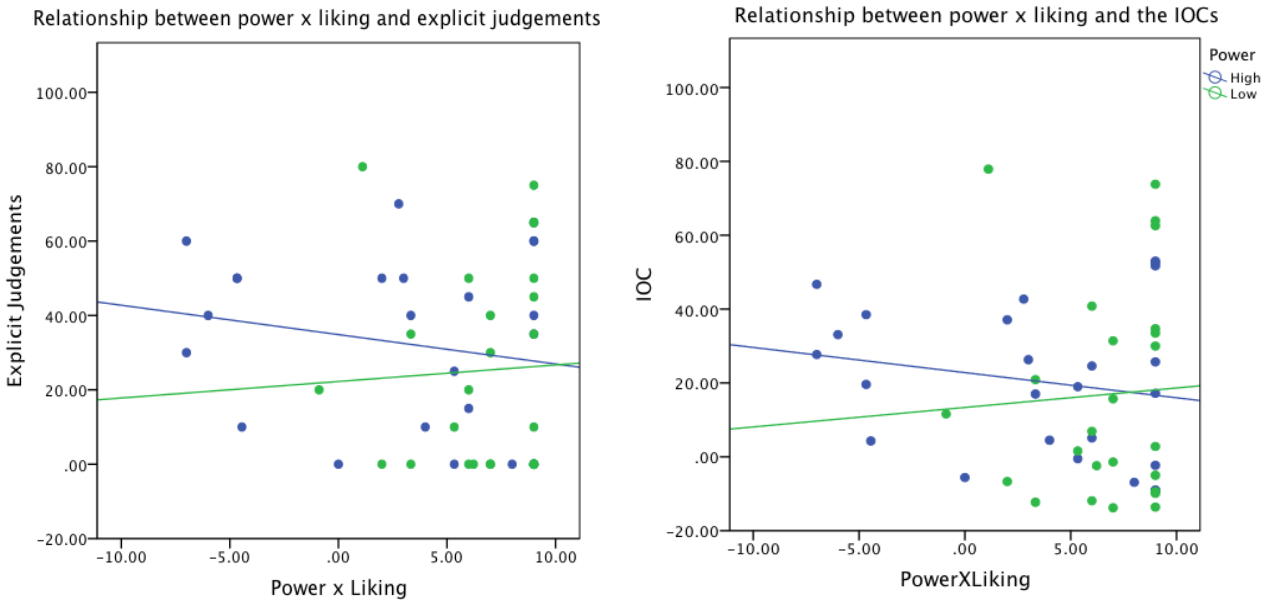

Figure 7.4. Comparison between the explicit reports of control and the IOCs with the power x liking (PxL) variable in both the high and low power conditions.

Similarly, in the high power condition, there was a non-significant negative correlation between explicit judgements of control and the participants' subjective ratings of power on the manipulation check, $r(23) = -.14$, $p = .51$ (see Figure 7.5). Likewise, this relationship was also apparent between the IOCs and the manipulation check ratings, $r(23) = -.15$, $p = .47$. Therefore, the negative relationship infers that the explicit judgements and the IOCs decreased as ratings of power increased, which parallels the correlations found between explicit judgements and IOCs with the PxL. However, the non-significance infers that the participants' explicit judgements and IOCs did not track with their ratings of power. Conversely, in the low power condition, there was a significant positive correlation between explicit judgements and the manipulation check ratings variables, $r(23) = .56$, $p = .05$. Therefore, as participants' ratings of power increased, so did their explicit perceptions of control. However, the relationship between the ratings and the IOCs was not significantly correlated, $r(23) = .11$, $p = .61$.

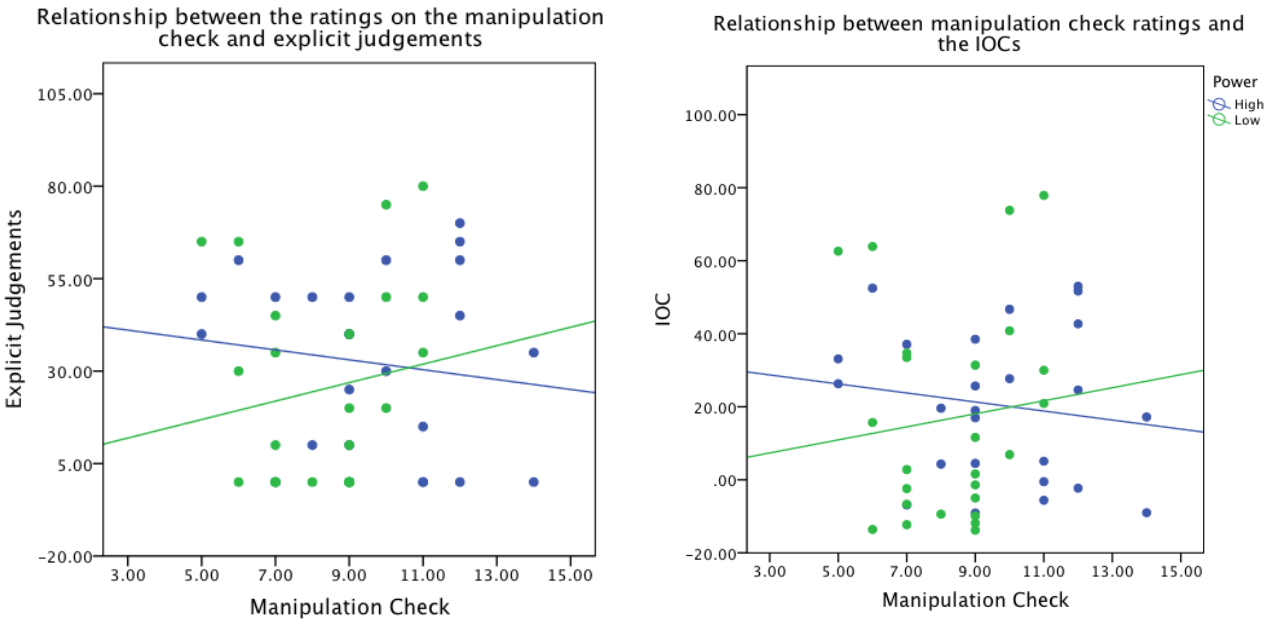

Figure 7.5. Comparison between the explicit reports of control and the IOCs with the participants' manipulation check power ratings in the high and low power conditions.

A multiple regression, with the PxL and manipulation check ratings entered as independent variables was run for each power condition to determine whether either was a predictor of explicit judgements of control. In both the high and low power conditions, the two-factor models did not give a significant prediction of explicit judgements, $R = .20$, $R^2 = .04$, $F(2, 22) = 0.47$, $p = .63$, and $R = .19$, $R^2 = .04$, $F(2, 22) = 0.41$, $p = .67$ respectively. Likewise, the two-factor models did not give a significant prediction of the IOCs in the high and low power conditions, $R = .21$, $R^2 = .05$, $F(2, 22) = 0.51$, $p = .61$, and $R = .14$, $R^2 = .02$, $F(2, 22) = 0.22$, $p = .81$ respectively.

Illusions of Control

The data was also analysed in accordance with Experiments 1 and 2, so that the power conditions were further analysed in terms of the ACT/PAS groups. In the 100-trial learning phase, the ACT and PAS groups in both the high and low power conditions displayed IOCs. As can be seen in Figure 7.6, the largest IOC was reported in the high power ACT group ($M = 25.49$, $SD = 23.34$), who greatly overestimated their explicit judgements compared to the actual control that was experienced ($M = 36.50$, $SD = 26.88$, and $M = 11.01$, $SD = 8.17$ respectively). The IOCs displayed by participants in the high power PAS group ($M = 17.20$, $SD = 18.37$), and the low power ACT ($M = 16.19$, $SD =$

29.03) and PAS groups (M = 17.49, SD = 30.02) were smaller and very similar to each other.

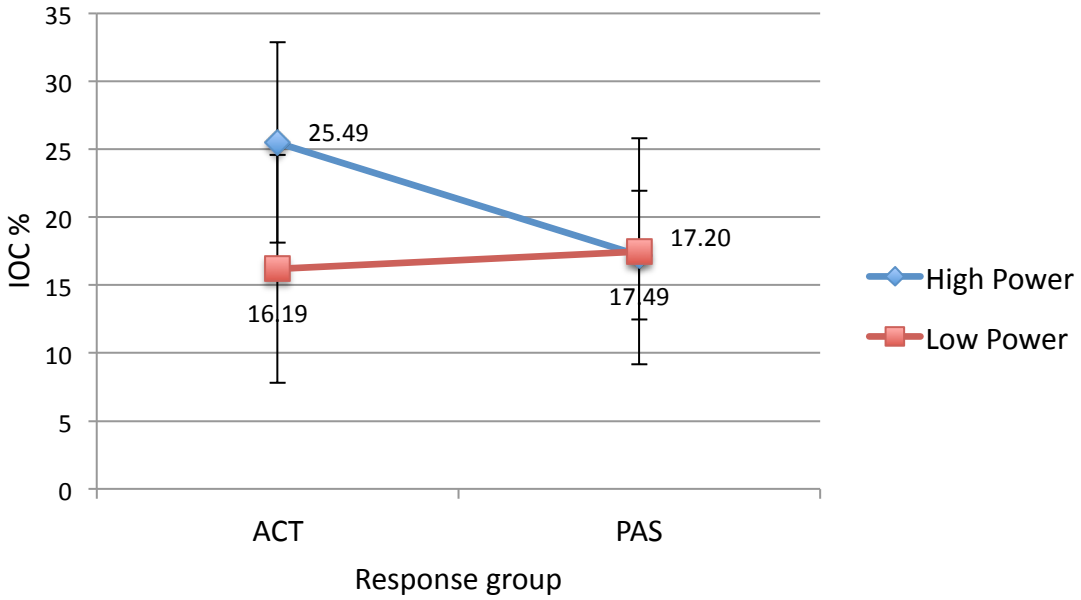

Figure 7.6. Comparison of the IOCs across the power conditions and the ACT/PAS groups. Error bars represent the standard error of the means.

A between-groups ANOVA with power condition and ACT/PAS as the between-subjects factors, and the IOC as the dependent variable did not find a significant main effect of power, $F(1, 46) = 0.38$, $p = .54$, a significant main effect of ACT/PAS, $F(1, 46) = 0.23$, $p = .63$, or an interaction, $F(1, 46) = 0.44$, $p = .51$. Therefore, the IOCs were not significantly affected by being primed for high or low power, or being more reinforced with green light onset for active or passive responding.

T-tests determined that the IOCs displayed by participants in both the high-power ACT and PAS groups were significant, $t(9) = 3.45$, $p = .007$ and $t(14) = 3.63$, $p = .003$ respectively. However, the IOCs shown by participants in both the low-power ACT and PAS groups were not significant, although they were approaching significance, $t(11) = 1.93$, $p = .08$ and $t(12) = 2.10$, $p = .06$ respectively. Therefore, it does appear that all participants overestimated their perceptions of control compared to their actual experiences.

However, despite the differences between the explicit judgements and actual control in the high power condition, there was a significant positive correlation between these two variables in the PAS group, $r(13) = .66$, $p = .01$, and a non-significant but trending positive correlation in the ACT group, $r(8) = .56$, $p = .10$ (see Figure 7.7).

Therefore, unlike in previous experiments, it appears that the two variables tracked each other, so as the actual control increased, the judgements of explicit control also increased. Contrarily, and in line with previous experiments, the lack of a significant correlation in both the ACT and PAS groups in the low power condition suggests that explicit judgements did not track actual control, $r(10) = -.29$, $p = .36$, and $r(11) = -.28$, $p = .35$ respectively. Indeed, the negative correlations infers that as actual control increased, explicit judgements decreased, further supporting the finding that their judgements were out of line with reality.

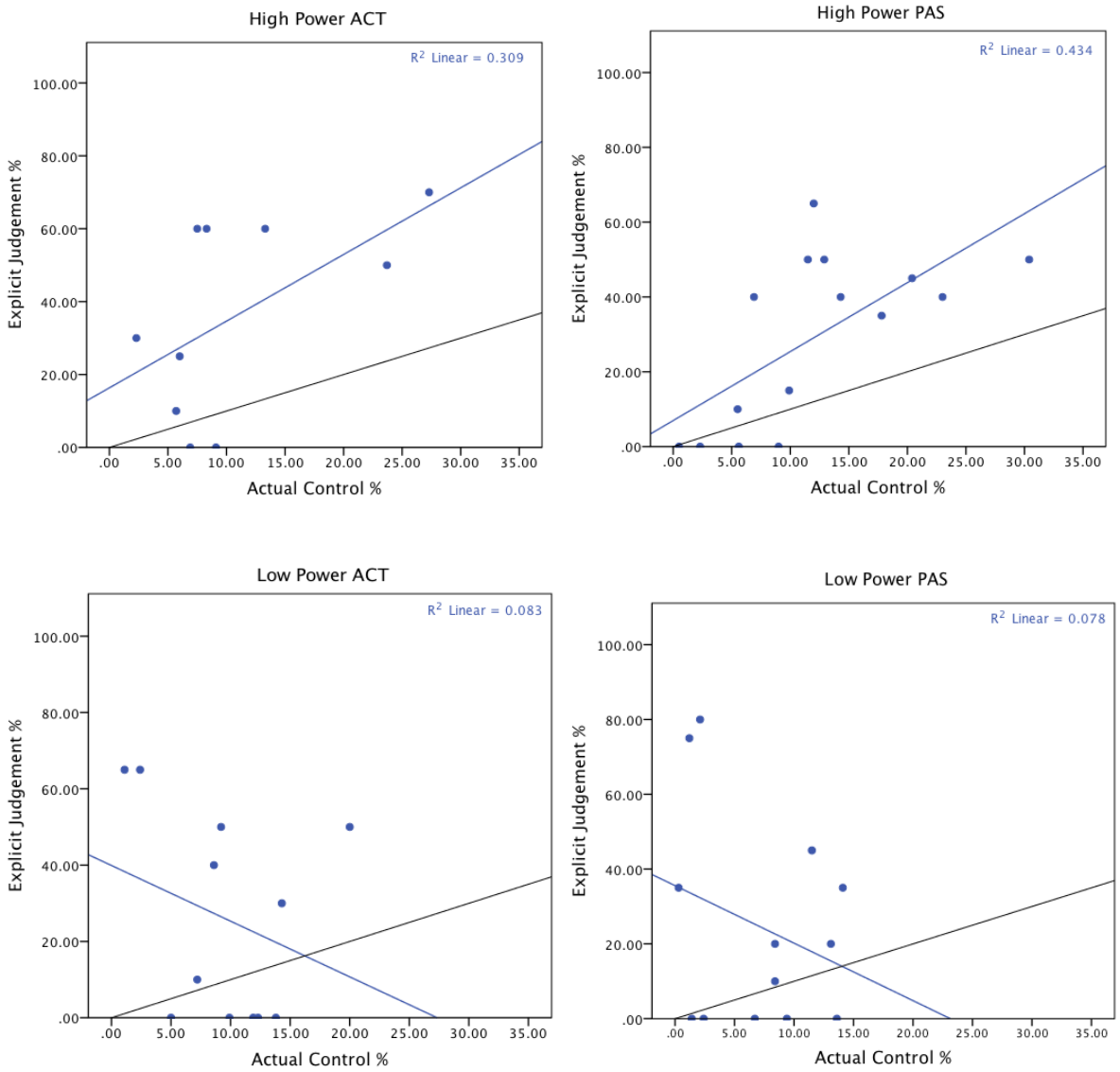

Figure 7.7. Comparison of the correlations between explicit judgements and actual control.

Dissociation of Explicit and Implicit Judgements

This section will analyse the relationships between the participants' implicit judgements and the actual noncontingent control, and will then discuss the explicit/implicit

dissociation. As can be seen in Figure 7.8, the differences in the high and low power ACT groups were positive, which means that implicit judgements were somewhat overestimated in comparison to the actual control (M = 6.49, SD = 15.42, and M = 4.11, SD = 23.03). Contrarily, the differences in the high and low power PAS groups were both negative (M = -3.47, SD = 21.60 and M = -8.28, SD = 18.76), which indicates that participants' implicit judgements were somewhat underestimated compared to the actual control.

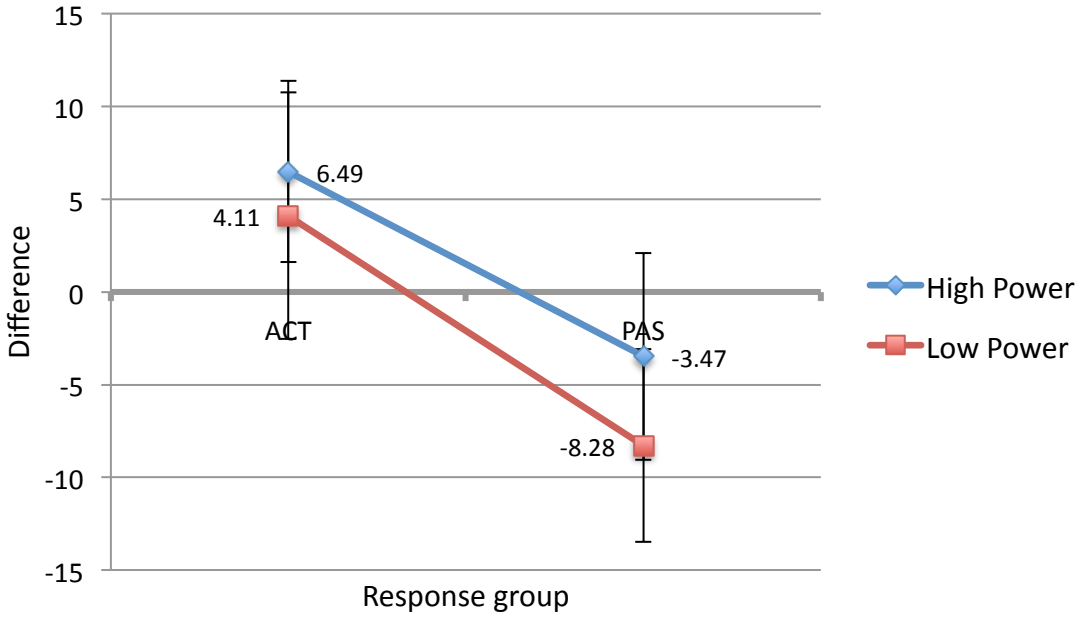

Figure 7.8. Comparison of the differences between the implicit judgements and actual control across power conditions and ACT/PAS. Error bars represent the standard error of the means.

A between-groups ANOVA with power condition and ACT/PAS entered as the between-subjects factors, and the differences between the implicit judgements and the actual control entered as the dependent variable did not find a significant main effect of power condition, $F(1, 46) = 0.39$, $p = .54$. Therefore, the difference in the high power condition (M = 1.51, SE = 4.12) was similar to the difference in the low power condition (M = -2.08, SE = 4.04).

There was also a non-significant main effect of ACT/PAS, $F(1, 46) = 3.75$, $p = .06$, although it was trending. Therefore, it can be inferred that the differences in the ACT groups (M = 5.30, SE = 4.32) were greater than the differences in the PAS groups (M = -5.87, SE = 3.82). Additionally, there was not a significant interaction between power and ACT/PAS, $F(1, 46) = 0.04$, $p = .83$.

T-tests were run to analyse the similarities between the implicit judgements and the

actual control in each group. The differences in the high power ACT and PAS groups, $t(9) = -1.33$, $p = .22$ and $t(14) = 0.62$, $p = .54$ respectively, as well as the low power ACT and PAS groups, $t(11) = 0.62$, $p = .55$ and $t(12) = -1.59$, $p = .14$ respectively, were all not significantly different from zero. Therefore, this suggests that the participants' understandings of the conditional probabilities were more accurate, and that implicit judgements were similar to the actual control.

Figure 7.9 displays the correlations between actual control and the implicit judgements. Only the correlation in the high power ACT group was significant, $r(8) = .73$, $p = .02$, which suggests that the implicit estimates tracked the actual control that the participants experienced. However, the two variables did not track each other in the high power PAS, and the low power ACT and PAS groups, $r(13) = .32$, $p = .24$, $r(10) = -.14$, $p = .66$, and $r(11) = .44$, $p = .13$ respectively.

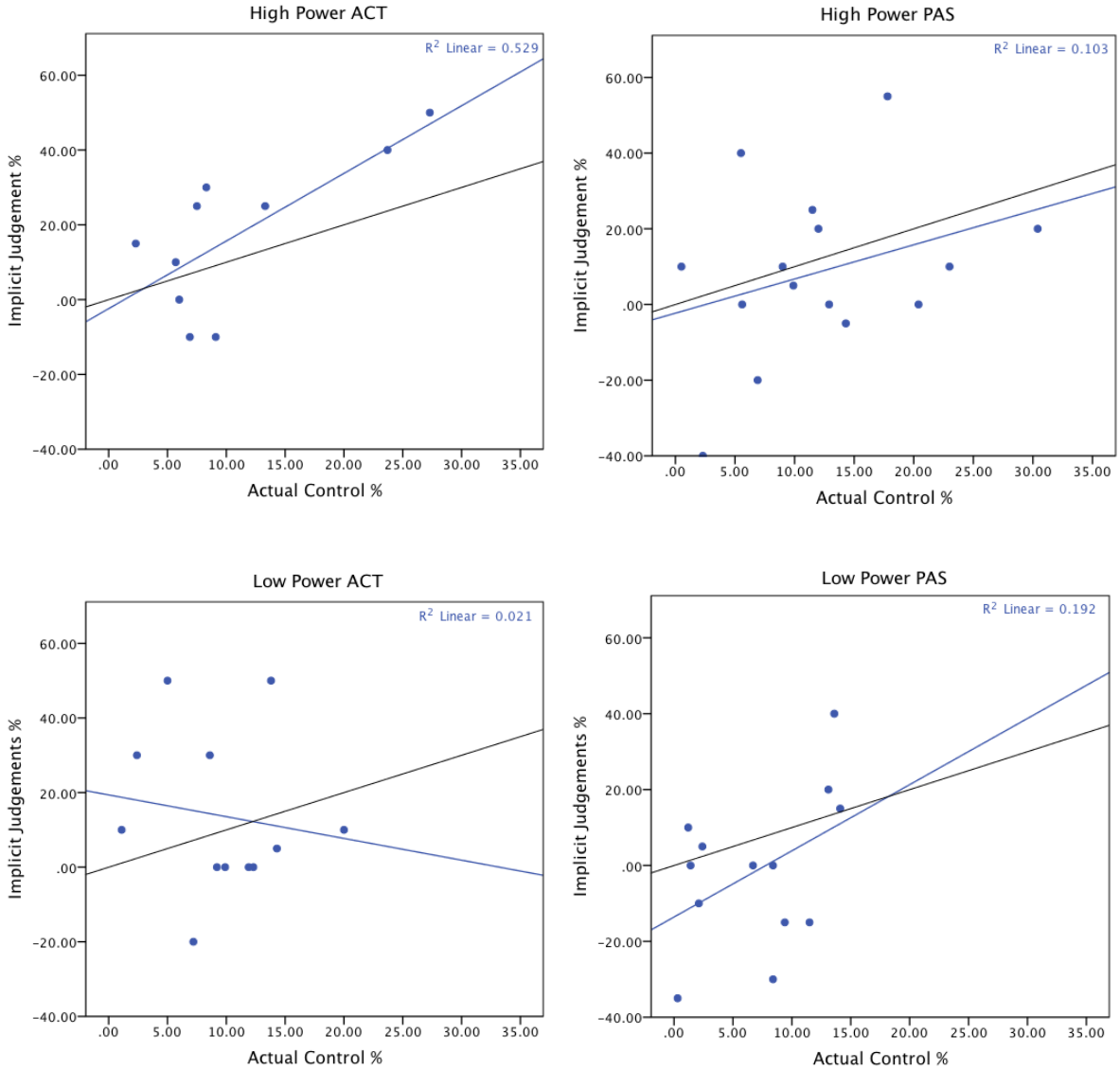

Figure 7.9. Comparison of participants' implicit judgements with the actual experiences.

In Figure 7.10, the line graphs compare the explicit and implicit judgements across ACT/PAS groups in both of the power conditions. In general, the judgements in the high power condition were greater than in the low power condition, which would be expected. However, none of the differences were significant. For example, the explicit judgement in the high power ACT group was not significantly higher than the explicit judgement in the low power ACT group, $t(20) = 0.94$, $p = .37$.

The explicit judgements in the high power ACT group were greater than in the PAS group, $t(23) = .72$, $p = .48$, but not significantly so, and the explicit judgements in the low power groups were very similar, $t(23) = .11$, $p = .91$. Likewise, the implicit judgements in the high power condition were greater in the ACT group than in the PAS group, $t(23) = 0.99$, $p = .33$, but not significantly greater, whilst the difference in the low power condition was trending, $t(23) = 1.77$, $p = .09$.

The explicit judgements were always higher than the implicit reports of control, with the differences reaching significance in the high power ACT and PAS groups, $t(9) = 5.02$, $p = .001$, and $t(14) = 2.81$, $p = .01$ respectively, and the low power PAS group, $t(12) = 2.47$, $p = .03$. Therefore, this supports the notion of a dissociation between the explicit and implicit judgements. However, the difference was not significant in the low power ACT group, $t(11) = 1.21$, $p = .25$.

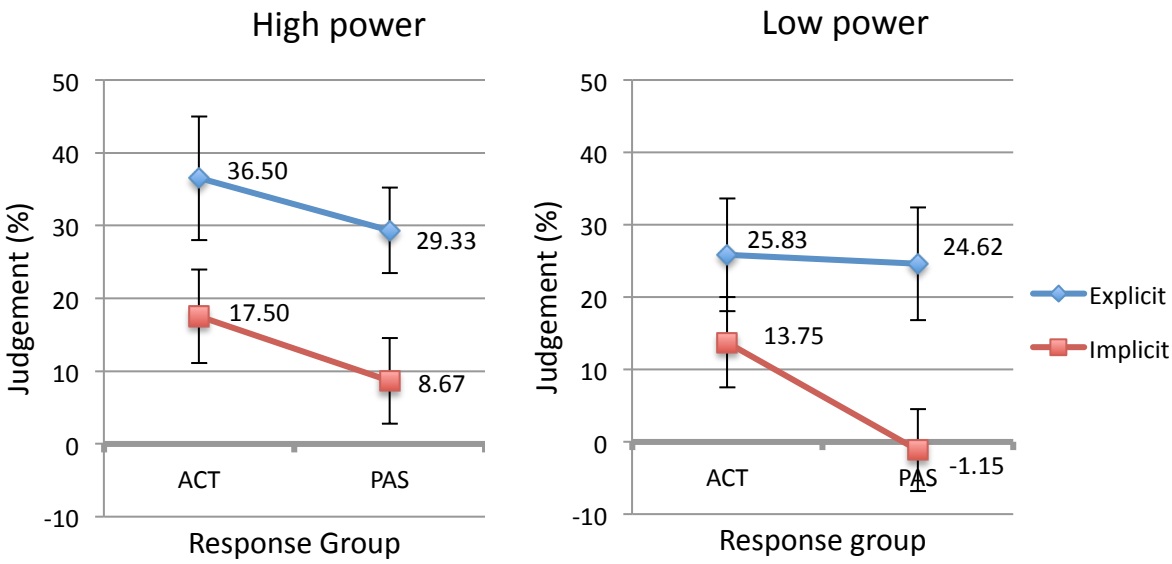

Figure 7.10. Comparisons of the explicit and implicit judgements across the power conditions and the ACT/PAS groups. Error bars represent the standard error of the means.

In terms of the explicit/implicit dissociation, the difference between the explicit/actual and implicit/actual correlations was only significant in the high power ACT group, $Z = -2.03$, $p = .04$. Therefore, this suggests that the dissociation between the two systems is only substantial when the participants have been primed with high power and rewarded for active responding. Additionally, a mixed-design ANOVA with judgements (explicit and implicit) as a within-subjects factor and power and ACT/PAS as between-subjects factors found a significant main effect of judgement, $F(1, 46) = 19.69$, $p < .001$. Particularly, explicit judgements ($M = 29.07$, $SE = 3.73$) were greater than implicit judgements ($M = 9.69$, $SE = 3.07$). Therefore, when collapsed across power and ACT/PAS, there appears to be a dissociation between explicit and implicit judgements.

However, there was not a significant main effect of power, $F(1, 46) = 1.91$, $p = .17$, or ACT/PAS, $F(1, 46) = 2.35$, $p = .13$. Nor were there any significant 2-way interactions between power and ACT/PAS, $F(1, 46) = 0.00$, $p = 1.00$, judgements and power, $F(1, 46) = 0.01$, $p = .92$ or judgements and ACT/PAS, $F(1, 46) = 0.77$, $p = .38$. Finally, there was also not a significant 3-way interaction, $F(1, 46) = 0.47$, $p = .50$. Therefore, the results of the ANOVA suggest that the explicit and implicit estimates of control did not differ across high and low power, or active and passive responding.

Maximisation Task Behaviour

An independent-samples *t*-test found that there was no difference in the maximisation rates (%) between the high and low power conditions, $t(48) = -.33$, $p = .74$. In line with previous experiments, the maximisation rate was higher in the ACT groups in both the high and low power primed conditions ($M = 70.34$, $SD = 15.21$, and $M = 65.65$, $SD = 26.45$, respectively), than in the high and low power PAS groups ($M = 39.99$, $SD = 24.84$, and $M = 50.00$, $SD = 25.82$, respectively). Therefore, participants appeared to make the more reinforced response more often in the maximisation task when they received more green light onset for active responding.

Explicit and implicit judgements were entered as independent variables into a multiple regression to determine whether either was a better predictor of future response behaviour. I will firstly present the regression models for the high power condition, followed by the models for the low power condition.

In the high power ACT group, the two-factor model gave a significant prediction of space bar press, $R = .76$, $R^2 = .58$, $F(2, 7) = 4.75$, $p = .05$, although tests of the predictor betas showed that neither explicit nor implicit judgements significantly predicted space bar

press, $\beta = .85$, $t(8) = 1.44$, $p = .19$ and $\beta = -.10$, $t(8) = -0.17$, $p = .87$ respectively. This is possibly due to multicollinearity as the explicit and implicit variables were significantly correlated in this group, $r(8) = .91$, $p < .001$. In the PAS group, the two-factor model did not give a significant prediction of future passive response, $R = .54$, $R^2 = .30$, $F(2, 12) = 2.51$, $p = .12$, although the predictor betas showed that implicit judgements significantly predicted non-response, $\beta = .55$, $t(13) = 2.23$, $p = .05$, but explicit judgements did not, $\beta = -.05$, $t(13) = -0.22$, $p = .83$.

In both of the ACT and PAS low power groups, the two-factor model did not give a significant prediction of active and passive response, $R = .47$, $R^2 = .22$, $F(2, 9) = 1.30$, $p = .32$ and $R = .49$, $R^2 = .24$, $F(2, 10) = 1.60$, $p = .25$ respectively. Furthermore, neither the explicit nor the implicit judgements emerged as predictors in the ACT group, $\beta = .14$, $t(10) = 0.48$, $p = .65$ and $\beta = .45$, $t(10) = 1.54$, $p = .16$, or the PAS group, $\beta = .14$, $t(11) = .49$, $p = .64$ and $\beta = .50$, $t(11) = 1.78$, $p = .11$.

Personality Factors and Depression

An independent samples *t*-test found that there was no difference in the self-reported depression scores from the BDI between the high and low power conditions, $t(48) = -0.28$, $p = .78$. Additionally, there was not a significant relationship between BDI scores and self-reported power scores on the manipulation check in the high or low power groups, $r(25) = .03$, $p = .90$ and $r(25) = .13$, $p = .53$. The relationships between the depression scores and the explicit judgements and IOCs were inconsistent across the power conditions. In the high power group, depression was positively and significantly correlated with explicit judgements, $r(25) = .40$, $p = .05$, but not significantly with IOC, $r(25) = .32$, $p = .12$. This suggests that these perceptions of control increased as feelings of depression increased. In the low power group, there were no relationships between these variables, $r(25) = .001$, $p = 1.00$ and $r(25) = -.01$, $p = .95$.

Next, I will discuss the relationships between the personality factors and the perceptions of control. In the high power condition, the explicit judgements of control and the IOCs were only significantly correlated with the impulsiveness/sensation-seeking (Imp/SS) factor from the ZKPQ-CC scale, $r(25) = .44$, $p = .03$, and $r(25) = .43$, $p = .03$. The positive relationships indicate that perceptions of control increase as Imp/SS traits increase. There were no other noteworthy relationships. In the low power condition, there were no significant correlations, although the relationship between explicit judgements and Imp/SS was trending, $r(25) = .36$, $p = .08$. Other trending relationships were between

explicit judgements and the IOC with neuroticism/anxiety (NAnx) on the ZKPQ-CC scale, $r(25) = -.35$, $p = .08$, and $r(25) = -.33$, $p = .11$. The negative relationships suggest that as neuroticism and anxiety traits increase, the perceptions of control decrease.

7.2.3 Discussion

The aim of this experiment was to investigate the effects of priming high and low power on control judgements and the IOC, so it is important to first discuss the effectiveness of the power prime. In terms of the experimenter's ratings, the power reported in the essays seemed to reflect the condition that was primed, so participants appeared to follow the experimental instructions. However, the ratings of how much the participant appeared to like the experience that they recalled were not so clear. Low power always appeared to be associated with disliking the experience, as expected, but there was more variability in the high power condition, with some people reporting being uncomfortable when in a position of power over others. This was accompanied by lower ratings of aggression, extraversion, impulsiveness and sensation-seeking. This suggests that these personality traits may result in less susceptibility to implicitly priming power. It also supports a link between possessing power and an increased proclivity for risk, as well as the dominance trait being a predictor of power (C. Anderson & Galinsky, 2006). Additionally, this finding is analogous with research that increases in control do not always result in positive affect, but instead can lead to greater anxiety due to increased responsibility and pressure (Rodin et al., 1980). However, the majority of people appeared to enjoy the experiences in their recall essays, and despite the more neutral rating for liking in the high power condition, there was still a significant difference between the two groups. Therefore, this would be in line with previous literature that possessing power is associated with positive emotion, whilst a lack of power leads to experiences of negative emotion (C. Anderson & Berdahl, 2002).

However, the results from the self-reports regarding perceptions of power and the depression scores were inconsistent with the experimenter's ratings of the essay content. There was no correlation between the two variables when high or low power was primed. Therefore, greater experiences of power did not appear to be accompanied by less depression, as might be expected. Furthermore, when primed with power, depression scores were positively and significantly related with explicit judgements of control, and trending with the IOC, which suggests that as depression increased, so did perceptions of

control. When a lack of power was primed, there were no relationships between depression and perceived control. This is contrary to the theory of depressive realism (Alloy & Abramson, 1979), in which nondepressed people are more likely to exhibit IOCs, whilst depressed people tend to be more realistic and accurate. However, it does support research that depressed people can show an IOC when made temporarily elated (Alloy et al., 1981), which may have occurred during the implicit power manipulations. Although, self-reports of neuroticism/anxiety in the low condition indicated that perceptions of control increased as this variable decreased. As neuroticism and anxiety are commonly associated with depression, this could be regarded as support for depressive realism.

As discussed in the traders experiment in Chapter Six, perceptions of control are linked with risk-taking. The example used was that of a trader who overestimates his or her beliefs of control, which could then lead to a greater likelihood of risk-taking based on these false perceptions (Fenton-O'Creevy et al., 2003; Houghton et al., 2000). In line with previous literature, this study suggested that increases in impulsiveness and sensation-seeking appeared to be related to greater reports of perceived control.

Regarding the subjective reports of power on the manipulation check, there was a significant difference between the high and low power conditions, with greater reports of power from participants primed with high power. Therefore, this would suggest that the power primes were successful. However, although significant, the difference between the means was not as great as expected with only a 1.32 difference, and both means being close to the middle value of 9 on the manipulation check scale. Additionally, the subjective ratings of power did not significantly track the experimenter's ratings of power, although they seemed more associated with the experimenter's ratings of power in the low power group, and the experimenter's ratings of liking in the high power group. This reflects the variability in the liking ratings in the high power group that was discussed earlier.

However, the pattern of results for the relationship between the experimenter's PxL variable and the participants' manipulation check ratings, although not significant, was in the expected direction. Therefore, in the high power group, when feelings of power and liking were aligned (i.e. high power and high liking), it was these participants who reported higher ratings of power. In the low power group, when feelings of power and liking were aligned (i.e. low power and low liking), these participants reported lower ratings of control on the manipulation check. Therefore, by looking at the relationship between the manipulation check ratings and the PxL variable, it is clearer to see that the

two ratings were in line with each other. To summarise the last three paragraphs, it appears that the recall essay primes were somewhat successful.

However, contrary to the hypothesis and previous literature (Fast et al., 2009), priming high power did not result in significantly greater explicit judgements or IOCs than priming low power. As theorised in the alternative hypothesis, it could be considered that participants who were primed with low power were motivated to reinstate their power by inflating their estimates of control (Friedland et al., 1992). In fact, in the high power group, although not significant, instead of higher power being related to greater control estimates, the negative relationships suggested that as power ratings decreased (PxL and the manipulation check), both the explicit judgements of control and the IOCs increased.

In the low power group, both the explicit control judgements and the IOCs had no relationship with the PxL variable, so they did not track with the experimenter's ratings. Likewise, the participants' IOCs did not track with their power ratings on the manipulation check, which is unsupportive of the hypothesis that IOCs would increase as power increased. However, the explicit judgements did appear to significantly track with the participant's subjective ratings of power. Therefore, as perceptions of power increased, so did the explicit judgements, which is in line with the hypothesis. However, the findings that both the explicit judgements and the IOCs were not significantly different across the power conditions, or significantly predicted by either PxL or the manipulation check ratings signifies that the recall essays power manipulation did not successfully affect these two variables. However, it would not be reasonable to claim that this supports a lack of connection between power and control, as there is a wealth of literature attesting to the association between the two.

Although the recall essays prime did successfully manipulate IOCs in the die-rolling task in Fast et al.'s (2009) study, an aim of this study was to increase the validity of these findings by demonstrating the effects of priming power on IOCs in a task where there was an objective standard. However, this aim was not supported, and this will be discussed in greater detail in the General Discussion (see subsection 7.4.2).

When the two power conditions were further analysed in terms of active and passive responding, it appears that all participants greatly overestimated their reports of explicit control, and therefore displayed IOCs. The effect was more pronounced in the high power group who received more green light onset for active responding, which is to be expected as the previous experiments and literature (Langer, 1975) have indicated that more active involvement results in greater perceptions of control compared to passive

involvement, and it was hypothesised that priming high power would result in higher explicit judgements. However, as the pattern was not present in both of the ACT groups or high power groups, neither ACT/PAS nor power condition emerged as factors for inducing the IOC. Therefore, this does not fully support the hypothesis that participants in the high power condition would report greater overestimations of control than the participants in the low power condition, and suggests that the optimal method for inducing an IOC may be a combination of active involvement and high power.

Next, the relationships between the explicit judgements of control and the actual control that was experienced will be discussed. Unlike in the previous experiments in this thesis, it appeared that the two variables tracked each other in the high power PAS group, and this pattern was trending in the ACT group. Therefore, although explicit judgements were consistently greater than the actual control, the judgements increased as the actual control increased, which may suggest that there was some understanding of reality. However, in line with previous experiments, the explicit judgements appeared to be out of line with reality in the low power groups, although the low negative relationships suggested that as actual control increased, the explicit judgements decreased. Although it was not significant, it is interesting, as it appears that when primed with low power, the participants were unable to adjust their perceptions of control in the appropriate direction when they experienced more actual control.

In comparison to the IOCs, the smaller differences between the implicit judgements and the actual noncontingent control suggest that participants had a better and more accurate understanding of the conditional probabilities underlying the noncontingency task. Whilst there was not an effect of power condition on the implicit/actual differences, they did appear to be affected by whether the participant was reinforced more for active or passive responding. Particularly, in the ACT groups, the implicit judgements were somewhat overestimated compared to the actual control, whereas in the PAS groups, they were somewhat underestimated compared to the actual control. Therefore, reinforcement for active responding was associated with greater estimates. Additionally, implicit reports only appeared to track the actual control in the high power ACT group, which suggests that only this group's estimates of the conditional probabilities was in line with the actual experience. This is reminiscent of Experiment Two, where the implicit control only tracked the actual control in the high frequency ACT group. However, it provides mixed support for the hypothesis, as the implicit judgements appeared to be more accurate than the explicit judgements across all groups, as expected (i.e. the implicit/actual differences

were smaller than the IOCs), but did not significantly correlate with the actual control experienced in the other three groups. Therefore, it can be questioned as to how much the participants really understood the conditional probabilities.

The explicit/implicit dissociation seems to be most apparent in the high power ACT group. Therefore, although all four groups greatly overestimated their explicit judgements, and reported more accurate implicit judgements, the tests of the differences between the correlations suggests that the dissociation was only apparent when participants were primed with high power, and received more green light onset for active responding. However, the ANOVA suggested that the explicit/implicit dissociation was not apparent across the power and ACT/PAS factors, but it was present when collapsed across the power and ACT/PAS factors. Therefore, this provides mixed support for the hypothesis that the dissociation would be present in the high power condition, but not in the low power condition. It was present in the high power group, but only when they were also reinforced more for active responding, as they significantly overestimated their explicit judgements concurrently with reporting more accurate implicit knowledge that was in line with the actual experience, which supports the hypothesis and Trivers (2000) explicit/implicit dissociation theory. However, it was not found in the high power PAS group, or the low power groups, in which the implicit knowledge, whilst more similar to the actual control than the explicit judgements, did not track with the actual experience. This did not support the hypothesis that the dissociation would be found in the high power condition, and was possibly influenced by the rewarding of passive responding. It does support the hypothesis that the dissociation would not be as distinct in the low power groups, but not for the correct reason, as it was expected that the low power prime would result in lower explicit judgements, and a smaller IOC, that was more in line with reality.

In the maximisation task, a familiar pattern recurred, in which the participants in the ACT groups made the more reinforced response (space bar press) from the learning phase more often than the participants in the PAS groups (no press). Additionally, participants in the high power PAS group responded more actively than the low power PAS group, so it is possible that the high power prime somewhat resulted in this, as being in a position of power is associated with taking action (Galinsky et al., 2003). As discussed in previous experiments, this may be because people associate being effective and in control with active involvement (Langer, 1975).

When passive responding was more reinforced in the high power condition, the implicit judgements emerged as a significant predictor of future response. This echoes the

findings in Experiments 2 and 3. However, as the format was the 0% active-passive version of the noncontingency task, the expectation would be that the explicit judgements would be more accessible for later decision-making, in line with Experiment 1 and with Trivers (2000) theory of self-deception. However, the format of the experiment did deviate from the first experiment with the addition of the power manipulations. When active responding was more reinforced in the high power condition, it appeared that whilst the model was significant, neither the explicit nor the implicit variables predicted future pressing behaviour, despite both being significantly correlated with future response. This is likely due to multicollinearity, as the two variables were significantly correlated within this group. In the low power groups, neither explicit nor implicit judgements emerged as predicting factors for future response behaviour. However, although not significant, the implicit judgements appeared to be better predictors than the explicit judgements in each group, and it is possible that they would have reached significance with a greater number of participants in the groups. Therefore, this is not in line with Trivers (2000) theory that information held in the explicit consciousness is more accessible, although the evolutionary benefits of the dominance of the implicit system over the explicit system was discussed in Chapter Four.

A potential methodological issue was that that the noncontingency task could have affected the participants' primed feelings of power. For example, if they were primed with low power, but then felt that they performed well in the task, this could have increased their feelings of power, and vice versa for participants primed with high power. Therefore, this could have affected the explicit judgements and IOCs reported after the learning phase of the task. Therefore, it would be useful to measure the participants' feelings of power after the priming task, and again after the noncontingency task to see whether they remain stable or not. This will be incorporated in to the competence study so that feelings of competence will be measured at these two different stages.

7.3 Experiment 7: Competence Priming

The concepts of competence and control have long been associated in the motivation literature (White, 1959). Regarding illusory control, in chance situations (e.g. the die-rolling paradigm), it was found that a sense of personal competence lead to greater expectancies of success and vice versa (Golin et al., 1977, 1979; Langer, 1975).

Furthermore, Thompson et al. (1998) found that emphasis on success or failure influenced the IOC, with greater IOCs associated with success.

The contingency-competence-control (CCC) model proposes that perceived control is the outcome of two underlying factors: perceived personal competence and perceived contingency of outcomes (Weisz and Stipek, 1982, see also Muris, Schouten, Meesters & Gijsbers, 2003). Therefore, perceived control is predicted by these factors. In this model, competence is defined as the level of ability to produce the desired outcome, control is defined as the capability to produce the intended outcome, and the contingency is defined as the degree to which the individual's behaviour affects the outcome. The observed positive correlation between perceived competence and perceived control can be interpreted in two ways: that greater perceptions of competence result in greater perceived control, and vice versa (Stipek & Weisz, 1981).

Further support comes from research on attributional style, which finds that people generally take more responsibility for successes than failures, i.e. they believe that producing the successful outcome was under their control (Seidel et al., 2012). Additionally, perceived incompetence is linked to depression (Weisz, Sweeney, Proffitt & Carr, 1993), and therefore can be linked with the literature regarding depressive realism (Alloy & Abramson, 1979), as both depression and perceived incompetence have both been associated with lower and more realistic levels of perceived control.

The aim of this study is to implicitly prime participants with competence (success) and incompetence (failure) to investigate the influences on their perceptions of control. Analogous with Experiment 6, it is proposed that participants primed for competence will exhibit a greater IOC than participants primed with incompetence. This hypothesis is supported by research that expectancies of success increase as perceived competence increases (Stipek & Weisz, 1981), and that levels of competence purportedly predict control, i.e. perceived control increases as competence increases (Golin et al., 1977, 1979; Langer, 1975). Based on this hypothesis, the explicit systems of the participants primed with incompetence would be expected to appear more accurate and in line with the actual control on the noncontingency task. Alternatively, priming incompetence may motivate participants to overcompensate for the loss of or to reinstate their perceptions levels of competence, by overestimating their judgements of perceived control, reminiscent of previous literature exploring control (Friedland et al., 1992; Whitson & Galinsky, 2008). In line with Trivers (2000), the conditional probabilities are expected to be more accurate, with the implicit system more in line with the actual noncontingent control than the

explicit system. If the participants primed with high competence show greater explicit judgements and IOCs than those primed with incompetence, and both groups simultaneously report accurate implicit judgements, then the explicit/implicit dissociation would be expected to be more distinct in the high competence condition. Lastly, it is expected that incompetence will be associated with higher levels of depression and lower perceptions of control (Weisz et al., 1993).

The advantages of this experiment over previous research are in how control is measured. In comparison to the die-rolling task, the noncontingency task allows the subjective reports of explicit control and the conditional probabilities to be compared with the objective values. Therefore, if the hypotheses are supported, the use of the noncontingency task will increase the validity of the results. Furthermore, as stated in the discussion of the power priming experiment, a methodological limitation arose from the possible affect of the noncontingency task on the primed power. Therefore, in this experiment, the self-report competence manipulation checks will be completed twice, firstly after the recall essay priming manipulation, and secondly after the noncontingency task. This will allow the examination of whether the initially reported levels of competence were unchanged after the computer task. It is possible that the experience of noncontingency between the participants' responses and outcomes could lead to lower levels of perceived competence, whilst chance experiences of control in the task could lead to greater perceptions of competence (Weisz & Stipek, 1982).

7.3.1 Methods

Participants

60 undergraduate and postgraduate students (36 females, age range: 18-36, M = 20.5) at Bangor University were recruited via SONA, and received two course credits for their participation. The data of 3 additional participants were removed because they failed to follow the experimental instructions.

Design

A between-groups experiment where participants were randomly assigned to one of two experimental conditions: the high competence condition (n = 28) or the low competence condition (n = 29). As in Experiment 6, a control group was not included as Experiment 1, where there was no manipulation of motivations, will be the control group.

Measures

The competence manipulation was developed from the power manipulation recall essays task that was utilised in Experiment 6. The competence manipulation also required participants to recall a particular incident that had occurred in their lives, and to write a detailed narrative of the incident within a 5-minute timeframe.

High-competence condition. The participants assigned to the high-competence condition (see Appendix Q) received the following instructions:

> Please recall a particular incident in which you felt competent. By competent, we mean that you felt you had the skills and abilities to be effective and meet the demands in the situation. Please describe the situation in which you had competence – events, feelings, thoughts, etc.

Low-competence condition. The participants assigned to the low-competence condition (see Appendix R) received the following instructions:

> Please recall a particular incident in which you lacked competence. By this, we mean that you felt that you did not have the skills or abilities to be effective and did not meet the demands in the situation. Please describe this situation in which you lacked competence – events, feelings, thoughts, etc.

The narratives were coded by the experimenter for the level of competence that the participants reported, to check for the effectiveness of the manipulation. Additionally, as with the power essays, the competence essays were coded for how much the participants appeared to like the incident that they had described. Both dimensions were coded using the same methods as in Experiment 6, although it was expected that high competence should elicit positive emotions and low competence should elicit negative emotions, and that it would be more clear-cut than in the power manipulation.

Self-report manipulation checks. Following the completion of the recall writing task and the judgement-of-noncontingency task, participants were asked to rate how competent, unsuccessful (reverse scored), skilled, and valuable they felt (see Appendix S) on a Likert scale from 1 (very inaccurate) to 5 (very accurate). The minimum score was 4, and the maximum score was 20. The check after the writing task was included to assess the effectiveness of the competence manipulation as reported by the participants. The check after the IOC task was included to assess whether this had influenced the competence or incompetence that had been primed during the writing task.

Personality and depression measures. See ‘Measures’ subsection in Experiment 6.

Procedure

See the 'Procedure' subsection in Experiment 6. Additionally, the participants completed the second competence manipulation check after the Judgements of Control Scale, but before the personality measures. The participants were then debriefed (see Appendix T).

7.3.2 Results

Competence Priming Checks

Parallel to Experiment 6, the experimenter's ratings of competence and liking were normalised from the 1 to 7 scale to a -3 to 3 scale. The ratings of competence reflected the conditions with a significantly higher rating in the high competence condition (M = 2.71, SD = 0.53) compared to the low competence condition (M = -2.76 SD = 0.51), $t(55)$ = 39.52, $p < .001$. As expected, participants primed with competence also conveyed a significantly greater level of liking of the experiences that they recalled (M = -2.50 SD = 0.84), than participants who were primed with a lack of competence (M = -2.76 SD = 0.64), $t(55)$ = 26.74, $p < .001$. Additionally, there was a significant positive correlation between the two ratings in both the high and low conditions, $r(26)$ = .50, p = .007, and $r(27)$ = .80, $p < .001$, respectively (see Figure 7.11). Therefore, this suggests that the more competent the participants felt, the more they appeared to enjoy the experience.

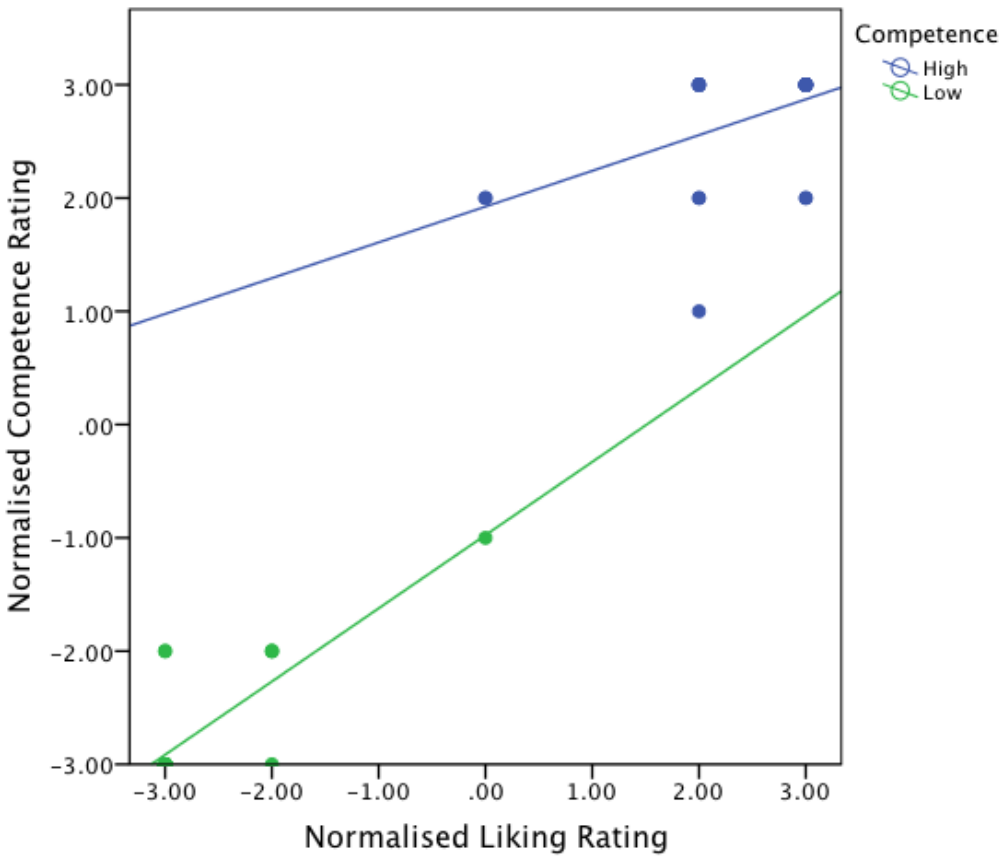

Figure 7.11. Comparison of the experimenter's ratings of competence and liking in the high and low competence conditions.

Regarding the participants' subjective reports of competence on the manipulation check that they completed after writing the recall essays, there was a significant difference between the high and low competence conditions, $t(49.82) = 3.24$, $p = .002$. As expected, participants in the high condition reported a greater level of competence ($M = 14.25$, $SD = 2.24$) than participants in the low condition ($M = 11.86$, $SD = 3.25$). It is also interesting to see the variability in competence ratings in the two conditions. There was a much greater variability in the low competence condition (range: 5-17) than in the high competence condition (range: 10-18). However, the participants' competence ratings on the manipulation check were significantly correlated with the experimenter's competence ratings in the high competence condition, but there was a negative relationship, $r(26) = -.53$, $p = .004$ (see Figure 7.12). Therefore, it appears that as the experimenter's ratings increased, the participant's ratings decreased. However, there was no correlation between the two variables in the low competence condition, $r(27) = -.001$, $p = 1.00$. In both the high and low conditions, the participants' competence ratings were not significantly

correlated with the experimenter's liking rating, $r(26) = -.13$, $p = .52$, and $r(27) = -.07$, $p = .72$ respectively. Therefore, their perceptions of competence did not appear to be related to the enjoyment that was observed by the experimenter in their recall essays.

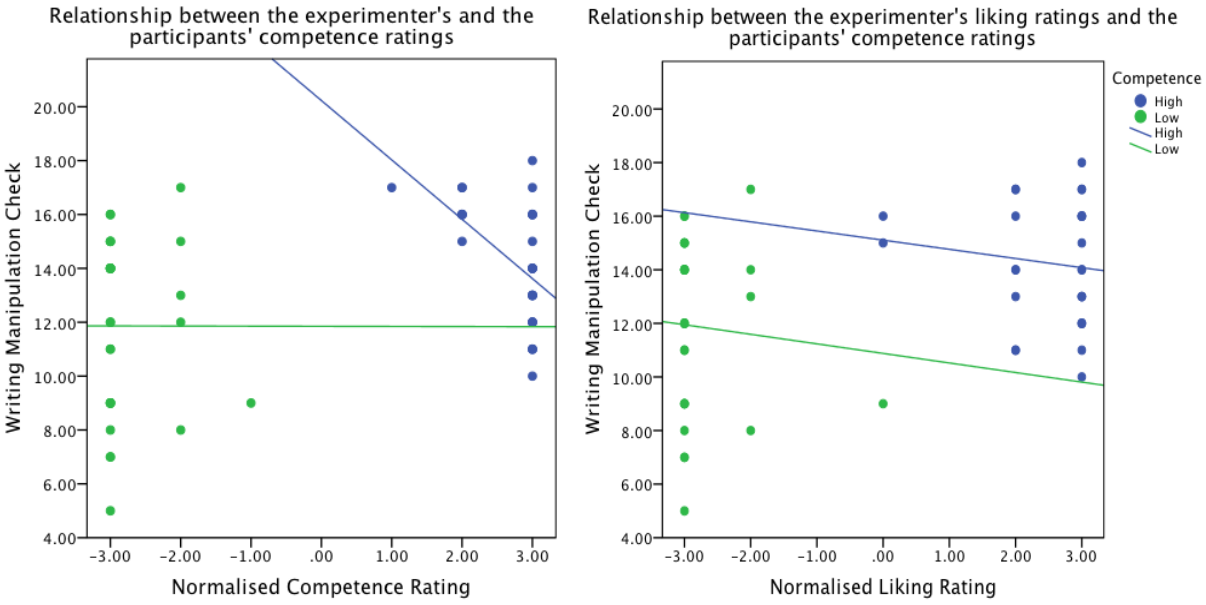

Figure 7.12. The experimenter's competence and liking ratings compared to the participants' competence ratings in both the high and low competence conditions.

The normalised competence and liking variables were multiplied to create a 'competence x liking' (CxL) variable. Like the PxL scale in the power experiment, the CxL scale also runs from -9 to 9, with -9 signifying complete misalignment, and 9 signifying complete alignment between the two variables. The CxL in the high competence condition ($M = 7.00$, $SD = 2.80$) was negatively but not significantly correlated with the participants' scores on the writing manipulation check, $r(26) = -.31$, $p = .11$ (see Figure 7.13). Therefore, this suggests that as the participants' competence scores increased, the experimenter's CxL rating decreased. In the low competence condition, there was no relationship between the CxL ($M = 7.86$, $SD = 2.28$) and the participants' ratings of competence, $r(27) = -.01$, $p = .95$.

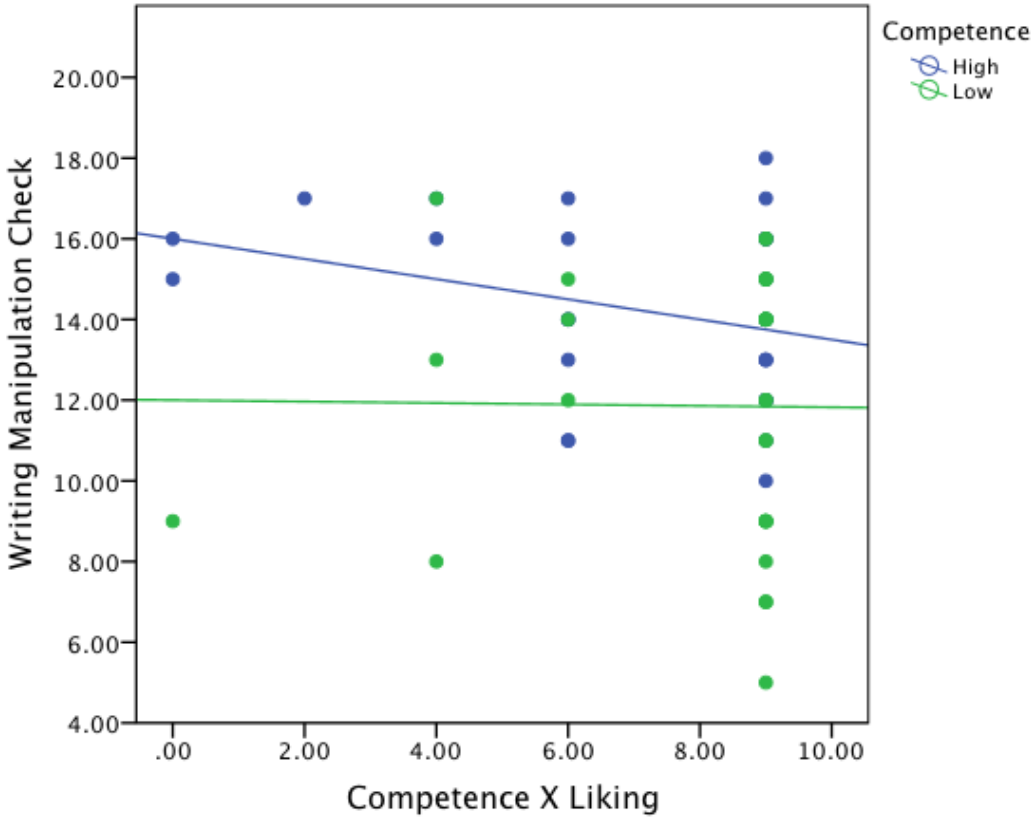

Figure 7.13. Comparison between the normalised competence x liking (CxL) variable and the participants' competence ratings after completing the recall essay.

The participants' perceptions of competence were also measured after they completed the 0% noncontingency computer task. In the high competence condition, a *t*-test found that there was a significant difference between the scores of competence reported after completing the recall essays (writing manipulation check) and after completing the noncontingency task (computer manipulation check), $t(27) = 6.47$, $p < .001$. Particularly, feelings of competence were rated lower on the computer manipulation check ($M = 10.18$, $SD = 2.45$), compared to the earlier writing manipulation check ($M = 14.25$, $SD = 2.24$). In the low competence condition, the difference between the two manipulation checks was not significant, $t(28) = 1.79$, $p = .08$, but it was trending in the same direction with lower ratings on the computer manipulation check ($M = 10.41$, $SD = 2.98$) compared to the writing manipulation check ($M = 11.86$, $SD = 3.25$). Unlike after the recall essays, the difference in competence ratings between the high and low conditions was not significant, $t(55) = -0.33$, $p = .75$. In the high competence condition, the CxL was positively but not significantly correlated with the computer manipulation check ratings, $r(28) = .33$, $p = .09$, although it was trending (see Figure 7.14). Therefore, the

experimenter's ratings and the participants' ratings after the computer task were in line with each other. However, in the low competence condition, the two variables were not related, $r(29) = -.02$, $p = .91$.

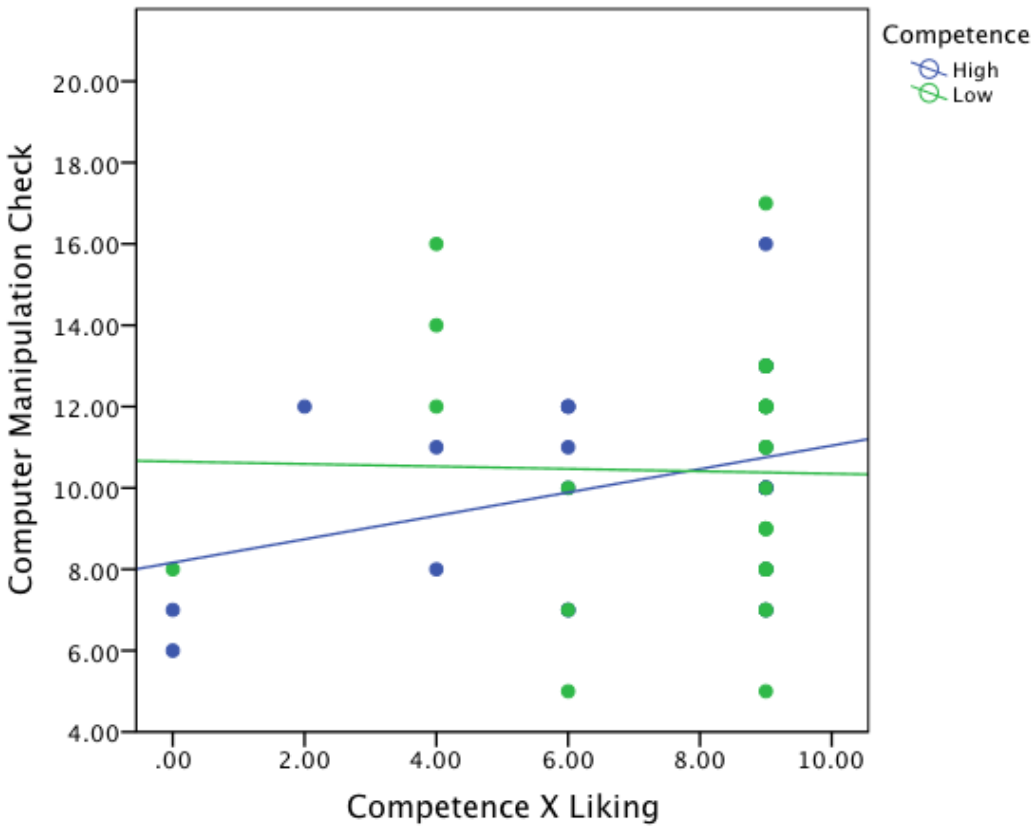

Figure 7.14. Comparison between the normalised competence x liking variable and the participants' competence ratings after completing the computer noncontingency task.

Competence Priming, Explicit Control Judgements and Illusions of Control

This section will examine the effects of priming high and low competence on the explicit judgements of control and the IOCs displayed by the participants. As in Experiment 6, the competence conditions were not further divided by active and passive responding at this stage. In the high competence condition, participants significantly overestimated their explicit judgements of control ($M = 21.43$, $SD = 21.03$) compared to the actual control ($M = 10.43$, $SD = 7.46$), $t(27) = 2.49$, $p = .02$, and therefore showed an IOC ($M = 11.00$, $SD = 23.41$). Likewise, in the low competence condition, participants also significantly overestimated their explicit judgements ($M = 23.10$, $SD = 26.97$) compared to the actual control experienced ($M = 8.27$, $SD = 5.98$), $t(28) = 2.96$, $p = .006$,

and therefore showed an IOC (M = 14.84, SD = 26.97). However, there was not a significant difference between the explicit judgements, $t(55) = -0.27$, $p = .79$, or the IOCs, $t(55) = -0.57$, $p = .57$ across the competence conditions. Therefore, explicit judgements and IOCs were not significantly greater when participants were primed with competence compared to being primed with a lack of competence.

Firstly, the relationships with the experimenter's CxL scores will be examined. In the high competence condition, the CxL variable was not significantly related with the explicit judgements of control, $r(26) = -.11$, $p = .58$, or the IOCs, $r(26) = -.13$, $p = .52$ (see Figure 7.15). Contrarily, in the low competence condition, CxL was negatively and significantly correlated with explicit judgements, $r(27) = -.45$, $p = .02$, and the IOC, $r(27) = -.50$, $p = .01$. In general, it appears that as the CxL scores increased (i.e. the competence and liking ratings were more in alignment), the explicit judgements and the IOCs decreased.

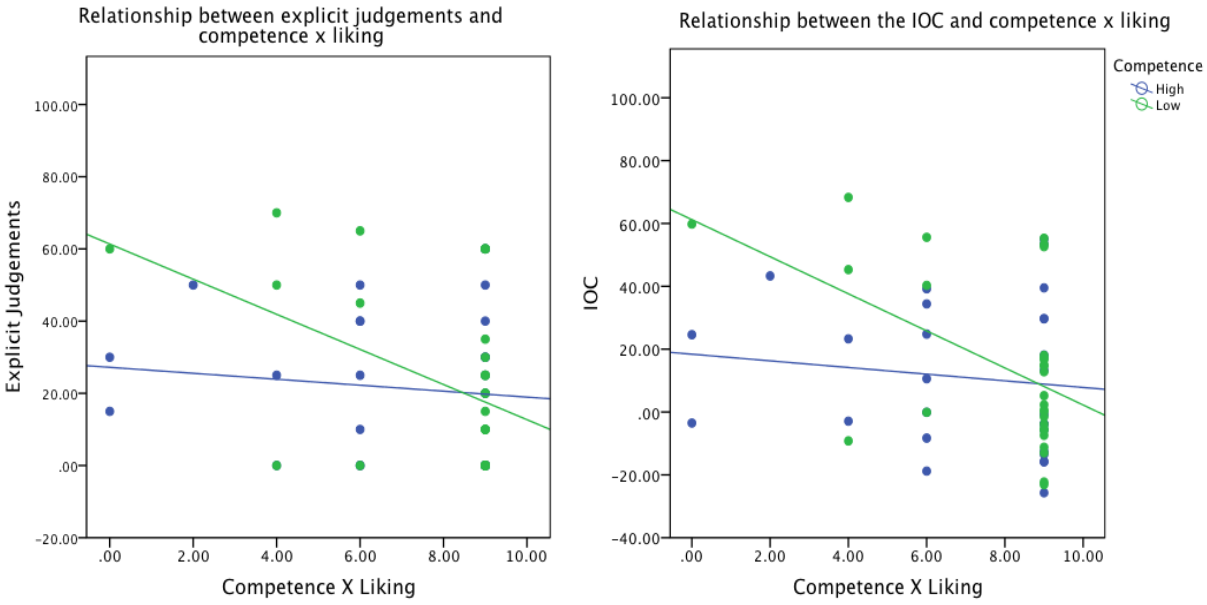

Figure 7.15. Relationships between the explicit judgements of control and the IOCs with the competence x liking (CxL) variable in the high and low competence conditions.

Secondly, I will examine the relationships that the explicit judgements of control and the IOCs had with the participants' competence ratings after completing the writing manipulation check after the recall essays. In the high competence condition, there was no relationship with the explicit judgements of control, $r(26) = .05$, $p = .80$, and a non-significant positive correlation between the participants' ratings and the IOCs, $r(26) = .12$,

p = .53 (see Figure 7.16). In the low competence condition, there were non-significant negative correlations with the explicit judgements, $r(27)$ = -.20, p = .31, and the IOCs, $r(27)$ = -.21, p = .29, which would suggest that the participants' perceptions of control decreased as their reports of competence increased. However, the non-significance indicates that, in general, these two variables were not related.

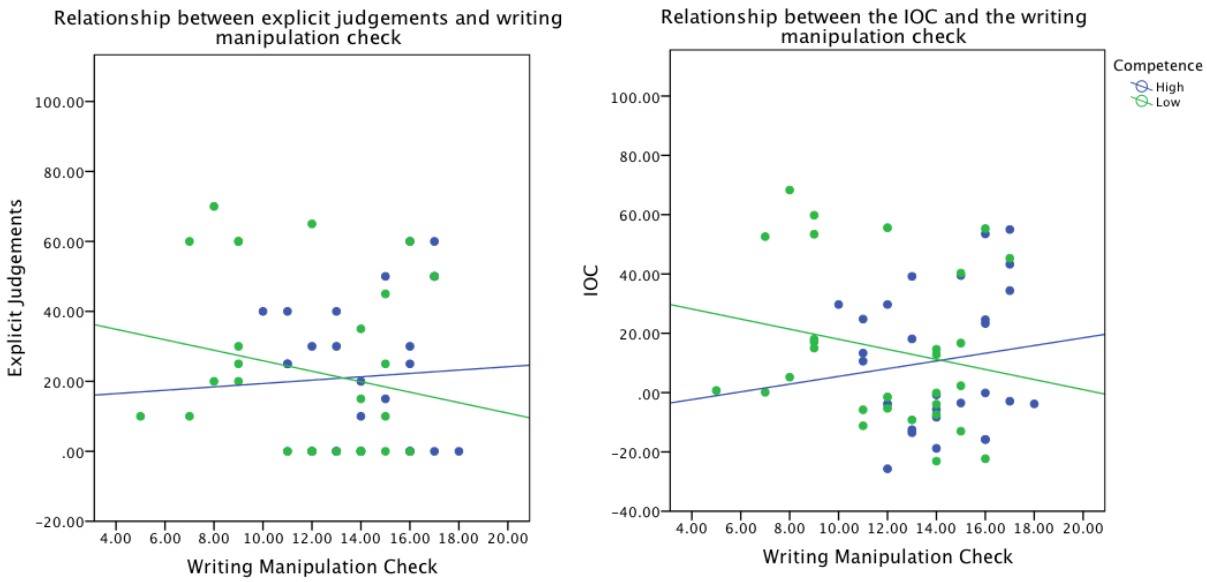

Figure 7.16. Comparisons between the explicit reports of control and the IOCs with the participants' competence ratings after completing the recall essays.

Next, I will discuss the relationships with the competence ratings after the noncontingency task was completed (computer manipulation check). In the high competence condition, there was a negative non-significant relationship between the ratings and the explicit judgements of control, $r(26)$ = -.22, p = .27, and with the IOCs, $r(26)$ = -.33, p = .09, although the latter relationship was trending (see Figure 7.17). Therefore, it seems that, although not significantly so, the greater the participants' competence ratings, the smaller their illusions of control, and the lower their explicit reports. In the low competence condition, there were non-significant positive correlations with the explicit judgements, $r(27)$ = .30, p = .11, and the IOCs, $r(27)$ = .27, p = .15, so it appears that there was a trend for the participants' perceptions of control to increase as these reports of competence increased.

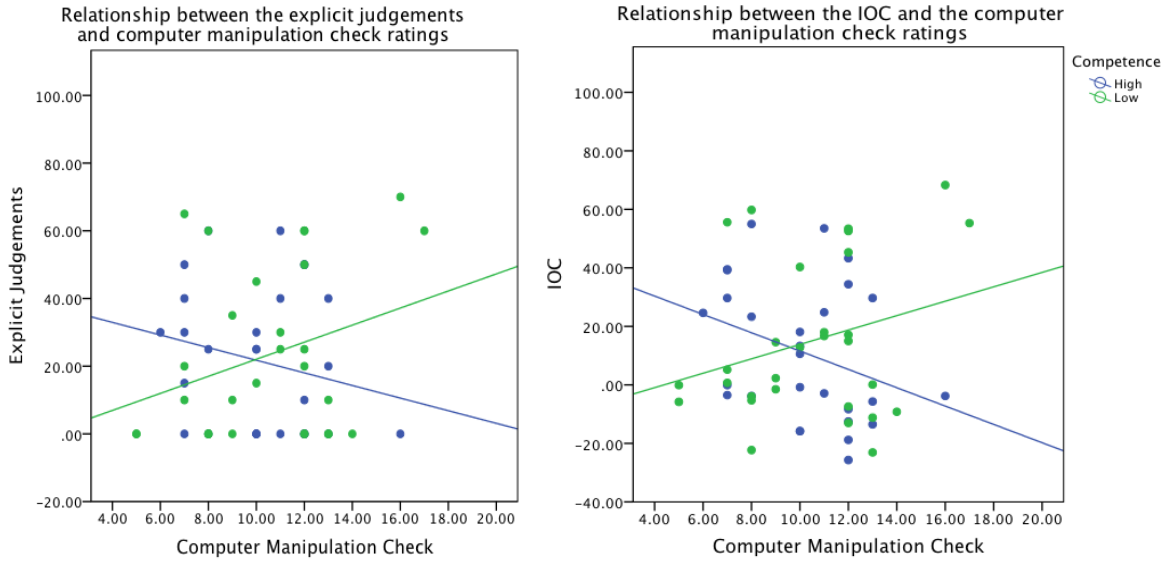

Figure 7.17. Comparisons between the explicit reports of control and the IOCs with the participants' competence ratings after completing the noncontingency computer task.

A multiple regression was run for both the high and low competence conditions, with the CxL, the writing manipulation check ratings and the computer manipulation check ratings entered as the independent variables, and the explicit judgements of control entered as the dependent variable. The three-factor model did not give a significant prediction of explicit judgements in the high competence condition, $R = .22$, $R^2 = .05$, $F(3, 24) = 0.42$, $p = .74$, but did give a significant prediction in the low competence condition, $R = .57$, $R^2 = .33$, $F(3, 25) = 4.08$, $p = .02$. Particularly, in the latter condition, tests of the predictor betas showed that the CxL variable was a significant predictor of explicit judgements, $\beta = -.44$, $t(28) = -2.70$, $p = .009$, whilst the writing and computer manipulation check ratings were not significant predictors, $\beta = .-21$, $t(28) = -1.27$, $p = .22$, and $\beta = .30$, $t(28) = 1.82$, $p = .08$, respectively, although the computer manipulation ratings were trending.

Similarly, this multiple regression was run with the IOC as the dependent variable. Consistent with the analysis above, the three-factor model did not give a significant prediction in the high competence condition, $R = .35$, $R^2 = .12$, $F(3, 24) = 1.12$, $p = .36$, but did in the low competence condition, $R = .60$, $R^2 = .36$, $F(3, 25) = 4.76$, $p = .01$. In the latter condition, tests of the predictor betas showed that the CxL variable was a significant predictor of the IOC, $\beta = -.50$, $t(28) = -3.10$, $p = .005$, whilst the writing and computer manipulation check ratings were not, $\beta = -.22$, $t(28) = -1.36$, $p = .19$ and $\beta = .27$, $t(28) = 1.67$, $p = .11$, respectively.

Illusions of Control

Comparable to the power study (Experiment 6), the competence conditions were further analysed in terms of the ACT/PAS variable. As can be seen in Figure 7.18, the largest IOCs were displayed in the high competence PAS group (M = 18.65, SD = 23.53), and the low competence ACT group (M = 17.14, SD = 28.09), who greatly overestimated their explicit judgements (M = 25.00, SD = 22.02 and M = 26.07, SD = 25.21 respectively), compared to the actual control that was experienced (M = 6.35, SD = 5.95 and M = 8.93, SD = 6.53 respectively). However, the smallest IOC was reported in the high competence ACT group (M = 6.05, SD = 22.64).

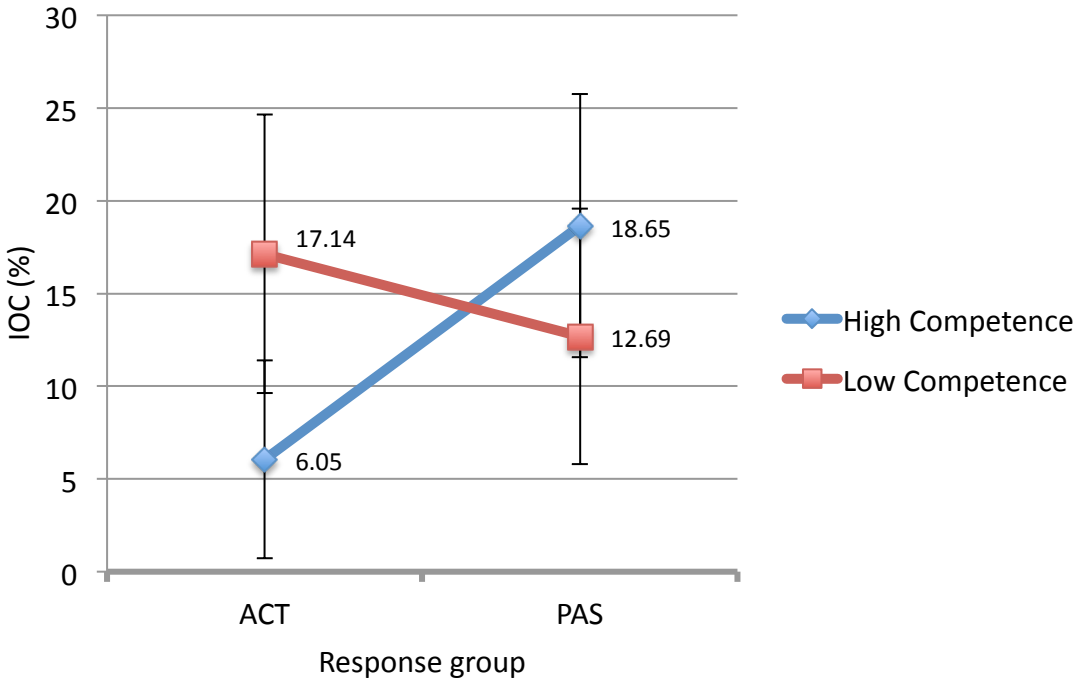

Figure 7.18. Comparison of the IOCs across the competence conditions and the ACT/PAS groups. Error bars represent the standard error of the means.

A between-groups ANOVA with competence condition and ACT/PAS as the between-subjects factors, and the IOC as the dependent variable did not find a significant main effect of competence, $F(1, 53) = 0.14$, $p = .71$, or ACT/PAS, $F(1, 53) = 0.36$, $p = .55$, or an interaction, $F(1, 53) = 1.58$, $p = .22$. Therefore, the IOCs did not appear to be significantly affected by the competence primes, or by the reinforcement for active and passive responding.

T-tests established that the two largest IOCs shown by the participants in the high competence PAS and the low competence ACT groups, were significant, $t(10) = 2.63$, $p =$

.03, and $t(12) = 2.28$, $p = .04$, respectively. Contrarily, the IOCs displayed by the participants in the high competence ACT group and the low competence PAS group, were not significant, $t(16) = 1.10$, $p = .29$, and $t(14) = 1.84$, $p = .09$, respectively. However, the IOC was trending towards significance in the latter group.

Additionally, a non-significant correlation between the explicit judgements and the actual control was consistently found in all four groups. Therefore, as can be seen in Figure 7.19, the explicit judgements were not in line with the actual experience of control in the high competence ACT and PAS groups, $r(15) = -.10$, $p = .70$ and $r(9) = -.13$, $p = .71$ respectively, or the low competence ACT and PAS groups, $r(12) = -.34$, $p = .24$ and $r(13) = -.20$, $p = .48$ respectively. However, the negative correlations suggest that as the actual control increased, the participants' explicit judgements of control decreased.

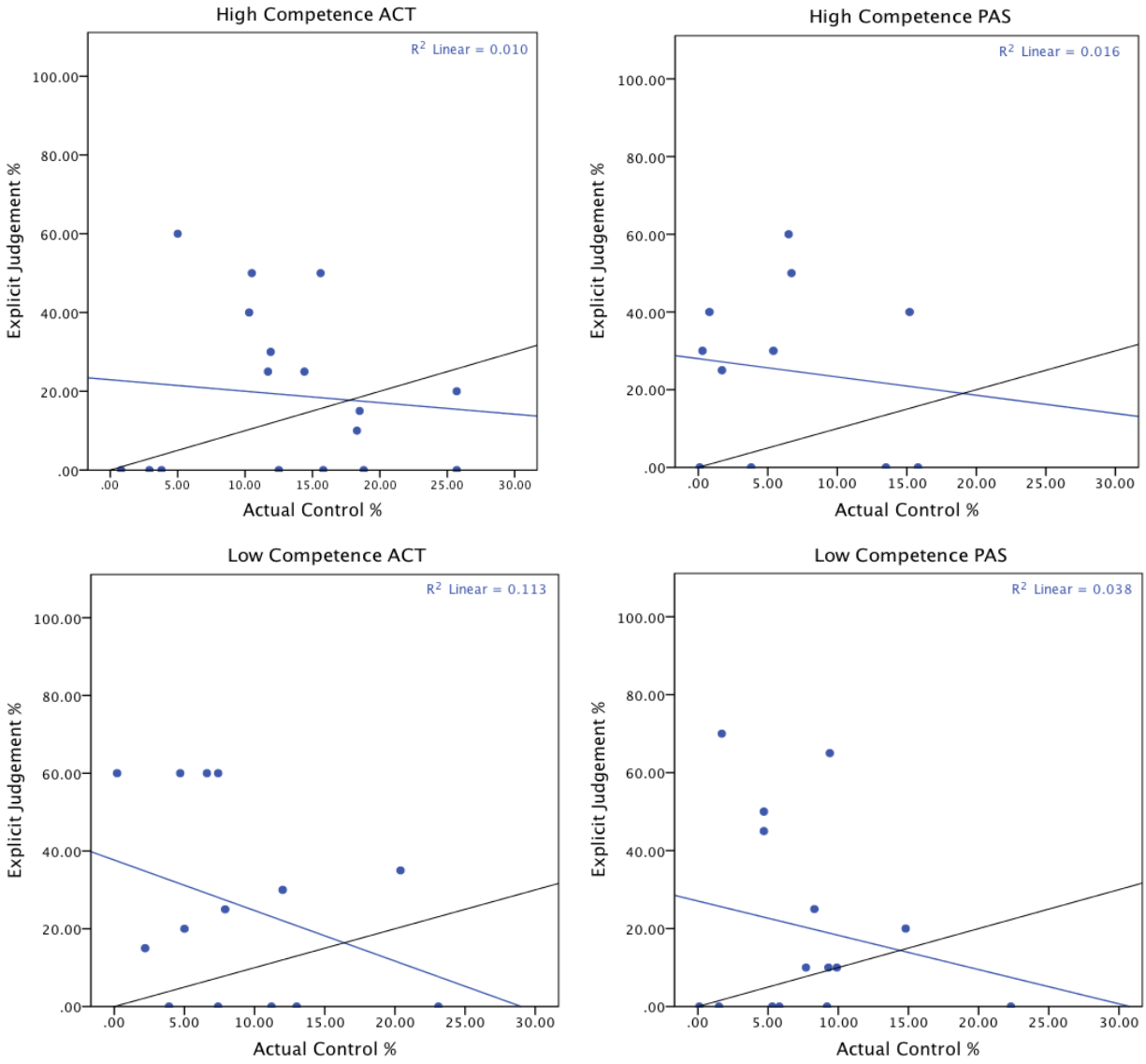

Figure 7.19. Comparison of the correlations between the participants' explicit judgements of control and the actual control experienced.

Dissociation of Explicit and Implicit Judgements

This section will analyse the relationships between the participants' implicit reports of control and the actual control, and then examine the explicit/implicit dissociation. In the high competence ACT group, the difference between the implicit reports of control and the actual control was high, with the participants greatly underestimating the control that they experienced (M = -16.01, SD = 24.79; see Figure 7.20). The differences in the high competence PAS, and the low competence ACT and PAS groups were much smaller (M = 3.2, SD = 14.55, M = -2.14, SD = 15.31, and M = -0.31, SD = 19.46).

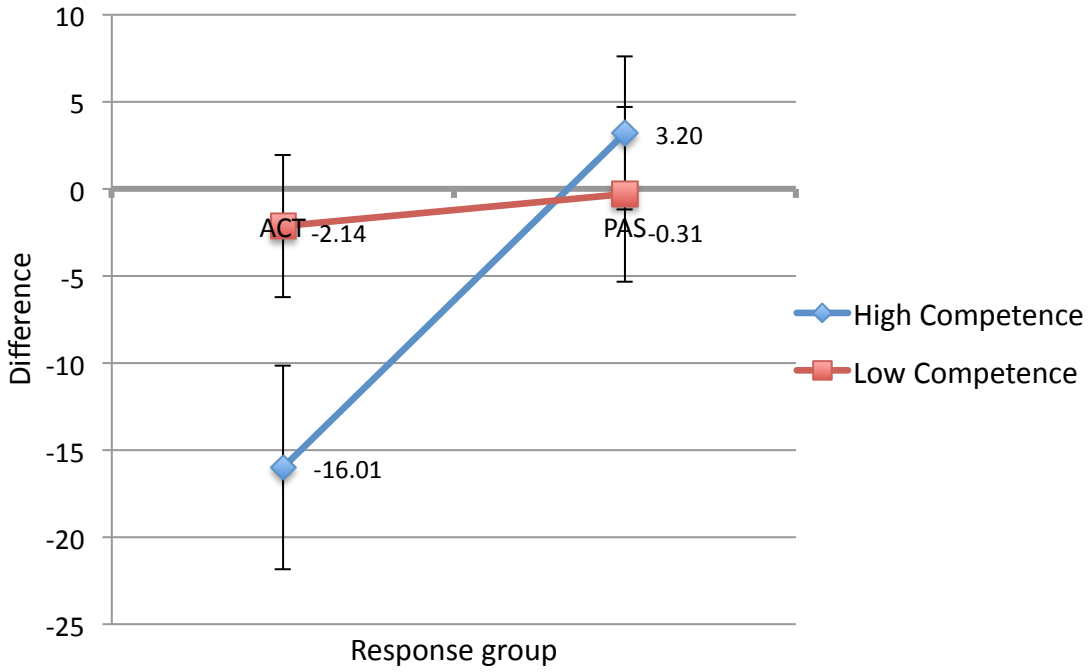

Figure 7.20. Comparison of the differences between the implicit control judgements and the actual control across the competence conditions and the ACT/PAS. Error bars represent the standard error of the means.

A between-groups ANOVA with competence condition and ACT/PAS entered as the between-subjects factors, and the differences between the implicit reports of control and the actual control entered as the dependent variable did not find a significant main effect of competence, $F(1, 53) = 0.97$, $p = .33$. Therefore, the differences were similar in the high (M = -6.41, SE = 3.79) and low (M = -1.23, SD = 3.64) competence conditions. Additionally, there was not a significant interaction between competence and ACT/PAS, $F(1, 53) = 2.74$, $p = .10$.

However, there was a significant main effect of ACT/PAS, $F(1, 53) = 4.02$, $p = .05$. In particular, the differences in the ACT group were negatively underestimated (M =

-9.08, *SD* = 3.53) compared to the differences in the PAS group (*M* = 1.44, *SD* = 3.89). However, it is probable that the significant underestimation in the high competence ACT group would have skewed this finding.

T-tests revealed that the difference between the implicit judgements and actual control in the high competence ACT group was significantly different from zero, $t(16) = 2.66$, $p = .02$, so the implicit reports were significantly underestimated, suggesting that the knowledge of the conditional probabilities was inaccurate. However, the difference in the high competence PAS group, $t(10) = -0.73$, $p = .48$, and the low competence ACT and PAS groups, $t(13) = 0.52$, $p = .61$, and $t(14) = .06$, $p = .95$, respectively, were all not significantly different. Therefore, the participants' implicit reports of control were similar to the actual control experienced, suggesting that their knowledge of the conditional probabilities was more accurate.

Figure 7.21 presents the relationships between the implicit control judgements and the actual control. It appears that only the correlation in the high competence PAS group was significant, $r(9) = .65$, $p = .03$, suggesting that the implicit estimates tracked the actual experiences of control. However, the correlations were not significant in the high competence ACT group, or the low competence ACT and PAS groups, $r(15) = .08$, $p = .75$, $r(12) = -.03$, $p = .93$, and $r(13) = .14$, $p = .62$, respectively. Therefore, this suggests that the two variables were not in line in these groups.

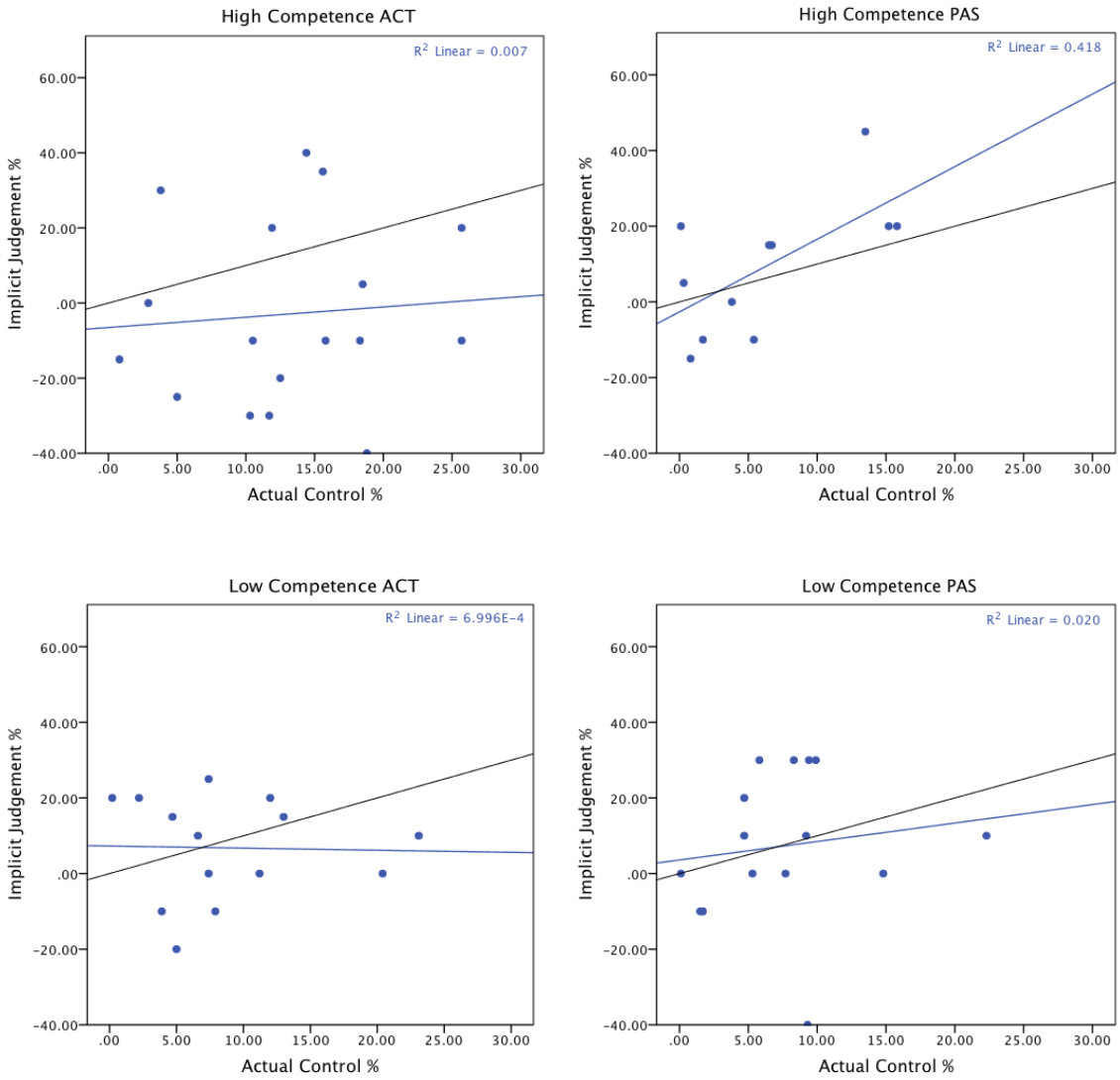

Figure 7.21. Comparison of the participants' implicit judgements of control with the actual control experienced.

In Figure 7.22, the graphs compare the explicit and implicit judgements of control. In the high competence condition, both the explicit and implicit judgements in the ACT group were smaller than in the PAS group, although not significantly so, $t(26) = -0.72$, $p = .48$, and $t(26) = -1.47$, $p = .15$. In the low competence condition, the estimates of explicit control were greater in the ACT group, although not significantly so, $t(27) = 0.62$, $p = .54$, whilst the implicit judgements were more consistent across the ACT and PAS groups, $t(27) = -0.09$, $p = .93$. Additionally, the differences between the explicit and implicit judgements were significant in both of the high and low competence ACT groups, $t(16) = 2.99$, $p = .01$ and $t(13) = 3.17$, $p = .01$, respectively. However, they were not significant in the high and low competence PAS groups, $t(14) = 1.73$, $p = .11$ and $t(27) = 0.62$, $p = .54$,

respectively. Therefore, this would suggest that there was a greater explicit/implicit dissociation when the participants were reinforced for active responding. However, there were no significant differences across competence conditions. For example, the explicit judgements in the high competence ACT group were not significantly different to the explicit judgements in the low competence ACT group, $t(29) = -0.84$, $p = .41$.

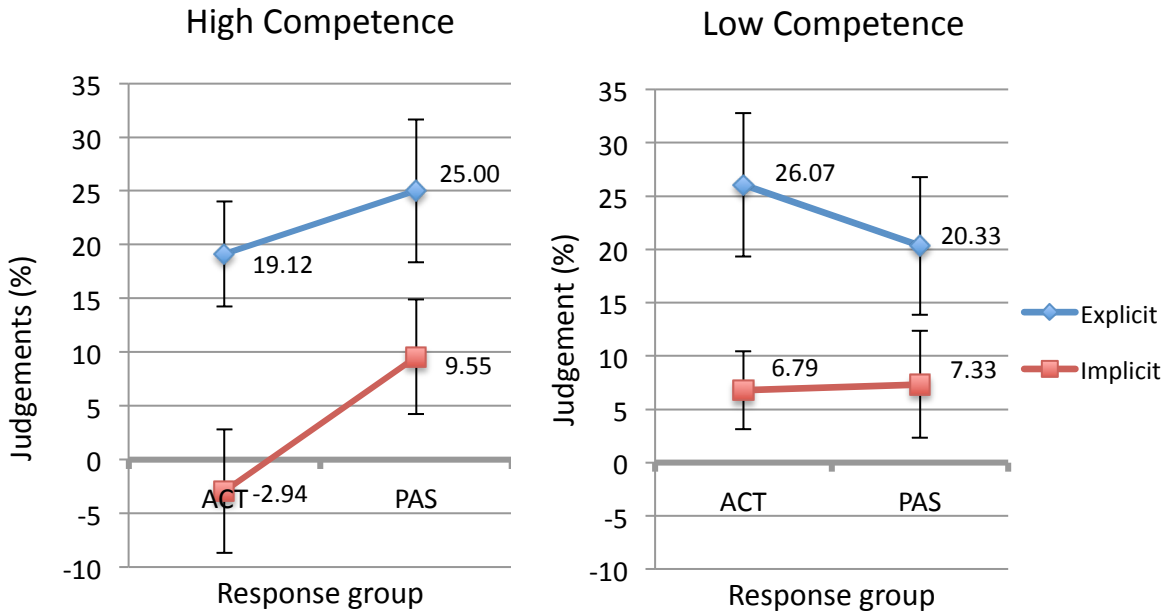

Figure 7.22. Comparison of the explicit and implicit judgements across the competence conditions and the ACT/PAS variable. Error bars represent the standard error of the means.

Regarding the explicit/implicit dissociation, the differences between the explicit/actual and implicit/actual correlations were not significant in any of the groups, although it was trending in the high competence PAS group, $Z = -1.65$, $p = .10$. Therefore, this suggests that the dissociation between the explicit and implicit systems was generally not present, but was most evident when the participants were primed with high competence and received more green light onset reinforcement for passive responding.

Furthermore, a mixed-design ANOVA with judgement (explicit and implicit) as a within-subjects factor, and competence and ACT/PAS as the between-subjects factors found a significant main effect of judgement, $F(1, 53) = 20.50$, $p < .001$. In particular, the explicit judgements ($M = 29.07$, $SE = 3.73$) were higher than the implicit judgements ($M = 29.07$, $SE = 3.73$). Therefore, the explicit/implicit dissociation is apparent when collapsed across the competence and ACT/PAS variables.

However, there was not a significant main effect of competence, $F(1, 53) = 0.33$, $p = .57$, or ACT/PAS, $F(1, 53) = 0.59$, $p = .45$. Additionally, there were no significant 2-way interactions between competence and ACT/PAS, $F(1, 53) = 1.88$, $p = .18$, competence and judgements, $F(1, 53) = 0.12$, $p = .74$, or judgements and ACT/PAS, $F(1, 53) = 0.70$, $p = .41$. Finally, there was also not a significant 3-way interaction between competence, ACT/PAS and judgements, $F(1, 53) = 0.00$, $p = .98$. Therefore, these results suggest that the explicit and implicit reports of control did not differ across high and low competence, or active and passive responding.

Maximisation Task Behaviour

An independent-samples *t*-test found no difference in maximisation rates (%) between the high and low competence conditions, $t(55) = 0.06$, $p = .95$. Parallel with the results in the previous experiments, the maximisation rate (%) was greater in the ACT groups in both the high and low competence conditions, ($M = 59.87$, $SD = 19.54$ and $M = 63.97$, $SD = 17.57$, respectively), than in the PAS groups in the high and low competence conditions, ($M = 41.21$, $SD = 17.40$ and $M = 41.26$, $SD = 17.66$, respectively). Therefore, when participants were more reinforced with green light onset for pressing the space bar in the 100-trial learning phase, they made more active than passive responses in the subsequent 10-trial maximisation task. However, participants who were more reinforced for not pressing the space bar did not make more passive than active responses.

The explicit and implicit judgements were entered into a multiple regression as independent variables to establish whether either was a better predictor of future response behaviour. In the high competence ACT and PAS groups, the two-factor models did not give a significant prediction of subsequent active and passive responding, $R = .18$, $R^2 = .03$, $F(2, 14) = 0.22$, $p = .80$, and $R = .30$, $R^2 = .09$, $F(2, 8) = 0.41$, $p = .68$, respectively. As expected, neither the explicit nor the implicit judgements emerged as predictors in the ACT group, $\beta = -0.03$, $t(16) = -0.13$, $p = .90$ and $\beta = .18$, $t(16) = 0.66$, $p = .52$, or in the PAS group, $\beta = -0.26$, $t(10) = -0.75$, $p = .48$ and $\beta = 0.09$, $t(10) = 0.26$, $p = .81$.

Likewise, in the low competence ACT and PAS groups, the two-factor models also did not give a significant prediction $R = .15$, $R^2 = .02$, $F(2, 11) = 0.12$, $p = .89$, and $R = .33$, $R^2 = .11$, $F(2, 12) = 0.73$, $p = .50$, respectively. As expected, neither the explicit nor the implicit judgements emerged as predictors of future response behaviour in the ACT group, $\beta = 0.16$, $t(13) = 0.50$, $p = .63$ and $\beta = -0.08$, $t(13) = -0.24$, $p = .81$, or the PAS group, $\beta = 0.03$, $t(14) = 0.12$, $p = .91$ and $\beta = -0.33$, $t(14) = -1.20$, $p = .25$.

Personality Factors and Depression

An independent-samples *t*-test did not find a significant difference in depression scores on the BDI between the high (M = 17.64, SD = 11.17) and low competence (M = 19.45, SD = 9.92) conditions, $t(55) = -0.65$, $p = .52$. Additionally, BDI scores were not significantly correlated with self-reported competence after the writing task or the computer task in the high condition, $r(28) = .10$, $p = .60$ and $r(28) = -.04$, $p = .84$. In the low condition, depression scores were significantly correlated with competence after the writing task, $r(29) = -.36$, $p = .05$, but not after the computer task, $r(29) = -.11$, $p = .56$. The negative correlations indicate that self-reported competence decreases as depression increases. Regarding the perceptions of control, self-reported depression was not significantly correlated with explicit judgements and the IOC in the high condition, $r(28) = -.21$, $p = .28$ and $r(28) = -.26$, $p = .18$, or the low condition, $r(29) = .14$, $p = .47$ and $r(29) = .16$, $p = .40$.

In the high competence condition, there were no personality factors that were significantly correlated with explicit judgements or the IOC. In the low competence condition, the only personality factor that was significantly correlated with the explicit judgements and the IOC was the agreeableness factor on the MINI IPIP scale, $r(29) = .36$, $p = .05$ and $r(29) = .43$, $p = .02$. The positive relationships suggest that increased kindness is associated with increased perceptions of control, although these relationships are not of importance to this investigation.

7.3.3 Discussion

The aim of this experiment was to examine the effects of priming high and low competence on the participants' illusions of control and the participants' control judgements. Therefore, the effectiveness of the competence prime will be discussed first. Regarding the competence ratings as coded by the experimenter, the competence content of the essays reflected the corresponding primed conditions with a greater rating in the high competence condition compared to the low (lack of) competence condition. This suggests that participants followed the experimental instructions. As expected, the essays of participants in the high competence condition also contained a greater degree of positive effect content (liking) than in the low competence condition. This supports previous literature that competence is associated with positive feelings, whilst a lack of competence is associated with negative feelings (Weisz et al., 1993).

The significant difference between the subjective competence ratings on the writing manipulation checks in the high and low competence conditions also suggests that the competence primes were successful. However, as in the power experiment, the difference between the means seemed small, with only a 2.39 difference, with both means lying close to the median value of 12, particularly the low competence condition. Likewise, the greater variability in competence ratings by the participants in the low competence condition is also noteworthy. There were many participants who gave a high competence rating despite being primed with a lack of competence, which explains why the average for the group quite high. Conversely, these high ratings would suggest that the lack of competence prime was not successful.

The relationships between the participants' and the experimenter's ratings were also interesting, as there was a significant negative relationship in the high competence condition, and no relationship in the low competence condition. Therefore, in the high condition, the results indicated that as the experimenter's ratings of the competence content in the recall essays increased, the participants' ratings of competence decreased. The same pattern was found in both the high and low competence conditions between the participant's ratings and the CxL (competence x liking) variable, although it was not significant in the high competence condition. The negative relationships here suggested that the more aligned the experimenter's ratings of competence and liking were, the less competent the participants felt. These findings were unexpected, as positive relationships between the two ratings would be predicted. Therefore, this once again calls in to question whether the competence primes were successful or not.

An interesting finding was that the participants' competence ratings in both the high and low conditions, were significantly lower after completing the 0% noncontingency computer task than when they were reported after the recall essay primes. Therefore, this suggests that the experience of a task in which the participants' responses and outcomes were noncontingently related resulted in a reduction of feelings of competence, which was particularly salient when first primed with a high level of competence. Furthermore, the difference between the high and low conditions was now non-significant, which signifies that the ratings were now similar. This may be particularly significant for the subsequent judgements of explicit control and the IOCs, as it could be expected that the lower perceptions of competence could also lead to lower judgements and illusions. Contrary to the relationship with the writing competence score, there was a positive relationship between the CxL and the computer competence score in the high condition. Therefore, the

participants' and the experimenter's ratings were in line with each other, as expected, although there was no relationship in the low condition.

Contrary to the hypothesis, priming high competence did not result in significantly greater explicit judgements or IOCs than priming a lack of competence. In terms of the alternative hypothesis, it is possible that the reduction in feelings of competence that were reported after the computer task, motivated participants to restore their competence by exaggerating their perceptions of control (Friedland et al., 1992). However, although this was only hypothesised in the low competence condition, it could also apply to the high competence condition, whose participants experienced a greater reduction in competence after the computer task.

In the low competence condition, both the explicit judgements and the IOCs increased as the competence ratings on all measures (CxL, writing, and computer manipulation checks) decreased. Therefore, this would support the notion of the alternative hypothesis. Additionally, both variables were significantly predicted by the experimenter's CxL ratings and highly predicted by the participants' ratings on the computer manipulation check. The results were less clear in the high competence condition. Although not significant, the explicit judgements and the IOCs also decreased as the ratings on the CxL and the computer manipulation checks increased, which parallels the low competence condition. However, whilst there was a low positive relationship between the writing manipulation check and the IOCs, it seems reasonable to dismiss the relationships with the writing check, as the ratings of competence were significantly lower after completing the computer check. The findings were unsupportive of the hypothesis that participants who were primed for high competence would display higher IOCs. Therefore, this would suggest that perceptions of success do not concur with perceptions of control, which is not in line with previous research that competence is predictive of perceived control (Weisz & Stipek, 1982).

Further analysis of the competence conditions in terms of active and passive responding found that all participants, except those in the high competence ACT group, greatly overestimated their reports of control. This is surprising, as greater perceptions of control and IOCs would be expected when perceptions of competence and involvement were high, with the lowest control judgements reported when people felt incompetent and task involvement was low (Golin et al., 1977, 1979; Langer, 1975; Weisz & Stipek, 1982). The non-significant results from the ANOVA further support the finding that the IOCs were not affected by the priming manipulations, which does not support the hypothesis

that high competence would lead to higher judgements and IOCs, and additionally shows that there was not an effect of the more reinforced response.

As expected, the explicit judgements of control did not track with the actual experiences of control in any of the groups. Furthermore, as in the power experiment, there was a general trend for peoples' explicit judgements to decrease as the experiences of actual control increased. Therefore, this supports the hypothesis, based on the research by von Hippel and Trivers (2011), that peoples' explicit systems are out of line with reality.

In comparison to the IOCs, the differences between the implicit judgements and the actual control experienced were smaller in the high competence PAS group, and both the low competence groups. This indicates that these participants were more accurate at estimating the conditional probabilities of the two responses on the task than they were at estimating the overall amount of control that they experienced. However, although the implicit judgements appeared to be more accurate, they only tracked with the actual control in the high competence PAS group. Therefore, the accuracy of the implicit systems in the low competence groups is questionable. In the high competence ACT group, the implicit judgements were significantly underestimated and out of line with the actual control, and the difference was larger than the IOC that was displayed, which suggests that the implicit systems of the participants were more out of line than the explicit systems. Additionally, the finding of no main effects in the ANOVA indicates that the implicit differences did not appear to be affected by the competence priming manipulations or the more reinforced response.

Regarding the explicit/implicit dissociation, parallel with previous experiments, the ANOVA found an explicit/implicit dissociation when collapsed across the competence and ACT/PAS variables. However, there was no effect of the competence priming manipulations, and the dissociation was generally not evident. Nevertheless, the dissociation was most apparent in the high competence PAS group, where participants significantly overestimated their explicit judgements, which were out of line with reality, and reported more accurate implicit judgements, which were in line with the actual experience. Therefore, the dissociation was most evident when participants were primed with high competence, and reward reinforcement was greater for passive responding. These findings did not support the hypothesis that the explicit/implicit dissociation would be clearer in the high competence condition compared to the low competence condition.

Once again, in the maximisation task, participants in the ACT groups made the more reinforced response from the learning phase more often than the participants in the

PAS groups. Therefore, when asked to maximise light onset, the participants who had received more reward reinforcement for passive responding in the learning phase chose to make more active responses in the subsequent task. This suggests the possibility that the participants did not understand the conditional probabilities, i.e. how often they were reinforced with green light onset for each response. However, it could also indicate that there is a general belief that to maximise an output, people need to be active to be effective. This would support research that links perceptions of control and active involvement (Langer, 1975).

Contrary to the hypothesis, neither the explicit nor the implicit systems were predictors of future response behaviour. Therefore, it appears that neither of these control judgements were accessed in later decision-making choices. This is not in line with Trivers (2000) theory of self-deception, that the less accurate explicit system would be more influential.

In summary, it appears that the implicit priming of competence and incompetence using the recall essays in order to influence perceived control and the IOC was unsuccessful. However, competence motivation and control motivation have long been associated, and this link is strongly present in the literature in both adult and child studies. The results suggested that the primed competence motivations might have been affected by the participants' experiences on the noncontingency task. Additionally, the variability in the self-reports of competence was high in the low competence condition after the recall essays were completed. Therefore, these methodological issues potentially caused the lack of support for the hypotheses.

7.4 General Discussion

7.4.1 Effectiveness of the priming manipulations

The effectiveness of the recall essays in priming both power and competence in this chapter is not straightforward. The experimenter's ratings indicated that the participants in both studies understood and followed the experimental instructions, with higher ratings in the high power and competence conditions, as well as greater levels of positive effect, as measured by the experimenter's ratings of liking (C. Anderson & Berdahl, 2002; Weisz et al., 1993). Interestingly though, there was a subgroup in the power experiment, as identified by the experimenter, whose recall essays contained less positive emotion content when primed with power. This pattern was not present in the

competence study, in which priming high competence was always accompanied by descriptions of positive emotion in the recall essays. However, a potential limitation of the experimenter ratings in both of the power and competence experiments is the absence of inter-rater agreement scores, which brings into question the reliability of the ratings. It is possible that the ratings of the content in the recall essays were subject to experimenter bias, which is further supported by the fact that the experimenter was privy to which priming condition (high or low) the essay was written for. Additionally, the ratings may have represented the experimenter's subjective ideas of what constitutes power, competence and emotion content, which may have been out of line with the participants' subjective understandings, and could possibly explain the disagreement between the two ratings.

In general, the participants' self-reported ratings were greater in the high power and competence conditions than in the low conditions, which supports the experimenter's ratings and suggests that the primes were successful. However, there was great variability in the self-reports across the high and low conditions in both experiments. Therefore, this suggests that the recall essays were not as effective as indicated by the experimenter's ratings.

Furthermore, the positive relationships between the two variables in the power study were somewhat aligned as expected, although negative relationships in the competence study suggested that whilst the competence content of the recall essays increased, the participants' perceived competence decreased. Therefore, the primes appeared to be more successful in the power study. However, the computer competence ratings of the participants in the high competence condition were more in line with the CxL. These second ratings were a methodological amendment in the competence study to examine whether the implicitly primed motivation remained consistent after the noncontingency task. However, this was not the case, and therefore has implications for the results of the power study, i.e. power ratings may have been significantly lower after completing the noncontingency task. This also implies that the priming manipulations were unsuccessful in these studies. This was an important finding as priming is intended to examine the influence on later tasks and perceptions (Utz et al., 2004), yet this suggests that the task significantly changed the amount of motivation, and could therefore be more influential on later tasks and perceptions.

7.4.2 Motivations and judgements of control

Neither study found support for the hypothesised association between the levels of primed motivation and the explicit judgements of control and the IOC. Instead, perceptions of control generally appeared to decrease as competence and power ratings increased, contrary to the hypotheses based on previous literature. Two possible contributing factors will now be discussed: the priming task and the noncontingency task.

Regarding the discussion in subsection 7.4.1, it is possible that the recall essays priming task was not a strong enough manipulation to produce the hypothesised effects, even though it has been effective across other studies (Fast et al., 2009; Galinsky et al., 2003). The advantages of the recall essays priming task were that it required participants to write about a personal experience, which should maximise the effects of the prime, and it was quick to administer. However, a future study may look at using the role-playing dyads power prime, which was discussed in the introduction to this chapter. It is possible that being in a powerful or subordinate position, rather than thinking and writing about it, may be a stronger manipulation. As stated in the literature review, the purpose of implicitly priming motivations is to study the effects on behaviour and perceptions in subsequent tasks and situations (Utz et al., 2004). However, there is evidence that priming manipulations are only influential for people who do not possess a stable social value orientation (Hertel & Fiedler, 1998). Therefore, this suggests that the effects of priming may be limited by individual differences in the traits that people possess.

Fast et al. (2009) found greater IOCs when participants were primed with power compared to participants primed with a lack of power using Langer's (1975) die-rolling paradigm. These studies aimed to increase the validity of these findings by finding the same results using the noncontingency task, where the subjective ratings of control can be compared to the objective experience. However, this was not supported, and it may be due to the differences in the task. Specifically, the noncontingency task is a more complex paradigm than the die-rolling paradigm, and how the illusion of control was operationalised was markedly different. In Fast et al.'s (2009) study, participants demonstrated an IOC if they chose to roll the die instead of the experimenter, whereas the IOC in this thesis was the difference between the participant's judgement of control and the actual amount of control experienced. Therefore, the IOC was quantifiable as opposed to being present or absent. Additionally, in Fast et al.'s (2009) study, the participants completed one trial, compared to 100 trials in these experiments. Whilst the number of trials in the noncontingency task aims to reduce the amount of control that a participant

can experience by chance, it also gives the participant more opportunities to identify that outcomes are not contingent on their responses. However, it is still the preferred task due to the greater validity it provides. Additionally, as discussed in Chapter Three (section 3.1), if self-deception is involved, people should still display an IOC despite more opportunities that could disconfirm their belief.

7.4.3 The explicit/implicit dissociation

Akin to the previous studies in the thesis, the explicit judgements of control were mostly inflated in comparison to the actual degrees of control, and were out of line with reality. Furthermore, the implicit judgements of control were generally smaller and more accurate when compared to the actual control that was experienced, but did not track it, except for in the high power ACT and high competence PAS groups. Likewise the explicit/implicit dissociation was only found in these two groups. Generally, the dissociation was not present across the high and low motivation and/or the active and passive responding groups. Therefore, the dissociation was unclear, although it was evident in both experiments when collapsed across conditions, which provides some support for Trivers (2000) theory of self-deception, that information in the implicit system is more accurate than in the explicit system.

In line with Trivers (2000) theory of self-deception, and Experiment 1, in which the 0% active-passive version of the noncontingency task was used, it was expected that the explicit judgements of control would be more accessible, and therefore more likely to influence future behaviour. However, in the competence study, neither the explicit nor the implicit judgements appeared to predict responses in the maximisation tasks, whilst the implicit judgements emerged as better predictors in the power experiment. Therefore, contrary to what was expected, it seems that future pressing behaviour was either influenced by the knowledge regarding the conditional probabilities or possibly random.

Additionally, in the maximisation tasks, there were no differences in response patterns across the high and low primed motivation conditions. However, in both studies, participants in the ACT groups made the more reinforced response than participants in the PAS groups. In general, it seems that participants in the PAS groups tend to make more active responses than passive responses. Therefore, this either undermines the belief that people have accurate knowledge of the conditional probabilities and can recognise when one response produces more of the desired outcome than another response, or it suggests that there is a universal belief that being active is more likely to produce the desired

outcome, and therefore participants ignore the probabilities that they observed in the learning task.

7.4.4 Depressive realism, motives and perceptions of control

The experimenter's ratings of liking suggested that high power and competence motives were associated with greater positive emotion content. However, in terms of negative emotion, the relationships with depression varied across both of the studies. In general, depression was not related to either of the motives, which is inconsistent with previous literature, except for in the low competence condition where reports of competence increased as depression decreased.

The depressive realism theory proposes that depressed individuals hold more accurate and realistic perceptions of their environment, whilst nondepressed people are more prone to positive illusions (Alloy & Abramson, 1979). However, the relationships between depression and perceptions of control also varied across these motive studies. In both of the low power and low competence conditions, depression did not appear to be related to explicit judgements or IOCs. In the high competence condition, non-significant negative relationships hinted at the notion of depressive realism, but positive relationships in the high power condition insinuated the opposite, that depression was related to greater perceptions of control. Therefore, there was weak support for the concept of depressive realism, and the high power condition instead provides support for the traditional viewpoint that better mental health is associated with accuracy and realism, whilst people with poor mental health are out of touch with reality (Jahoda, 1958).

7.4.5 Concluding comments

Following the results from Experiment 1, this chapter aimed to examine the effects of implicitly priming the power motive and the achievement/competence motive on perceptions of control. The results found that IOCs were present, with overestimations of explicit judgements of control, and more accurate estimates of the conditional probabilities. However, support was not found for a difference between the high and low conditions of the motives; high power and competence did not produce higher explicit judgements and IOCs, and therefore a greater explicit/implicit dissociation, than in the low power and competence conditions. Finally, support for the phenomenon of depressive realism was largely not present.

CHAPTER EIGHT

ATTRIBUTIONAL RETRAINING: EXPERIMENT EIGHT

The previous chapter investigated the effects of single-episode power and competence priming manipulations on IOCs, but failed to find a difference in the sizes of IOCs between priming high and low levels of these motivations. In Chapter Six, Experiment 4 measured the IOC at two time points, with no intervention between the baseline and follow-up sessions. The study found IOCs to be stable and enduring over time. This chapter aims to expand on these experiments by investigating the effects of a multiple-episode attributional retraining intervention, which is based on attribution theory. The literature review will introduce the attribution theory and outline the attributional retraining research and the associations with the IOC literature. This will be followed by Experiment 8, which will explore whether this intervention has an effect on individuals' perceptions of control.

8.1 Attribution Theory Literature Review

8.1.1 Attribution theory, dimensions and explanatory styles

Attribution theory is a social cognitive theory of motivation and achievement that explores perceived causation of events and outcomes (Kelley & Michela, 1980; Weiner, 1972). In his model of attribution theory, Weiner (1972, 1979) suggested that people make causal attributions to explain events and the perceived reasons behind success and failure outcomes. Subsequently, these causal attributions affect present and future behaviour, cognitions and emotions, and influence expectations about future events and outcomes (Kelley & Michela, 1980).

The attribution theory was developed from an idea originally proposed by Heider (1958, as cited in Perry, Hechter, Menec & Weinberg, 1993), as he endeavoured to understand how people interpret their social environment and explain other people's behaviour. He suggested that people tend to explain the behaviour of others with internal (person-based) attributions, such as personality traits, ability or effort, whereas they explain their own behaviour with external (situation-based) attributions, such as other

people, task difficulty or luck. This internal vs. external dichotomy was later defined as the locus dimension by Weiner (1979). Alongside the locus of control/causality dimension, Weiner's (1972, 1979) theory of achievement attribution identified two other properties that causal attributions share: stability and controllability. Stability (stable vs. unstable) refers to the same causal attribution being present when the same situation next occurs, and therefore influences the expectancy of future success or failure. Controllability (controllable vs. uncontrollable) refers to the amount the perceived cause is under the control of the individual. For example, a person can control the amount of effort they expend in a situation.

Three additional dimensions have since been acknowledged and incorporated in to the model of attribution: globality, intentionality, and changeability (C. A. Anderson, 1983). Globality (global vs. specific) refers to whether the cause is specific for that situation or is generalised to different situations (Alloy, Peterson, Abramson & Seligman, 1984; Weiner, 1985). For example, if the causal attribution is specific, then a person might expect to fail their social psychology exam, whereas he/she might expect to fail all of their psychology exams if the cause is perceived as global. Intentionality (intentional vs. unintentional) refers to how much the cause demonstrates an intention, i.e. something done purposely/knowingly (Weiner, 1979, 1985). Finally, changeability (changeable vs. unchangeable) refers to whether the factors influencing the causal attribution can be changed by the person (C.A. Anderson, Horowitz & French, 1983). For example, ability may be regarded as enduring and unchangeable, whereas the amount of effort invested can be increased or decreased.

When an individual characteristically makes specific causal attributions, this is defined as their attributional style, and can affect the person's expectancies, performance and motivation (C. A. Anderson et al., 1983). Self-enhancing attributional styles should be encouraged over self-defeating styles. An example of a pessimistic (unhealthy) attributional style is one where successes are attributed to external, unstable and specific factors, whilst failures are attributed to internal, stable and global factors, and vice versa for an optimistic (healthy) attributional style (Abramson, Seligman & Teasdale, 1978; Proudfoot, Corr, Guest & Dunn, 2009). A pessimistic style is likely to lead to feelings of hopelessness and is characteristic of people with depression, as well as being indicative of someone who may be susceptible to depression (Nolen-Hoeksema, Girgus & Seligman, 1986, 1992; Peterson et al., 1982).

8.1.2 Attribution retraining interventions: Changing attributional style

As discussed in the previous section, individuals tend to have an established attributional style, which concerns how people characteristically explain the outcomes and events that occur in their environment. Attribution retraining (AR) is a form of cognitive therapy, of which the principal purpose is to modify a person's attributional style, i.e. their causal attributions about their successes and failures (Perry et al., 1993). Specifically, it is necessary to identify people who have pessimistic and self-defeating attributional styles, and to change these to optimistic and self-enhancing attributional styles. For example, if failures are attributed to internal, stable and global factors, so that the individual believes these outcomes are due to their inability and generalisable over time and situations, this style needs to be replaced with a style where failures are attributed to external, unstable and specific factors. This will lead to an increase in achievement motivation, perceived control, and adaptability to the environment (Weiner, 1979).

AR interventions have been found to be successful, with both short-term and long-term benefits for adults and children in a wide range of situations, such as increasing amount of walking in sedentary elderly people (Sarkisian, Weiner, Davis & Prohaska, 2007), increasing work productivity, job satisfaction and reducing employee turnover in the workplace (Proudfoot et al., 2009). Single-episode AR interventions have commonly shown first-year university students videotaped interviews of senior students, discussing how academic performance improved after first year. Findings indicated that changing stable attributions to unstable attributions was successful at increasing subsequent performance and grade attainment (Perry et al., 1993; Wilson & Linville, 1982). This research was extended, so that the students in the interviews discussed how they originally attributed their failures to external causes such as bad teachers, but over time changed these to internal causes such as effort (Noel, Forsyth & Kelley, 1987). This lead to a shift from external, uncontrollable attributional styles to internal, controllable attributional styles, and resulted in higher grades in the students' final exams.

Additionally, Craske (1988) was successful at changing attributional style in school children by encouraging them to explain their failures in terms of a lack of effort, rather than a lack of ability, both of which are internal factors on the locus of control dimension. Therefore, changing attributions from internal, stable and uncontrollable causes (inability) to internal, unstable and controllable (degree of effort), improved performance through the children trying harder. Importantly, this increased their expectations of future success.

Clinical research has focused on replacing the pessimistic (unhealthy) explanatory styles of people with depression with optimistic (healthy) styles via AR interventions (Dieser & Ruddell, 2002). Therapists challenge the individuals' attributions and suggest healthier possible explanations for the patients to consider (Wang, Zhang, Li, Zhang & Zhang, 2011). For example, Dieser and Ruddell (2002) found that a 4-week intervention using optimistic verbal messages in therapy sessions successfully affected stability and personal control attributions compared to a control group. Furthermore, an 8-week AR group therapy intervention was successful at changing maladaptive attributional styles to more adaptive styles, and reducing symptoms in groups of patients with major depressive disorder, generalised anxiety disorder and obsessive-compulsive disorder (Wang et al., 2011). Consequently, AR interventions lead to improvements in health and well-being.

8.1.3 Attributional research and the IOC

The dimension of controllability in attribution theory posits that people attribute events and outcomes to controllable and uncontrollable factors, and therefore refers to the perceived amount of control that the individual has over the cause (Weiner, 1972, 1979). A healthy and optimistic attributional style is one in which events are attributed to controllable factors, such as effort and strategy, rather than uncontrollable factors such as luck and task difficulty (Perry et al., 1993). When events are attributed to controllable factors, there is the adaptive advantage that people are more likely to be motivated to work harder to achieve their goals (Kelley & Michela, 1980), which parallels research regarding positive illusions (Gollwitzer & Kinney; Taylor & Gollwitzer, 1995).

Furthermore, the literature on learned helplessness and depression postulates that a sustained perception of no control is likely to lead to feelings of anxiety, stress and depression (Peterson & Seligman, 1984). Therefore, greater levels of perceived controllability are associated with increased levels of subjective well-being (Abbey & Halman, 1995). This is in line with research on depressive realism and the IOC, in which nondepressives were more likely to report higher levels of control than depressives, who were more likely to show small or no IOCs (Alloy & Abramson, 1979). To consolidate the research on attribution theory and depressive realism, AR interventions have resulted in an increase in perceived control and a decrease in symptoms of depression by replacing maladaptive attributional styles with more adaptive styles (Dieser & Ruddell, 2002). However, whilst there are connections between perceived control and attribution theory,

there have been no studies that have investigated the effects of attribution retraining on illusions of control.

8.2 Experiment 8: Attributional Retraining Intervention

The aim of this study is to investigate the effects of an AR intervention on the IOC and on symptoms of depression. Whilst some studies have examined perceived control (external/internal locus of control), this appears to be the first study to explore the effects of an AR intervention on illusions of control. Based on the literature review, attributional retraining should change attributional styles from pessimistic to more optimistic. Therefore, in the experimental group receiving the intervention, a decrease in the participants' self-reports of depression and an increase in their levels of optimism are hypothesised, accompanied by an increase in their IOCs. No change in either variable is expected in the control group. In line with the previous experiments in the thesis, it is expected that the participants will demonstrate more accurate knowledge of the conditional probabilities, in comparison to the overestimated explicit judgements of control. In addition, it is hypothesised that the explicit/implicit dissociation will increase at the post-test in the experimental group, due to the intervention increasing explicit judgements.

8.2.1 Methods

Participants

There were 46 participants recruited at the pre-test phase from a sample of 52 participants recruited by the other investigator for a study investigating an intervention for AR. Participation was optional and they were recruited during the first session of the AR study. Participation in the AR and IOC post-tests was dependent on full completion of the AR intervention. Ten participants dropped out over the 4-week AR study, so the final sample size at the post-test was 36 participants (28 females; age $M = 22.14$, $SD = 5.18$). All participants were undergraduate students at Bangor University, and they were paid £10 on completion of both the pre-and post-sessions.

Design

Attribution Retraining. A repeated-measures design was used. The independent variable was whether the participants received the AR intervention. There was an experimental condition (n = 21), which received the 4-week attribution retraining, and a

control condition (n = 15), that carried out tasks unrelated to attribution retraining. A battery of questionnaires were completed at both the pre-and post-tests: Attributional Style Assessment Test (ASAT-I), Dimensions of Conscience Questionnaire, Others as a Shamer Scale, Life Orientation Test Revised (LOT-R), Schizotypal Personality Questionnaire, Rosenberg's Self Esteem Scale, Positive and Negative Affect Schedule (PANAS) and memory recall and recognition. Only the scores from two of these listed dependent measures were of interest in my analysis: the ASAT-I (see Appendix U) and the LOT-R (see Appendix V). The ASAT-I was included as it provides a score for the attributional style, and the LOT-R measures dispositional optimism. Participants completed the baseline tests in the first session, followed by two sessions of intervention, concluding with the post-test in session four.

Perceptions of Control. See the Methods section in Chapter Five (subsection 5.1.1). The baseline data for this study was collected after the participants completed the baseline session (Session 1) of the AR study, but before they started the 2-week intervention phase (Session 2). Participants completed the post-test perceptions of control study after they completed the AR post-test session (Session 4). The format and procedure of the post-test was identical to the pre-test.

Measures

ASAT-I. The Attributional Style Assessment Test is a 20-item measure of hypothetical situations, in which participants choose the explanation for an outcome that is most appropriate to them. Each item has 6 possible explanations corresponding to the following attributional factors: strategy, ability, effort, personality traits, mood, and circumstances. Half of the situations were classified as interpersonal, and the other half as noninterpersonal. Also, half of the situations described successes and the other half described failures. This resulted in four classification groups, each containing 5 items: interpersonal success, interpersonal failure, noninterpersonal success, and noninterpresonal failure. The reliabilities of the ASAT measures range between .40 and .70 (C. A. Anderson et al., 1983).

LOT-R. The Revised Life Orientation Test is a 10-item measure of dispositional optimism, i.e. the general expectation that good things will happen. It comprises 3 questions measuring optimism, 3 measuring pessimism, and 4 filler questions. The items are rated on a Likert scale from 0 (strongly disagree) to 4 (strongly agree). The alpha coefficient for internal consistency is .78 (Scheier, Carver & Bridges, 1994).

Procedure

AR Session 1: Participants filled in the consent form and then completed a pack of questionnaires containing the ASAT-I, Dimensions of Conscience Questionnaire, Others as a Shamer Scale, LOT-R, Schizotypal Personality Questionnaire, Rosenberg's Self Esteem Scale and the PANAS. Following this, they were shown 20 items of memory stimuli via a Powerpoint presentation, with one item per slide, each presented for 10 seconds. The investigator advised the participants to pay attention, as they would be tested on the number of words they could remember in the next session. The participants were asked if they wanted to sign up to the optional perceptions of control part of the study, and signed up to timeslots.

The participants filled in the consent form for the perceptions of control study, and then the baseline data was collected using the procedure outlined in the Methods section in Chapter Five (subsection 5.1.1).

AR Session 2: Participants were asked to recall as many words as they could in 5 minutes from the stimuli presented the previous week. They were then given a memory recognition sheet and instructed to circle all the words they recognised from the stimuli within another time limit of 5 minutes. Participants in both conditions were given 12 scenarios (see Appendix W) from the Attributional Style Questionnaire (Peterson et al., 1982) and completed an attribution exercise sheet. The experimental condition was presented with five columns to complete for each scenario: Antecedents, Beliefs, Causes, Disputing Evidence and Evaluation (see Appendix X). Participants in the control condition only completed the first three columns (see Appendix Y). Therefore, the attribution retraining part was the last two columns (D and E). In addition, the experimental condition was also given examples of healthy attribution styles in success and failure situations. All participants were given 3 attribution evaluations to complete in their own time during the three weeks between the second and third sessions.

AR Session 3: All participants were given 12 hypothetical situations (see Appendix Z) chosen from the Attributional Style Questionnaire for General Use (Dykema, Bergbower, Doctora & Peterson, 1996) and filled in their respective attribution exercise sheets (same as Session 2) for each situation. The experimental condition had the extra information about attribution styles repeated to them. At the end of the session, all participants were presented with a new set of 20 memory stimuli words, in the same format as in Session 1.

AR Session 4: As in Session 2, participants were given 5 minutes for the memory recall task, and 5 minutes for the recognition task. They then completed the battery of questionnaires from Session 1. Finally the participants were debriefed and paid for their participation in the AR part of the study. They then signed up to timeslots for the post-test session of the perceptions of control part of the study.

The procedure for collecting the post-test data for the perceptions of control study was identical to the baseline session. After participants completed both the noncontingency task and the personality and depression measures, they were debriefed (see Appendix AA) and paid for their participation in this part of the study.

8.2.2 Results

This results section will firstly examine the effectiveness of the AR intervention regarding the attribution scores on the ASAT-I. Secondly, the explicit judgements and IOCs will be examined, as well as the relationships with the well-being measures. Finally, data regarding the explicit/implicit dissociation and maximisation task will be analysed.

Attribution Retraining Intervention

The analysis of the ASAT-I scores via *t*-tests found that there were no significant differences between pre-and post-test scores in either the control or the experimental groups. However, the directions of the small attribution changes were as expected. Following the intervention in the experimental group, outcomes/events in positive, successful situations became more attributed to internal stable causes, and less attributed to internal unstable and external factors. Conversely, in the control condition, positive, successful outcomes/events became more attributed to internal unstable factors, and less attributed to internal stable and external causes (see Figure 8.1).

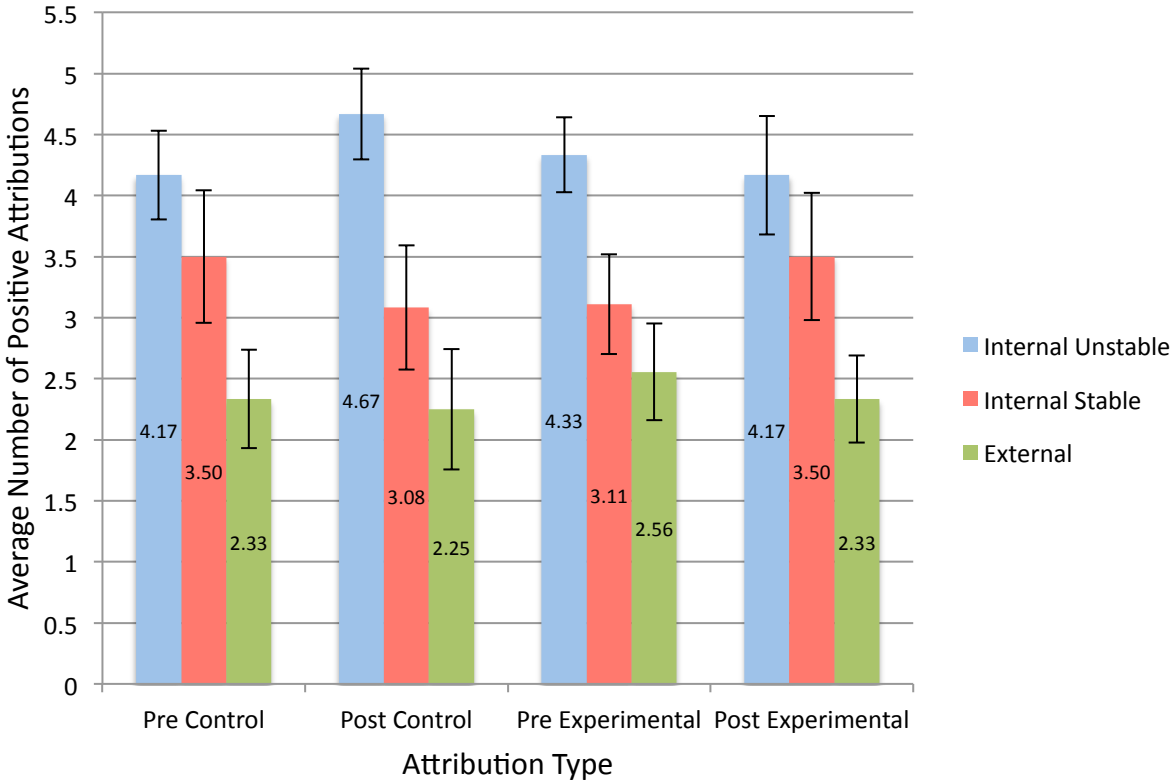

Figure 8.1. Positive internal unstable, internal stable and external attribution scores in the control and experimental conditions across the pre-and post-tests. Error bars represent the standard error of the means.

Also in the experimental condition, negative outcomes/events became more attributed to internal unstable and external causes, and less attributed to internal stable factors, whilst in the control condition, they became more attributed to internal stable causes, and less to internal unstable causes, with no change in external attributions (see Figure 8.2).

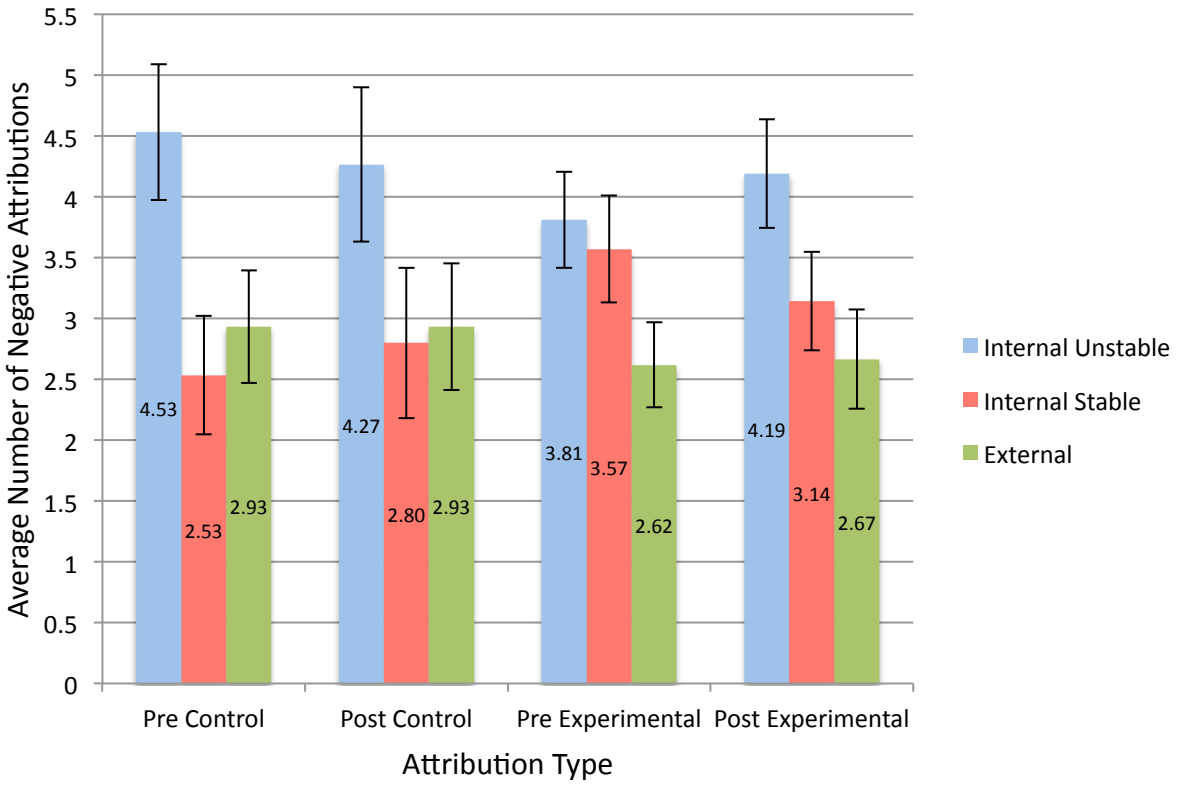

Figure 8.2. Negative internal unstable, internal stable and external attribution scores in the control and experimental conditions across pre-and post-tests. Error bars represent the standard error of the means.

Illusions of Control

During the pre-test, the explicit judgements in the control group ($M = 33.00$, $SD = 24.84$) and the experimental group ($M = 43.10$, $SD = 20.52$) were overestimated in comparison to the actual control in both groups ($M = 8.03$, $SD = 5.74$, and $M = 5.69$, $SD = 5.83$). Likewise, in the post-test, the explicit judgements in the control ($M = 36.67$, $SD = 26.90$) and experimental groups ($M = 56.67$, $SD = 22.44$) were also greater than the actual control that was experienced in both groups ($M = 9.36$, $SD = 6.10$, and $M = 7.37$, $SD = 6.16$). Therefore, IOCs were displayed in both the control and experimental groups at both the pre-and post-tests (see Figure 8.3).

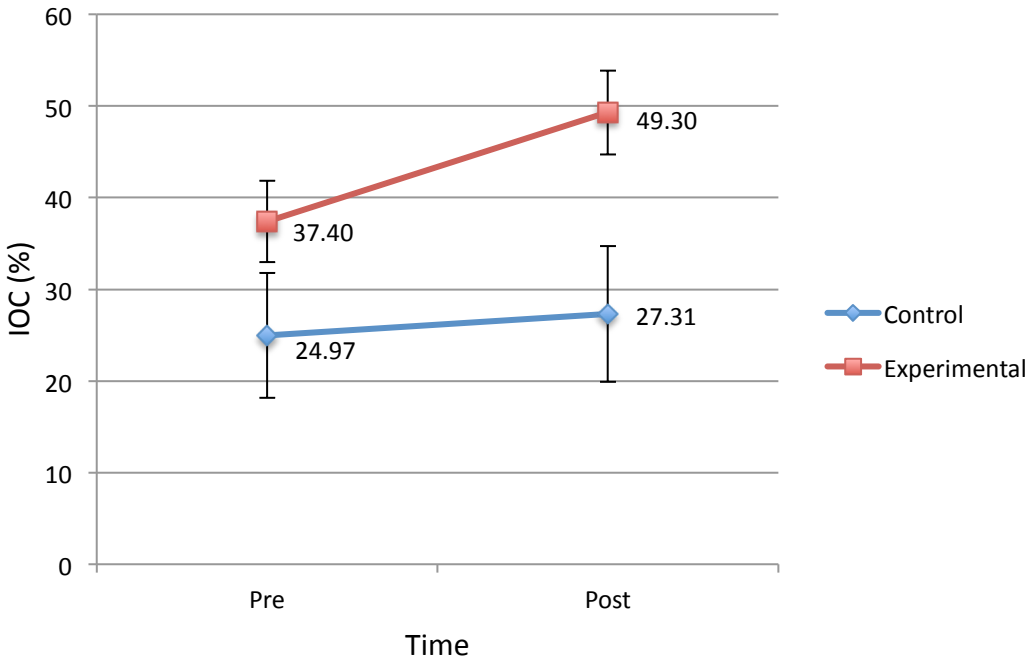

Figure 8.3. Comparison of the IOCs in the control and experimental groups across the pre- and post-tests. Error bars represent the standard error of the means.

T-tests indicated that the IOCs were significantly different from zero in both the control and experimental groups at the pre-test, $t(14) = 3.66$, $p = .003$, and $t(20) = 8.43$, $p < .001$ respectively, and at the post-test, $t(14) = 3.68$, $p = .002$, and $t(20) = 10.76$, $p < .001$, respectively. Therefore, it is apparent that all participants overestimated their judgements of control compared to the actual amount they experienced in the task.

In line with previous experiments, there were no significant relationships between the explicit judgements and actual control in both the control and experimental conditions at the pre-test, $r(13) = -.17$, $p = .55$, and $r(19) = .17$, $p = .45$, respectively, and at the post-test, $r(13) = -.20$, $p = .47$, and $r(19) = .36$, $p = .11$, respectively (see Figure 8.4). Therefore, the lack of significance suggests that the participants' judgements of control did not track the actual control. Indeed, in the control groups, the negative correlations indicate that as the actual amount of control increased, the explicit judgements of control decreased.

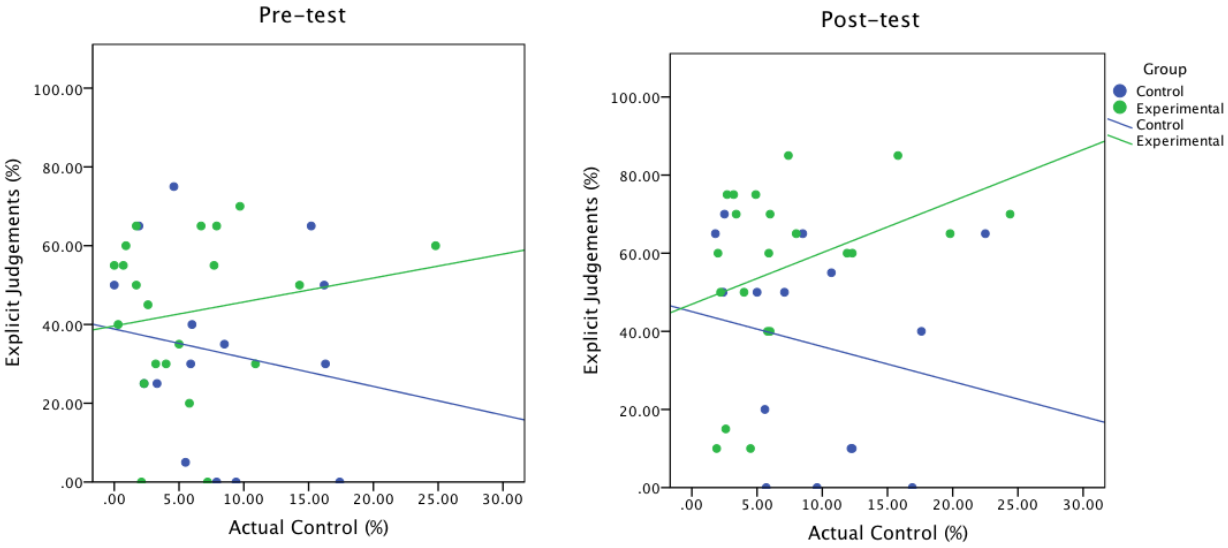

Figure 8.4. Comparison of the relationships between explicit judgements of control and the actual control in the control and experimental groups at the pre-and post-tests.

Regarding the effects of the AR intervention on the participants' IOCs, a mixed-design ANOVA with time (pre IOC and post IOC) as the within-subjects factor, and group as the between-subjects factor was performed. The ANOVA did not find a significant main effect of time, $F(1, 34) = 2.15$, $p = .15$, which suggests that IOCs did not differ across the pre-and post-tests when collapsed across group. However, there was a significant main effect of group, $F(1, 34) = 7.20$, $p = .01$. In particular, when collapsed across time, the IOCs of participants in the experimental condition ($M = 43.35$, $SE = 4.14$) were greater than the IOCs of participants in the control condition ($M = 26.14$, $SE = 4.90$).

The ANOVA did not find a significant interaction between time and group, $F(1, 34) = 0.97$, $p = .33$, which indicates that there was not an effect of the intervention on the IOCs. However, there did appear to be a weak effect of the AR intervention, and this section will discuss the differences between the control and experimental conditions across the two time points. At the pre-test, an independent-samples *t*-test found that the IOCs in the control group ($M = 24.97$, $SD = 26.42$) and the experimental group ($M = 37.40$, $SD = 20.34$) were not significantly different, $t(34) = -1.60$, $p = .12$, respectively. Therefore, prior to the intervention, the perceptions of control were similar across the groups.

At the post-test, an independent-samples *t*-test found that the IOCs in the control group ($M = 27.31$, $SD = 28.77$) and the experimental group ($M = 49.30$, $SD = 21.01$) were significantly different, $t(34) = -2.66$, $p = .01$, respectively. Therefore, after the AR intervention, the illusions of control of the participants in the experimental group were

significantly greater than the participants in the control group.

In the control group, who did not receive the AR intervention, a paired-samples *t*-test found that there was not a significant difference between the participants' IOCs at the pre-and post-tests, $t(14) = -0.28$, $p = .79$. Therefore, the IOCs remained similar across the two time points. However, in the experimental group, a paired-samples *t*-test found a significant difference in IOCs between the two time points, $t(20) = -2.15$, $p = .04$. Therefore, the IOCs were significantly greater after the participants had received the 4-week AR intervention.

Depression and Optimism

Participants in the control condition did not report a significant change in their symptoms of depression from the pre-test ($M = 18.80$, $SD = 11.28$) to the post-test ($M = 16.60$, $SD = 12.51$), $t(14) = 1.31$, $p = .21$. Likewise, in the experimental condition, there was no change between pre-test ($M = 19.10$, $SD = 10.93$) and post-test ($M = 17.90$, $SD = 11.57$), $t(20) = 0.77$, $p = .45$. Furthermore, the scores on the BDI were not significantly correlated with the IOCs in the control or the experimental conditions, $r(13) = -.27$, $p = .33$, and $r(19) = -.05$, $p = .84$.

Similarly, the participants' self-reports of optimism on the LOT-R measure were not significantly different in the control and experimental conditions from pre-test ($M = 14.31$, $SD = 3.77$ and $M = 15.15$, $SD = 4.28$ respectively) to the post-test ($M = 15.31$, $SD = 3.88$ and $M = 14.80$, $SD = 3.83$ respectively), $t(12) = -1.21$, $p = .25$ and $t(19) = 0.43$, $p = .67$, respectively. Furthermore, at the post-test, the scores of optimism were not significantly correlated with the IOC in the control or experimental conditions, $r(11) = .19$, $p = .53$, and $r(18) = -.41$, $p = .07$, although the latter relationship was trending.

Dissociation of Explicit and Implicit Judgements

The differences between the implicit judgements of control and the actual control were calculated for each group. As can be seen in Figure 8.5, the differences in the control group at both the pre ($M = 8.31$, $SD = 26.10$) and post-tests ($M = 2.64$, $SD = 25.84$) were positive, signifying that the participants somewhat overestimated their implicit judgements compared to the actual values of control in the pre-test, but were very accurate in the post-test. In comparison, the differences reported by participants in the experimental group at both the pre ($M = -5.93$, $SD = 23.00$) and post-tests ($M = -11.41$, $SD = 28.03$) were

negative, which indicates that the implicit judgements were somewhat underestimated in relation to the actual control experienced.

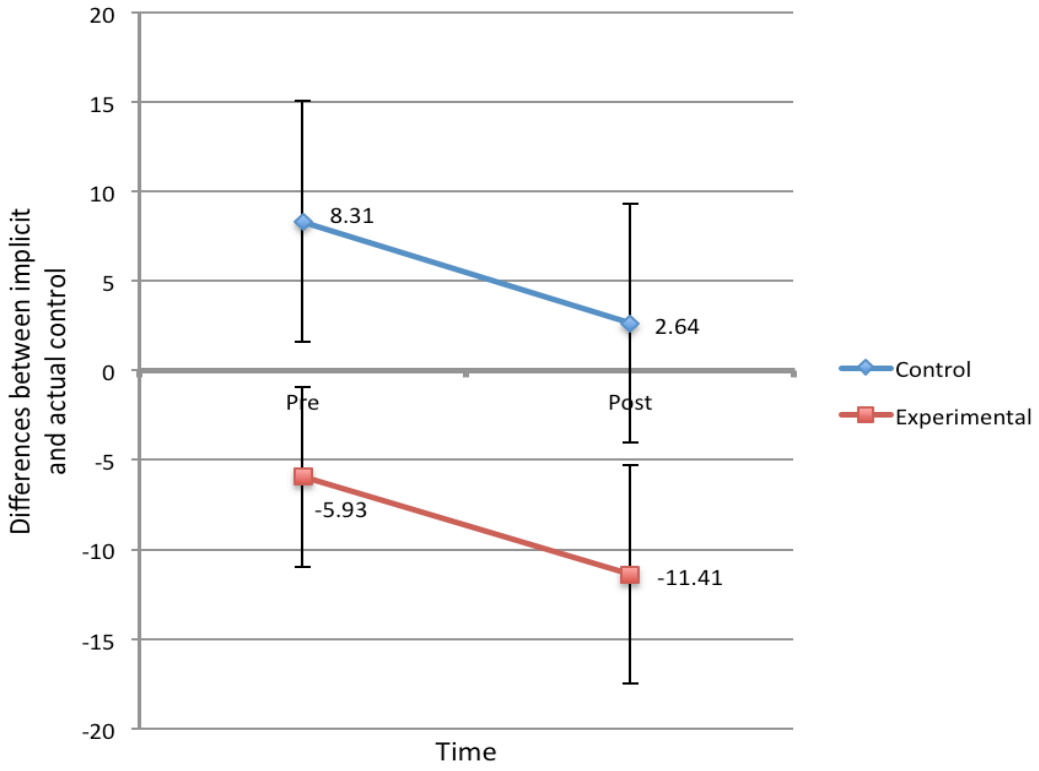

Figure 8.5. Comparison of the differences between implicit and actual control across treatment groups and time (pre-and post-tests). Error bars represent the standard error of the means.

T-tests indicated that the differences between the implicit judgements and actual control were not significantly different from zero in both the control and experimental groups at the pre-test, $t(14) = -1.23$, $p = .24$, and $t(20) = 1.18$, $p = .25$, respectively, and at the post-test, $t(14) = -0.40$, $p = .70$, and $t(20) = 1.87$, $p = .08$, respectively. Therefore, the implicit judgements of control were similar to the actual control experienced, which suggests that the participants' knowledge of the conditional probabilities was accurate. Although, the difference was trending in the experimental condition's post-test, which suggests that the implicit control was largely underestimated compared to the actual control.

Figure 8.6 shows the correlations between the implicit and actual control variables. There were no significant relationships in either the control or experimental groups at the pre-test, $r(13) = .42$, $p = .12$, and $r(19) = .29$, $p = .20$, respectively, or at the post-test, $r(13) = .21$, $p = .44$, and $r(19) = .41$, $p = .07$, respectively. Therefore, these correlations indicate

that the implicit judgements did not track the actual control. Although, the correlation in the experimental group's post-test was approaching significance, which would suggest that the variables were more in line with each other in this group.

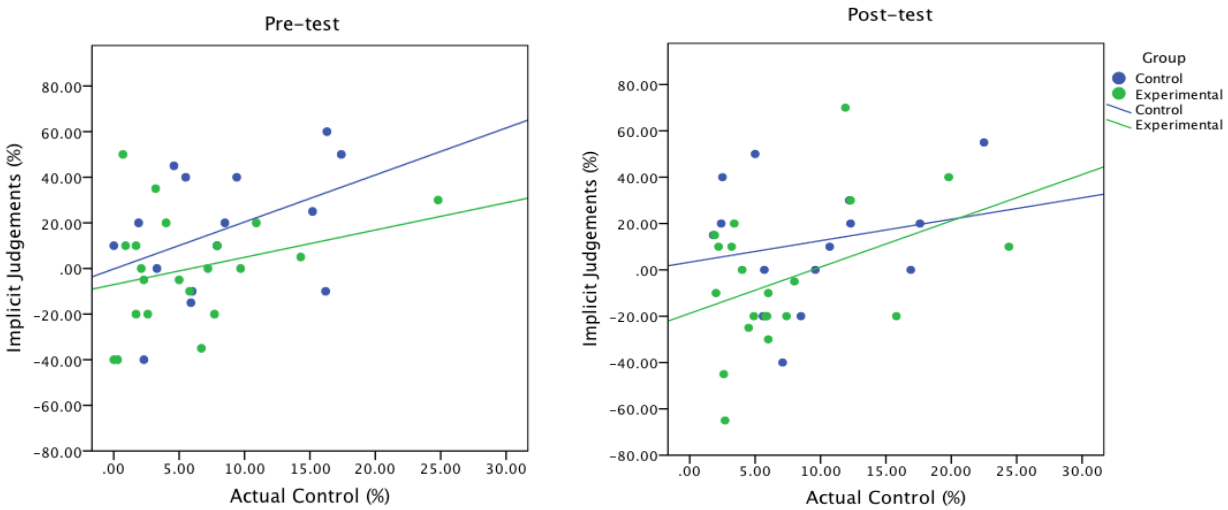

Figure 8.6. Comparison of the relationships between implicit and actual control across the control and experimental conditions at pre-and post-tests.

A mixed-design ANOVA with judgements (explicit and implicit) and time (pre and post) as within-subjects factors, and group as the between-subjects factor found a significant main effect of judgements, $F(1, 34) = 76.77$, $p < .001$. Therefore, when collapsed across time and group, the explicit judgements ($M = 42.36$, $SE = 3.30$) were greater than the implicit judgements ($M = 6.01$, $SE = 3.43$). However, there were no main effects of time, $F(1, 34) = 0.53$, $p = .47$, or group, $F(1, 34) = 0.01$, $p = .91$.

Also, there was a significant 2-way interaction between judgements and group, $F(1, 34) = 14.29$, $p = .001$. Therefore, the explicit judgements in the control condition ($M = 34.83$, $SE = 5.04$) and the experimental condition ($M = 49.88$, $SE = 4.26$) were significantly greater than the implicit judgements in the control condition ($M = 14.17$, $SE = 5.24$) and the experimental condition ($M = -2.14$, $SE = 4.43$), when collapsed across time. However, there were no significant 2-way interactions between time and group, $F(1, 34) = 0.69$, $p = .41$, or judgements and time, $F(1, 34) = 2.19$, $p = .15$. Finally, and most importantly, there was not a significant 3-way interaction between judgements, group and time, $F(1, 34) = 0.30$, $p = .59$, which indicates that the training effect was not significant.

The graphs in Figure 8.7 compare the explicit and implicit judgements across the pre-and post-tests in the control and experimental groups. The explicit judgements of

control were consistently higher than the implicit judgements of control. However, in the control condition, the difference was not significant at the pre-test, $t(14) = 1.65$, $p = .12$, but was significant at the post-test, $t(14) = 2.91$, $p = .01$. In the experimental condition, the explicit judgements were significantly higher at both the pre-and post-tests, $t(20) = 6.03$, $p < .001$, and $t(20) = 7.65$, $p < .001$, respectively.

In addition, the explicit judgements in the control condition did not change significantly from the pre-test to the post-test, $t(14) = -0.48$, $p = .64$, whereas in the experimental condition, the explicit judgements were significantly greater at the post-test, $t(20) = -2.72$, $p = .01$. The implicit judgements did not change significantly across pre-and post-tests in either the control or experimental conditions, $t(14) = 0.45$, $p = .66$, and $t(20) = .50$, $p = .63$.

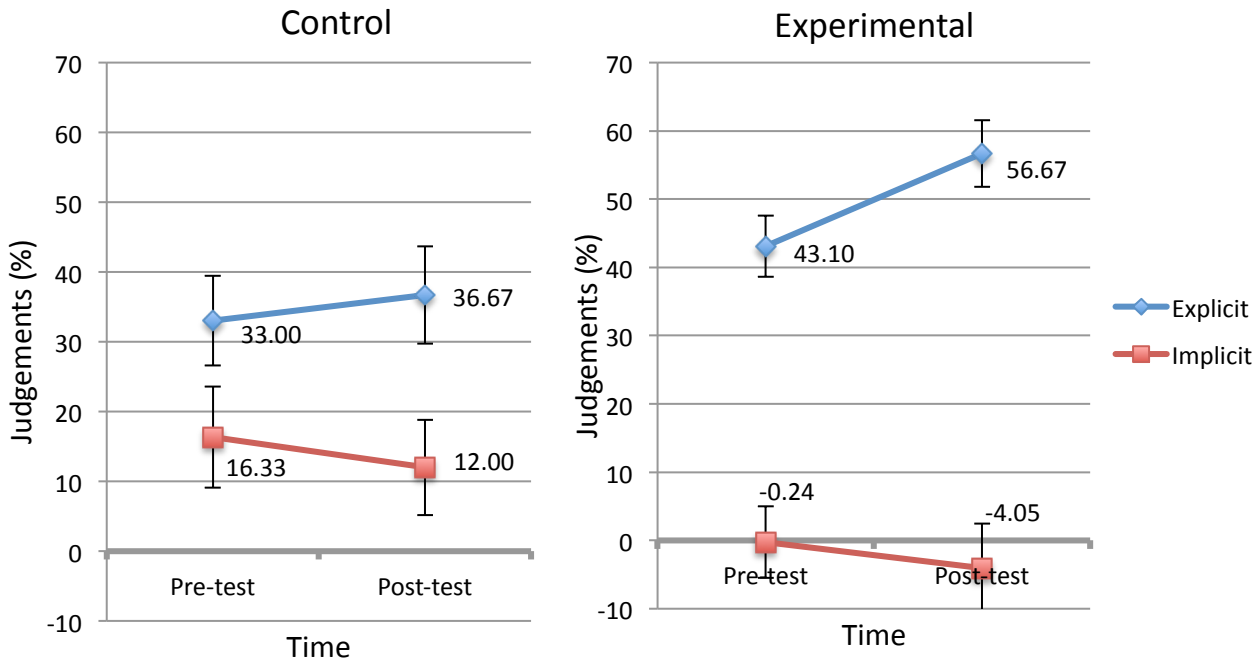

Figure 8.7. Comparisons of the explicit and implicit judgements across the treatment groups and time. Error bars represent the standard error of the means.

Interestingly, there appeared to be differences between the control and experimental condition at the pre-test, before the intervention had been administered. Although the differences were not significant, the explicit judgements of control in the experimental group ($M = 43.10$, $SD = 20.52$) were greater than in the control group ($M = 33.00$, $SD = 24.84$), $t(34) = -1.33$, $p = .19$. Therefore, the IOCs were also higher in the experimental group prior to the intervention ($M = 37.40$, $SD = 20.34$) in comparison to the

control group (M = 24.97, SD = 26.42), $t(34) = -1.60$, $p = .12$. This will be reviewed in the discussion (subsection 8.2.3).

Maximisation Task Behaviour

To determine whether either system was predictive of future responding in the maximisation task, the explicit and implicit judgements were entered into a multiple regression model. I will firstly present the regression models for the control and experimental conditions at the pre-test, followed by the models at the post-test.

At the pre-test, the two-factor model did not give a significant prediction of Q-key press in the control group, $R = .26$, $R^2 = .07$, $F(2, 12) = 0.44$, $p = .66$. Conversely, the model was significant for the experimental group, $R = .66$, $R^2 = .43$, $F(2, 18) = 6.78$, $p = .01$. Specifically, it was the implicit system that was predictive of responses, $\beta = .62$, $t(20) = 3.49$, $p = .003$, not the explicit system, $\beta = .26$, $t(20) = 1.47$, $p = .16$. Therefore, this appears to be another pre-test difference between the control and experimental groups.

At the post-test, the two-factor models for both the control and experimental groups were predictive of subsequent Q-key press, $R = .64$, $R^2 = .42$, $F(2, 12) = 4.26$, $p = .04$, and $R = .88$, $R^2 = .77$, $F(2, 18) = 30.07$, $p < .001$, respectively. In the control group, the implicit judgements emerged as the significant predictor, $\beta = .60$, $t(14) = 2.66$, $p = .02$, but not the explicit judgements, $\beta = .12$, $t(14) = 0.54$, $p = .60$. However, in the experimental group, both the explicit and implicit judgements emerged as significant predictors, $\beta = .24$, $t(20) = 2.08$, $p = .05$ and $\beta = .83$, $t(20) = 7.34$, $p < .001$, respectively.

8.2.3 Discussion

Regarding the effectiveness of the AR intervention, there were no significant changes in ASAT-I scores between the pre-and post-tests in the experimental group. Therefore, these small changes indicate that the intervention was not successful at changing attributional style, which is unsupportive of the hypothesis. However, although not significant, the directions of the changes in the ASAT scores were indicative of a more optimistic attribution style, which generates some support for the hypothesis that the intervention would result in healthier attributions in the experimental group.

For example, at the post-test, positive outcomes/events became more attributed to internal stable factors (ability and personality), and less to internal unstable (effort and strategy) and external factors (mood and circumstances). This is healthier because these

participants were more likely to believe that they can cause positive events, rather than them occurring due to factors such as luck. At the same time, negative outcomes/events became more attributed to internal unstable and external factors, and less attributed to internal stable factors. Therefore, this suggests that post-intervention, participants in the experimental group were more likely to think that negative events are caused by factors unrelated to themselves, such as luck, and to factors that they can influence, i.e. more effort can be expended, and strategies can be modified and improved. This is healthier than negative events being reflective of their inability. In comparison, the changes in attribution scores were in the opposite direction for participants in the control condition, with negative events being more attributed to internal stable factors, which is indicative of a more pessimistic style (Abramson et al., 1978). Therefore, the small changes in attributions indicate a more pessimistic attributional style for participants who did not receive any retraining, and a more optimistic attributional style for participants who did receive the AR intervention.

Although the attribution changes were in the expected direction, the scores of dispositional optimism on the LOT-R were not reflective of these changes. Indeed, levels of optimism increased in the control condition who did not receive the intervention, and who experienced small changes in attribution style towards a more pessimistic style. Conversely, in the experimental condition, participants who received the intervention and reported small changes towards a more healthy optimistic attribution style reported less overall optimism at the post-test. Therefore, the AR intervention did not result in a significant increase in optimism as hypothesised. Furthermore, the negative relationship between levels of optimism and IOCs in the experimental condition at the post-test suggests that decreases in optimism were associated with greater illusions. This is unsupportive of the concept of depressive realism, in which a positive relationship between well-being and illusions is theorised (Alloy & Abramson, 1979; Taylor & Brown, 1988).

Moreover, the self-reports of depression levels on the BDI were not significantly lower in the experimental group after the post-test, which is unsupportive of the hypothesis that the AR intervention would decrease participants' levels of depression and increase their well-being. However, unlike the levels of optimism, there was a small decrease in the levels of depression, which is at least trending in the anticipated direction. However, the levels of depression decreased more for participants in the control condition, who did not receive the intervention, which was not theorised. Reasons for this will be explored in the

discussion of the limitations of the methods used in the AR intervention. Furthermore, there was a negative relationship between depression and IOCs in the control condition, so that there was an inclination for IOCs to increase as depression decreased, which is in line with the idea of depressive realism, but this was not supported in the experimental condition in which there was no relationship between the variables.

As previously discussed, the intervention was unsuccessful at significantly changing attribution style and increasing well-being. The reasons for this include that the procedures experienced in the groups may not have been sufficiently different and the intervention was not strong enough in the experimental group. The AR part of the study was columns D and E on the attribution exercise sheet, which instructed participants to dispute the evidence that they had provided in column C about the causality of the events/outcomes, and then to evaluate their previously made attributions, i.e. did they now think that there could have been alternative causes? However, both the experimental and control groups were required to complete the first three columns (A, B and C) on the exercise sheet. Therefore, filling out these columns on the form, particularly the causality column (C) may have prompted participants in the control condition to think about their attributions.

Regarding the strength of the intervention, the participants in the experimental condition only received two sessions of AR (sessions 2 and 3). In general, attribution interventions in clinical settings generally run for 4-12 weeks with one session a week (Dieser & Ruddell, 2002; Wang et al., 2011), so two sessions may not have been enough to generate a significant change in attribution style. However, some studies have shown that single-episode AR interventions can produce small changes in attribution style (Noel et al., 1987), although mostly, they report no change, and are unlikely to lead to long-term effects (Perry et al., 1993). In addition, there was a 3-week gap between sessions 2 and 3, due to the university holidays, and they only had to complete 3 attribution evaluations in that time, and were not given any "homework" evaluations to complete after session 3, before the post-test session. Therefore, this may not have been enough additional retraining outside of the two 1-hour sessions.

Although short interventions are generally not accompanied by changes in attribution styles, they do still have positive effects on the outcomes. For example, in the pursuit of increasing academic performance using AR interventions, previous literature has found that students' GPA scores and scores on final exams are higher after the intervention (Perry et al., 1993). In this study, although the intervention did not significantly affect

attributional style and increase well-being, there did appear to be a weak effect on the perceptions of control exhibited by participants. In particular, the IOCs of participants in the control condition did not change between the pre-and post-tests, whereas the IOCs of participants in the experimental condition were significantly greater at the post-test. This was supported by the findings that the differences between the groups' IOCs were not significant at the pre-test, but were significant at the post-test. Therefore, this appears to support the hypothesis that the perceptions of control would be greater in the experimental condition after receiving the AR intervention. However, the long-term effects of this cannot be deduced, as a follow-up session was not completed. Due to the findings that the AR intervention did not significantly change attributional styles, it is possible that the effects may not endure.

Additionally, there appeared to be differences in the perceptions of control between the control and experimental conditions in the pre-test, prior to the intervention. It is possible that these effects were random and due to individual differences in the participants at the time of group allocation. However, it brings in to question whether the differences between the groups at post-test were due to the intervention, or to the effects at pre-test. Therefore, we should be cautious about the findings regarding the increase of perceptions of control in the post-experimental group.

In line with the experiments in the preceding chapters, the explicit perceptions of control did not match with the participants' actual experiences of control in either the control or experimental conditions, or at the pre-and post-tests. In particular, the negative relationships in the control conditions at both time points suggested that perceptions of control decreased as the actual control increased. Therefore, the participants' perceptions of control were out of line with reality, providing more support for the theory that the explicit system is largely inaccurate, and contains false, socially desirable information (Trivers, 2000; von Hippel & Trivers, 2011).

In comparison to the large IOCs, the differences between the implicit judgements and the actual control were smaller in both conditions at both time points, and the non-significant *t*-tests suggest that the means of the variables were similar. Therefore, this indicates that the participants were more accurate at estimating the conditional probabilities than they were at estimating the amount of control. Although the difference in the experimental post-test was approaching significance, it was still smaller than the IOC, which was highly significant. However, similar to the explicit judgements, the implicit judgements did not significantly track with the actual degrees of control in either of the

treatment groups or at either of the time points, although the relationship was approaching significance in the experimental post-test. This would suggest that the implicit judgements and actual control were more in line with each other in this group. However, as previously discussed, the implicit judgement in this group was the most inaccurate, so although the two variables appeared to track each other, the implicit judgements were largely underestimated.

Regarding the explicit/implicit dissociation, the ANOVA found that when time and group were not taken in to account, the explicit judgements were significantly greater than the implicit judgements, which provides support for the dissociation. Furthermore, the dissociation was also apparent when treatment group was taken into account, as the explicit judgements were significantly greater than the implicit judgements in both the control and experimental conditions. However, the dissociation was not evident when time (pre-and post-tests) was included in the analysis. This was due to the control condition at the pre-test, in which the explicit judgements were not significantly greater than the implicit judgements. In addition, the explicit judgements in the control condition and the implicit judgements in both the control and experimental conditions remained similar across the two time points. It was only the explicit judgements in the experimental condition that were significantly greater at the post-test, which does provide weak support for the success of the AR intervention at increasing explicit perceptions of control. However, as the 3-way interaction was not significant, these results only hint that there was an effect of the intervention, but it is not a robust finding.

The greatest difference between explicit and implicit judgements was in the experimental condition at the post-test, which is supportive of the hypothesis that the AR intervention would lead to a clearer dissociation in this group. In comparison to the explicit judgements, the implicit judgements remained more consistent across time. This is supportive of the traditional model of self-deception (Gur & Sackeim, 1979), as it appears that people are able to hold two simultaneously held, contradictory beliefs about their control judgements.

Similar to previous studies in this thesis, the implicit judgements emerged as the significant predictor of future pressing behaviour in the maximisation task in each group except the pre-test control condition, in which response was not significantly predicted by either explicit or implicit judgements. Therefore, this is not in line with Trivers' (2000) theory that information in the explicit (conscious) system should be more accessible than information in the implicit (unconscious) system. However, it is theorised that the implicit

system contains more accurate information than the explicit system, which is purported to act as a social front. Indeed, the implicit judgements of control were more accurate than the explicit judgements of control in the noncontingency task, so it is more advantageous to access this information in order to make better decisions. However, in the experimental condition, whilst the implicit judgements were more predictive in the pre-test, it appeared that the participants were using both the explicit and implicit systems in the post-test. Therefore, it appears that they were acting more like the participants in Experiment 1, who were using the explicit system.

As outlined in the introduction (subsection 8.1.2), AR interventions have many real-world applications, from reducing aggression in children (Hudley et al., 1998) to reducing sedentary levels in the elderly (Sarkisian et al., 2007). However, the application most relevant to illusions of control is the use of AR interventions in clinical settings. Attribution retraining is considered to be a form of cognitive behaviour therapy (CBT), and can therefore be used as an alternative therapy tool (Dieser & Ruddell, 2002; Wang et al., 2011). Such interventions have successfully changed unhealthy pessimistic attributional styles to healthier, more optimistic styles, and reduced symptoms of depression, anxiety and obsessive-compulsive disorder. Therefore, although the AR intervention applied in this study did not lead to significant decreases in depression or increases in optimism in this study, previous literature has reported that attribution retraining successfully increases well-being (Wang et al., 2011). Poor mental health is often associated with perceptions of a lack of control, and therefore, increases in perceived control are generally accompanied by improvements in mental health (Langer & Rodin, 1976; Schulz, 1976). Therefore, AR interventions should logically also lead to increases in perceptions of control. This study appears to be the first one that specifically examines the effect of AR on IOCs, and found that the illusions of control were higher in the experimental condition at the post-test. In fact, this IOC was the highest illusion shown throughout all of the experiments in the thesis, which may be due to the AR intervention component, but could also be due to factors within the groups, as it was already very high at the pre-test.

The most common application of AR interventions seems to be in academic settings to increase performance in university students. Some advocate that these interventions should be mandatory for all first-year university students (Perry et al., 1993). However, as research has shown that the possession of an unhealthy pessimistic attributional style in childhood is an indicator for developing depression later in life

(Nolen-Hoeksema et al., 1986), it is my opinion that school children should participate in AR interventions as a preventative measure for poor mental health in the future. In some cases, the effects of even a single-episode intervention are still present at a 4-month follow-up (Andrews & Debus, 1978). However, other research advocates that top-up sessions may be necessary to boost the effects of the interventions (Perry et al., 1993).

Future research could improve upon this study in numerous ways. Firstly, in order to observe significant changes in attributional styles, the AR intervention needs to be stronger. This could be achieved by making the methods for the control and experimental conditions more distinctive, so that it is not questionable as to whether the methods used caused participants in the control condition to ruminate about their attributions. Furthermore, the length of the intervention should be increased, with a session every week, so that participants are receiving regular training, which would increase the likelihood of changing attributional styles.

Also, the group sizes in this study were fairly small, with 15 participants in the control group, and 21 participants in the experimental group, which could have resulted in a greater effect of individual differences on the results. The small sample sizes were due to the difficulty in finding people to participate in a 4-week study, and to the attrition rate, as participants were not eligible to complete the study if they missed one of the AR sessions. Therefore, it would be beneficial to test a larger sample of participants, in order to have a greater number of people in each condition and more confidence in the reliability and validity of the findings. Finally, the long-terms effects of the AR intervention on IOCs could not be assessed due to the lack of a follow-up. Therefore, a longitudinal study would be beneficial to examine whether the increases in perceptions of control are maintained.

CHAPTER NINE

GENERAL DISCUSSION

The principal aim of the experiments in this thesis was to explore and provide support for the concept of a dissociation between explicit and implicit systems in regards to peoples' judgements of control, with the evolutionary theory of self-deception as an underlying motive. It was proposed that the concept of the explicit/implicit dissociation, in which false socially desirable information is stored in the explicit (conscious) system, and the more accurate unwelcome information is stored in the implicit (unconscious) system could facilitate self-deception, via the storage of contradictory but simultaneously held beliefs (Gur & Sackeim, 1979; Trivers, 2000; von Hippel & Trivers, 2011). Subsequently, the thesis aimed to examine whether either system was predictive of future behaviour.

Perceptions of control were chosen as the focus for the investigation of the explicit/implicit dissociation because the possession of control is considered to be socially desirable and associated with numerous benefits, such as increased well-being, power and resources (Friedland et al., 1992; Inesi et al., 2011). Therefore, it seems likely that people will be motivated to overestimate their perceptions of control when asked explicitly, and this will be contradictory to implicit knowledge of their control. Therefore, the experiments aimed to provide support for the explicit/implicit dissociation by demonstrating the presence of inaccurate explicit judgements of control (illusions of control) and accurate implicit judgements of control via the conditional probabilities.

Subsidiary aims were to examine influential factors on the IOC and the explicit/implicit dissociation, the theory of depressive realism through the association between IOCs and self-reports of symptoms of depression, and the associations between IOC and personality traits. Therefore, the results from the experimental chapters will be summarised and discussed in terms of the following theoretical components: the illusions of control, the explicit/implicit dissociation, future decision-making behaviours, depressive realism and personality factors. The reliability of the findings will also be discussed in this order, as the most reliable findings in the thesis were those regarding the IOC and explicit/actual correlations, followed by the results concerning the implicit control and implicit/actual correlations, with the depression and personality factor correlations being

considered the most unreliable. The discussion will then proceed to consider the implications of the research, the methodological issues and limitations, and finally the applications of the work conducted, and future research that would be of interest.

9.1 Summary of Thesis Experimental Findings

9.1.1 Illusions of control

The IOC is defined as the phenomenon in which people overestimate their control over the environment, i.e. there is "an expectancy of a personal success probability inappropriately higher than the objective probability would warrant" (Langer, 1975, p. 311). Therefore, the IOC was operationalised as the difference between the explicit judgements of control and the actual degree of control experienced. It was hypothesised that throughout the experiments that constitute the thesis, people would overestimate their subjective judgements comparative to the objective contingency. There was great support for the hypothesis, as significant IOCs were present in all of the experiments. This demonstrates the robust and pervasive nature of the IOC, and supports the notion that people tend to judge noncontingent situations as contingent situations, reporting that their responses and behaviours exert control over the environmental outcomes (Langer, 1975; Thompson et al., 1998). Therefore, it appears from these illusions that peoples' subjective representations do not match the objective contingencies, so their perceptions are generally out of line with reality. This is contrary to Maier and Seligman (1976), but supports Taylor and Brown's (1988) concept that people are prone to illusions by distorting information in an exaggerated and unrealistic positive direction, as well as the notion that people are motivated to possess a sense of control (Fast et al., 2009; Langer, 1975). This is also what I would consider to be the most consistent and reliable finding throughout the thesis, as it was found across all of the experiments, in different contexts, with samples from different populations.

However, despite these findings that explicit judgements are consistently overestimated and IOCs are high, there was also high variability, with many people displaying large illusions and many people who showed no illusions. Furthermore, the IOC was not present within all of the groups in the experiments, and I will now discuss the experiments in which this was the case, and the factors that appear to affect the size of the IOC. In Experiment 2, a degree of contingency was introduced in the task (25%), and the density of the outcome reinforcement was varied, so that participants either received a high

or low frequency of the desired outcome, i.e. green light onset. In addition, the sign (positive or negative) of the contingency was balanced, so that people either received more reinforcement for active responding (space-bar press) or for passive responding (no press). The results found that there was an effect of outcome frequency and an effect of response type (active/passive) on the IOCs. In particular, the IOCs of participants in the low frequency groups displayed small or no IOCs, and the participants who received more positive reinforcement for passive responding did not show IOCs. The only significant IOC was evident in the high frequency group, who were reinforced more for active responding. Therefore, this suggests that high outcome frequency and active response type are important factors for inducing an IOC. Indeed, the participants who experienced low outcome frequency and passive reinforcement underestimated their amount of control, which indicates that these factors were effective at eliminating the IOC.

However, it was not only the outcome frequency and the sign of the contingency that was manipulated, but also the set degree of control in the contingency task was increased to 25%. Therefore, the apparent increase in accuracy of the explicit judgements may be attributable to the increase in actual control. It seems logical to reason that if the degree of control was set to 100%, so that every response participants made resulted in the desired outcome, the accuracy rates of their explicit judgements would be higher. Obviously, displaying an IOC would be impossible, but the variability of the underestimations should be small. From this rationale, it could be hypothesised that as the actual degree of control decreased, the difficulty of generating accurate judgements would increase, leading to the emergence of IOCs. This would support the idea that the largest IOCs might be present in noncontingent (0% control) situations, where the outcomes are random for each response.

The effect of response type was also present in Experiments 1 and 6 (power study) where the active-passive version of the noncontingency task was used. Whilst all of the participants in Experiment 6 significantly overestimated their perceptions of control, the participants who had been primed with power and received more green light reinforcement for active responding displayed the largest IOC. Therefore, although there were no main effects of power primes or response type, it appeared that a combination of high power and active responding was optimal for inducing an IOC in this experiment. This is supportive of Fast et al. (2009) who found that participants in the high-power condition were more likely to show IOCs. Similar to Experiment 6, large IOCs were present in Experiment 7 (competence), and there were no main effects of competence primes or response type.

However, contradictory to Experiment 6, an IOC was not present in the high competence group in Experiment 7 who received more green lights for active responding. Therefore, despite expectations, this was not a successful combination for inducing an IOC. A possible reason for this may be that there is not as strong an association between competence and control as there is between power and control, which is supported by the volume of literature available.

The occurrence of greater overestimations of control following more reinforcement for active responding endorses the notion that involvement is influential on perceptions of control. Langer (1975) identified involvement as a skill-related factor that encourages IOCs in chance situations. Therefore, the action of pressing the space bar in the noncontingency task appears to lead people to feel more involved in producing green light onset, and to attribute more responsibility to their responses. This appears to be a mostly consistent finding throughout the thesis in experiments that have included the ACT/PAS between-groups approach, and therefore can be considered reliable. It is also likely that this would be a repeatable pattern in future experiments using the active-passive noncontingency task.

Based on this finding, in an active-active version of the noncontingency task where both of the responses were key presses on the computer keyboard, it was hypothesised that receiving reinforcement for entirely active responding would result in greater IOCs than the active-passive version. Whilst the IOC was numerically greater in Experiment 3 than in Experiment 1, it was not significantly greater, and in Experiment 4, the IOC was non-significantly smaller than in Experiment 1, which did not support this hypothesis. However, the presence of the IOC even when the response modality is modified attests to the stability of the phenomenon.

As mentioned above, implicitly priming power and competence motivations did also not emerge as an influential factor on the size of IOCs. The experimenter ratings and self-reports of power in Experiment 6 and competence in Experiment 7 were significantly greater in the high conditions compared to the low conditions, which would suggest that the primes were successful. Although on further analysis, despite the significance, the differences between the means were small, and there was great variability and overlap in the subjective ratings. Therefore, this contradicted the apparent success of the primes, and might somewhat explain the ineffectiveness of the manipulations on the perceptions of control. Furthermore, whilst it was hypothesised that increases in power and competence would lead to increases in IOCs (Fast et al., 2009), there appeared to be a negative

relationship, so that lower perceptions of competence and power were associated with greater overestimations of control. This would suggest that reductions in motivations encouraged people to seek out control (overcompensate) on the noncontingency task, which supports previous literature (Taylor, 1983; Whitson & Galinsky, 2008).

Finally, there was weak support for the influence of attributional retraining on the IOC. Whilst there was not a significant interaction with time, a slightly more optimistic attributional style did lead to a significant increase in IOCs in the experimental group at post-test, compared to no change in the control condition. Therefore, this lends some support to previous literature that IOCs are changeable under particular conditions (Alloy & Abramson, 1979; Alloy et al., 1981; Fast et al., 2009).

Therefore, from the experiments in the thesis, it appears that task involvement via the responses was the most influential factor on IOCs. Additionally, the frequency of desired outcome and the degree of actual control appeared to affect perceptions of control. However, power and competence did not emerge as important factors, although there appeared to be some effect of power on control judgements when it was combined with active involvement.

Additional support for the robust and pervasive nature of the IOC came from the CAB sample in Experiments 4, and the control condition in Experiment 8 (attribution retraining), where the IOCs remained consistent at follow-up sessions in the long-term (1 year) and short-term (2 months), when no intervention was conducted. This attests to the stability of the illusions over time. Furthermore, Experiments 4 and 5 (trainee traders) demonstrated IOCs in nonstudent samples, in which the participants had a greater variability of age and were inexperienced at participating in psychology experiments, so the task and measures that they completed were novel. Therefore, the findings from these experiments increase the external validity of the phenomenon. In Experiment 5, it was hypothesised that the IOCs would be significantly greater in the trainee traders than in the other samples as there are many person-based and situational-based factors that are linked to the inducement of IOCs: competition, familiarity, choice and involvement (Fenton-O'Creevy et al., 2003; Langer, 1975). The hypothesis appeared to be supported, as the IOCs were significantly higher than the comparison group from Experiment 1. However, the explicit judgements of control, which were equivalent to the IOCs due to the lack of available actual contingency data, were not significantly higher than in Experiment 1, which puts in to question the validity of these results. The noncontingency task may emulate the markets in which traders practice, as the markets are noisy and it is difficult to

discern whether trading outcomes are caused by the information and skills of the trader, or by the random market movements. Therefore, these conditions may have encouraged the trainees to accept more responsibility and credit for the positive outcomes.

The consistent finding that the participants' explicit judgements of control were not significantly correlated with the actual amount of control experienced in the tasks further supported the hypothesis that peoples' perceptions of control are out of line with reality. This is also considered to be a reliable finding, as the explicit judgements and actual experiences of control consistently did not track with each other, as signified by the lack of correlation between the two variables. Indeed, the relationships between the explicit and actual measures of control, including the presence of the IOC, are considered to be the most reliable findings. Unlike the questionability of the implicit measure (see subsection 9.3.2), the explicit measure was definitely explicit, and the computer program provided the actual data regarding the contingency. Therefore, the data for both of these measures is considered dependable, and may have contributed to the consistency and reliability of the IOCs and explicit/actual correlations.

This was further supported by the finding in Experiment 4 that the IOCs were significantly correlated with the participants' judgements of the frequency of successful outcomes (confirming cases), so as the perceived number of green lights increased, so did the amount of perceived control. However, in the high power condition in Experiment 6, it appeared that increases in the explicit judgements were largely related to increases in the actual amount of control. This possibly implies some accuracy and understanding, as the explicit judgements did track with the actual experiences, but the presence of a large IOC in both groups dilutes the significance of this relationship, as the estimations were still not in line with reality. Therefore, these results regarding the sizes of the IOCs and the relationships with the actual contingencies are in line with Trivers (2000, see also von Hippel & Trivers, 2011) model of self-deception that false, welcome and self-enhancing information is stored in the explicit system (see subsection 9.2.1 for a thorough discussion of the implications on self-deception).

9.1.2 Implicit judgements and the explicit/implicit dissociation

To recap, the implicit judgements of control were calculated by subtracting the estimated conditional probability of one response from the estimated conditional probability of the other response. This is analogous to the actual control, where the objective conditional probabilities are used in the calculation. Contrary to the

overestimated explicit judgements of control, the implicit judgements were more similar to the actual experiences of control in most of the experiments. In other words, the differences between the implicit judgements and actual control were smaller than the differences between the explicit judgements and actual control (the IOCs). The only exceptions were Experiment 4 and the high competence active responding group in Experiment 7, where the implicit control was significantly underestimated compared to the actual contingencies. Furthermore, the sizes of the differences between the implicit and actual variables were similar to the size of the corresponding IOCs. Therefore, these inaccuracies indicate that the knowledge of the conditional probabilities was lacking. In general, the explicit judgements were consistently higher than the implicit judgements, but this may be due in part to the methods used to analyse the data (see discussion of statistical analysis, subsection 9.3.2).

However, the relationships between the implicit judgements of control and the actual control are less straightforward. Whereas the explicit judgements were typically uncorrelated with the actual control, the implicit/actual relationship was more variable. In Experiments 1, the active responding groups in Experiment 2, the high power active responding group in Experiment 6, and the high competence passive responding group in Experiment 7, the implicit judgements tracked the actual control, so their estimates appeared to be in line with the actual contingencies in the tasks. However, in Experiments 3, 4, 8, and in the other groups in Experiments 2, 6 and 7, the implicit judgements were not in line with the actual control. Despite the appearance that the implicit judgements were generally more accurate, the findings that the judgements did not increase or decrease correspondingly questions the accuracy of the judgements of the conditional probabilities.

The experiments in which the implicit judgements of control were similar to the actual amount of control, and the relationships between the two variables suggested that they tracked each other were supportive of Trivers (2000) theory that true, accurate information is held in the implicit system. However, the samples in which the implicit judgements were significantly underestimated, and/or were not correlated with the actual control were unsupportive of the theory that the information in the implicit system is representative of reality. The results concerning the implicit judgements of control are less reliable than those regarding the explicit judgements. The correlations between the implicit judgements and the actual values of control were not always high, and not always present. Therefore, the inconsistency of these findings questions the reliability of the occasions on which the relationships were found. This is likely due to the weaknesses of the measure, in

whether it can truly be considered implicit, as it is calculated using explicit judgements, and is therefore prone to biases (see subsection 9.3.2). Therefore, the accuracy of the conditional probabilities that are used to calculate the implicit control may be affected, so that the sizes of the implicit values of control, and their tracking (or lack of) with the actual control may not be meaningful.

Regarding the model of explicit/implicit dissociation, the dissociation was most evident in Experiment 1, in the high frequency and active responding group in Experiment 2, the high power and active responding group in Experiment 6, the high competence PAS group in Experiment 7, and in the experimental post-test group in Experiment 8. These participants overestimated their explicit judgements, whilst concurrently reporting accurate knowledge of the conditional probabilities. However, the dissociation was less clear in Experiments 3, 4 the other groups in Experiment 2, 6, 7 and 8. This appeared to occur when the explicit judgements were more accurate, and therefore more in line with the implicit judgements, or when the accuracy of the implicit judgements was impaired and not in line with the actual control. Trivers (2000; see also von Hippel & Trivers, 2011) theory of explicit/implicit dissociation proposes that welcome but inaccurate information is held in the explicit system, whilst unwelcome, but accurate information is held in varying degrees in the implicit system. Therefore, the former studies in which the overestimated explicit judgements that were out of line with reality and the more accurate implicit judgements that were representative of the actual experiences provided support for the explicit/implicit dissociation, whilst the latter studies did not (see subsection 9.2.1 for a more detailed discussion of the implications on self-deception). However, the reliability of the results concerning the dissociation is questionable. The dissociation was not clear in more experiments than it was evident in, and as discussed above, is dependent on particular results regarding the explicit and implicit judgements. Whilst the explicit judgements were mostly inflated as expected, the implicit judgements were not always as accurate as expected, so the values of implicit control are less dependable than the explicit judgements.

9.1.3 Future decision-making behaviours

This section will discuss the responses made by participants in the 10-trial maximisation tasks, as well as any effects of the explicit and implicit systems, across the experiments and the task versions. When responses and outcomes are noncontingently related, and outcome reinforcement is equal across the two responses, people should make

both responses equally if they have accurately understood the objective conditional probabilities (Alloy & Abramson, 1979). However, in the active-passive task version, different patterns emerged for participants who had received more positive reinforcement for active responding in the 100-trial learning phase, compared to the participants who were reinforced more for passive responding. In Experiments 1, 2, 6 and 7, the participants in the active responding groups made more active responses than passive responses in the maximisation task, which is expected as they were more reinforced for this response in the learning phase. However, in the passive groups, the participants in Experiments 1, 6 and 7 also made the active response more often than the passive response in the maximisation task, whilst participants in Experiment 2 made both responses equally. Therefore, this is erroneous because if these participants had an accurate understanding of the conditional probabilities, they should have made fewer space-bar presses in order to maximise the desired outcome. So either this is further support for the notion that the inaccurate explicit judgements were more influential, or that despite their knowledge, the general association between active involvement and possessing control was significant enough to overrule the probabilities that they had estimated in the learning phase of the task. As previously discussed, active involvement emerged as a factor that induces IOCs. Therefore, it is unsurprising that active involvement was also related to maximising the desired outcome, despite contradictory evidence in the passive responding groups. However, in the active-active versions of the task, the participants were more likely to make both responses equally, as expected in a noncontingent task. Therefore, modifying the response modality appeared to resolve the different response patterns observed in the active-passive version. These findings concerning involvement in the maximisation task were consistent throughout the experiments, and therefore appear reliable and replicable.

The influence of the explicit and implicit systems on future responses will now be discussed. In Experiment 1, the regression model indicated that the explicit judgements of control were more predictive of future responses on the maximisation task for participants who were more reinforced for active responding. This finding that the false overestimated judgements were more influential supports Trivers (2000) theory that the explicit (conscious) system is more accessible than the implicit system.

However, in Experiments 2, 3, 4, 6 and 8, the implicit system generally emerged as the predictive factor, so it appears that the responses made on the maximisation task were influenced by the knowledge of the conditional probabilities. These findings did not support the hypothesis that the explicit judgements would be more accessible and lead

people to make decisions based on this information, and is therefore unsupportive of von Hippel and Trivers (2000) that accurate information is less accessible to people as it is stored in varying degrees in the unconsciousness.

It was not always the case though that one system prevailed over the other. In Experiment 7, the passive group in Experiment 1, the high frequency passive group in Experiment 2, the high power active group in Experiment 6, and the pre-test control group in Experiment 8, neither system appeared to be predictive. It is possible that a factor other than the explicit judgements or implicit judgements of control was influential, such as the total frequency of green light onset. However, it could also be due to an inadequate understanding of the relationships between the control variables, i.e. the explicit/actual and implicit/actual correlations, and/or the conditional probabilities, i.e. the participants were not aware of which responses they had received more green light onset for. Therefore, this leads to the possibility that when the Judgements of Control scale was completed, the judgements were not knowledgeable estimates, but random guesses, which would indicate that their future attempts to maximise the desired outcome were also completely random. Therefore, the findings related to the prediction of future responding appear to be unreliable. This is due to questions over the accuracy of the implicit judgements via the conditional probabilities. Inaccurate implicit judgements, and the possibility that responding may have been random in the maximisation task would make the findings less meaningful.

9.1.4 Depressive realism and personality traits

The theory of depressive realism proposes that nondepressives are prone to positive illusions, whereas depressed individuals have a more balanced awareness of their environment. Therefore, nondepressed people are considered to be out of touch with reality, whilst depressed people have more accurate and realistic perceptions about themselves and the environment, i.e. they see the world as it actually is (Alloy & Abramson, 1979). Indeed, various studies found that nondepressed participants showed IOCs, whilst depressed people more accurately judged their degree of control (Alloy & Abramson, 1982; Dobson & Franche, 1989; Golin et al., 1977, 1979).

However, throughout the experiments in this thesis, there were inconsistent results regarding the direction of the relationship between the IOCs and the self-reported symptoms of depression from the administered BDI scale, and therefore varying support for the depressive realism theory. In Experiment 3, the 1-year follow-up in Experiment 4,

the high competence groups in Experiment 7, and the post-control group in Experiment 8, there were negative relationships between perceptions of control and depression levels. Therefore, decreases in depression were associated with increases in IOC, which is supportive of the depressive realism theory.

However, in Experiment 4, and the high power groups in Experiment 6, there were positive relationships between the BDI scores and IOCs. In Experiment 5, the BDI measure was not administered to the sample of trainee traders, but there was a positive relationship between the neuroticism/anxiety subscale on the ZKPQ-CC and the IOC. Therefore, these results indicate that increases in depressive symptoms are accompanied by increases in illusions of control, which contradicts the previously discussed findings. Instead, this provides support for the traditional viewpoint that good mental health is associated with an accurate and unbiased perception of reality, whilst poor mental health is associated with pessimistic and inaccurate beliefs (Beck, 2005; Jahoda, 1958). Furthermore, self-deception and positive illusions have been linked to narcissistic personalities, which are associated with poor psychological adjustment (John & Robins, 1994), and is unsupportive of the depressive realism concept. Finally, there were no relationships between the two variables at the pre-test in Experiment 4, the low power and competence groups in Experiments 6 and 7, and the experimental condition in Experiment 8. However, none of the correlations between depression scores and the IOCs reached significance, regardless of direction, which suggests only weak support in favour of both the theory of depressive realism and the traditional viewpoint.

However, this may be due to the appropriateness of the BDI as a measure throughout the thesis, which I will now discuss. The BDI was originally developed to measure symptoms of depression in people in mental health care and primary care contexts (Roelofs et al., 2013), so the use of the inventory in non-clinical samples may be considered unsuitable, and may limit the reliability of the findings. Indeed, many clinical theorists propose that when these types of depression inventories are administered to non-clinical participants, that the high scores are more likely to indicate milder forms of negative mood, such as dysphoria, anxiety and distress, rather than depression (Coyne, 1994; Gotlib, 1984). Additionally, items relating to changes in sleep and appetite may inflate scores on the BDI, but may not be indicative of depression, but representative of the increase of independence experienced, particularly in university student samples. Therefore, this may lead to more "false positives", where participants are falsely diagnosed as depressed (Steer & Beck, 1985).

However, many researchers also agree that the BDI is a useful measure of depression, and reliably discriminates between nondepressed, dysphoric and depressed people in both clinical and non-clinical samples (Gorenstein, Andrade, Zanolo, & Artes, 2005; Osman, Barrios, Gutierrez, Williams & Bailey, 2008; Wang & Gorenstein, 2013). However, its recommended use is as a screening tool, rather than a diagnostic measure, and should be used as a two-stage method for diagnosis by clinicians to prevent excessive instances of false positives (Shean & Baldwin, 2008).

The theory of learned helplessness proposes that a perception of no control is essential for the development of depression (Peterson & Seligman, 1984). However, unlike the depressive realism theory, the learned helplessness theory proposes that rather than being more realistic and having an accurate perception of their environment, depressed individuals are more likely to underestimate their influence and control. The task of noncontingency was predominantly utilised throughout the thesis, where the amount of control was set to the minimum of zero, so the design of the study was not amenable to studying underestimations. However, as there was always a degree of control present in the experiments, due to chance, it was possible to observe participants who did slightly underestimate their judgements of control by examining the scatterplots displaying the relationships between explicit judgements and actual control. In particular, the black lines of fit on these graphs represented where accurate judgements would lie if they perfectly tracked the actual control, so any participants who were below these black lines underestimated the amount of control they possessed. For example, when participants estimated that they had 0% control in the task, this would be correct if they had experienced true noncontingency, but when there was an actual degree of control, for example 8%, then these participants did underestimate their control. However, these underestimations were unlikely to be significant, due to the small size of the actual degree of control. Only Experiment 2 studied the IOC in a contingent situation (25% control), and a negative IOC was observed in the participants who experienced low frequency of green lights and were also reinforced more for passive responding. Nevertheless, it was not a significant underestimation, and therefore the judgements of control were similar to the actual control. However, looking at the scatterplots of explicit judgements and actual control, more participants underestimated their perceived control than in the noncontingent studies, but further analysis would be needed to ascertain whether these people had higher levels of depression.

Regarding personality traits, it was expected that people who are prone to IOCs would also report themselves as being more extraverted, active and sensation-seeking, and less neurotic/anxious than people who are not susceptible to illusions (Fenton-O'Creevy et al., 2003; Houghton et al., 2000; Jylhä & Isometrä, 2006; Lefcourt, 1973). For example, if people convince themselves that they possess more control than they do, then they may be more likely to take risks (Frey & Voland, 2011). However, in addition to weak support for the depressive realism theory, the experiments in this thesis found no consistent relationships between IOCs and personality traits. The only support for the hypothesis was from Experiments 5 and 6, where increases in IOCs in the trainee traders' and participants primed with high power were significantly associated with increases in self-reports of impulsiveness and sensation-seeking. This also supported previous research that IOCs are accompanied by decreases in risk-perception (Fenton-O'Creevy et al., 2003; Houghton et al., 2000).

The correlations concerning the relationships between the IOCs, depression scores , and personality factors were inconsistent in direction and size, and may be considered the most unreliable in the thesis. Furthermore, questions over the use of the BDI as a measure of depression in non-clinical samples increase the perceived unreliability of these findings.

9.2 Implications of Experimental Results

9.2.1 Self-deception

There was strong support for the notion that the IOC is a common phenomenon, which provides evidence for the importance and desirability of, as well as the need for perceived control (Burger & Cooper, 1979; Thompson & Spacapan, 1991; Whitson & Galinsky, 2008). The finding that people appeared to be motivated to deceive themselves in to believing that they had more control than they actually did may provide support for the notion that self-deception facilitates self-enhancement, self-esteem and well-being (Taylor & Brown, 1988; Trivers, 2000; von Hippel & Trivers, 2011).

The aim of the thesis was to provide support for the evolutionary theory that a dissociation between explicit and implicit systems could facilitate the functioning of self-deception, as proposed by von Hippel and Trivers (2011). The findings appear to provide support for this aim as the overestimations of explicit judgements of control were reported on the Judgements of Control measure simultaneously with more accurate knowledge of the conditional probabilities, i.e. the implicit control. Furthermore, these findings provide

support for the traditional approach to self-deception, by showing that people can hold contradictory beliefs at the same time (Gur & Sackeim, 1979; Quattrone & Tversky, 1984). This concept has been previously deemed as paradoxical and criticised for how two opposing beliefs can be held concurrently (Mele, 1997, 2001). However, the explicit/implicit system appears to allow people to maintain a positive illusion of perceived control, whilst also storing the accurate information.

The functionality and adaptiveness of self-deception is important to explain why this trait has been naturally selected to survive. The two principal functions of self-deception are that people can deceive themselves and others into believing that they are more beneffective than they actually are, and it facilitates self-enhancement. As the possession of control is considered desirable and is associated with many benefits, the consistently high IOCs in the face of contrary evidence that were evident in the experiments in the thesis, supports the concept that self-deception is important for self-enhancement. However, the weak support for the depressive realism theory, that good mental health is associated with positive illusions (Alloy & Abramson, 1979; Dobson & Franche, 1989; Taylor & Brown, 1988) does not provide evidence for the idea that people self-deceive for self-enhancement purposes.

Whether the self-deception suggested by the experimental results was engaged in to better deceive others is not identifiable. It is possible that the participants were unconsciously motivated to convince the experimenter that they possessed more control than they did, but it is also possible that they were consciously motivated to impress the experimenter, which would be regular other-deception. This incites the discussion of how researchers know that the participants are truly self-deceiving, and are not actually aware of the contradictions in their beliefs (Nosek et al., 2007). If people are not aware of their implicitly held beliefs and associations, then this is supportive of self-deception, particularly the traditional approach, in which one of the necessary conditions is that the individual is not aware of holding one of the beliefs (Gur & Sackeim, 1979). However, if they are aware, but prefer to ignore them for self-presentation purposes, then this would not be considered true self-deception.

The evolutionary theory purports that information in the explicit system is held in the conscious mind and should therefore be more accessible to the individual during decision-making. Whilst this would result in decisions that are in accordance with the self-deception, and therefore facilitate the deception of others, the implications of basing decisions on the inaccurate explicit judgements of their environment are that they can lead

to errors and inappropriate behaviours, and be potentially costly. Also, if people continue to self-deceive and make these decisions in the long-term, despite the conflicting evidence, then they may lose credibility, as well as the trust and confidence of other people. Therefore, this is a limitation of Trivers (2000) theory and is not adaptive. However, there was very limited support for this in the thesis. Instead, it seemed that the implicit judgements were more predictive of subsequent responses. The advantages of unconsciously accessing the implicit system for subsequent decision-making are that people could make more accurate and realistic decisions, which could have better consequences, whilst maintaining the positive illusions via self-deception. However, this is only valid if the implicitly information is indeed more accurate than the explicitly held information. This appeared to be the case in the majority of the studies, and would therefore support this notion. Therefore, self-deception could be considered more beneficial and adaptive, and would provide sound reasoning for the natural selection of self-deceptive behaviour.

It is possible that accessing the information from the explicit system is specific to the particular conditions of the task that are present in Experiment 1, and that deviations from this format may result in the use of the implicit system. Speculatively, there may be factors of the task that encourage the use of the implicit system, for example, a degree of actual control and more information regarding the conditional probabilities in the contingency task (25%). However, it may just be that people subconsciously use implicit information, as there are many studies in which behaviour is affected by implicit information. For example, Nardone et al. (2007) found that anosognosic patients with a motor disability looked away faster from aversive stimuli, despite not acknowledging their physical impairments explicitly, yet the stronger their denial about their impairments, the greater the effect on their task performance. In this situation, this appears to be an automatic process that acts as a coping mechanism, which is perhaps the case in all self-deception to protect the individual from aversive information that could reveal the self-deception. Therefore, positive illusions and self-deception are advantageous and adaptive in the interest of maintaining the well-being of the individual.

9.2.2 Priming manipulations and motivations

This section will discuss the implications of the findings from the power and competence studies. In the power study, it is interesting to note the emergence of a subgroup from the participants who were primed with power, but did not appear to find the

experience positive. From the content of their recall essays, this seemed to be due to feeling uncomfortable and lacking confidence when in the position to exert power over other people. This was accompanied by lower scores on the following personality traits; aggression, extraversion and impulsiveness/sensation-seeking. This parallels research that found that increases in control are not always accompanied by increases in positive affect (Rodin et al., 1980). Instead, increases in control can be associated with greater responsibility and pressure to obtain the desired outcome. If the outcome does not seem achievable, this could lead to greater anxiety due to the judgements of other people. However, although the small subgroup in Experiment 6 did not significantly skew the data in the study, it is something to be mindful of in future research concerning power priming.

A potentially important finding also emerged from Experiment 7 (competence), in that the noncontingency task appeared to undo the priming from the recall essays manipulations. The self-reported feelings of competence were significantly lower after experiencing the noncontingent task, particularly in the high competence condition. Therefore, competency was affected when outcomes were unrelated to the participants' responses, so the task appeared to interfere with the manipulations of the independent variable, which may have influenced the dependent variables, i.e. the perceptions of control. Consequently, this has implications for Experiment 6, where power was not measured again after the noncontingency task, and endorses the importance of conducting pilot studies to determine the effects of the chosen task on the variables in future research.

9.3 Methodological Strengths and Limitations

9.3.1 The (non)contingency task

As discussed in Chapter Two (section 2.3), a limitation of earlier research investigating IOCs was that there were no objective standards to compare the subjective judgements against (Ackermann & DeRubeis, 1991). This was important, as it meant there was no way to measure the size of the IOC. For example, in Langer's (1975) seminal research, if participants chose to roll the die themselves, it was concluded that they displayed an IOC, but there was no IOC if they let the experimenter roll the die. In this case, the IOC was either present or not, so there was no magnitude of the illusions, and one participant could not display a greater IOC than someone else.

Therefore, the principal strength of the noncontingency task is that it allowed the comparison of the subjective judgements with the objective contingencies, which resulted

in a more accurate representation of the participants' IOCs. The limitations of the unavailability of the actual data were evident in Experiment 5, as it was more difficult to interpret the findings since the explicit judgements and the IOCs were assumed to be equal due to the lack of evidence to suggest otherwise. However, it is unlikely that there was true noncontingency in the task, i.e. 0% actual control, due to the small number of trials (10), so the IOCs were probably smaller, which means that the validity of the results in this experiment are questionable. Therefore, this demonstrates the importance of the ability to compare the subjective judgements against the objective counterpart.

However, whilst the availability of the objective data in the noncontingency and contingency tasks is a strength that increases the reliability and validity of the research conducted, a limitation of the task is that it is a more complex paradigm than the methods used in experiments by Langer (1975) and Fast et al., (2009), and the IOC was operationalised differently. Therefore, it is a more complicated task to complete, and requires more effort from the participants. However, it has been successful at demonstrating the IOC in previous research (Alloy & Abramson, 1979; Carson et al., 2010; Martin et al., 1984; Tang & Critelli, 1990), and it successfully demonstrated the IOC in the experiments in this thesis.

Another strength of the task is the method by which the participants received the information. The information about the responses and outcomes was received trial-by-trial, which is reflective of how information in the real world is likely received, on a situation-by situation basis. However, the major limitation of this method is the artificialness of the apparatus and the aims. The task consists of estimating the amount of control over green light onset after pressing and not pressing keys in front of a computer screen, which is not necessarily generalisable to real-life situations. Indeed, it is probably very rare that someone would attempt to estimate or quantify the percentage of control that they have in a real-life situation, so the task itself is unlikely to be representative of the types of situations in which people consider their perceptions of control and influence over their environment.

Another methodological issue is the number of trials that the participants are required to complete in the learning phase. As explained in Chapter Three (section 3.1), if there are too few trials, then this increases the likelihood of the actual control fluctuating from the asymptotic value. Conversely, the more trials in the task, the more exposure the participants will have to both confirming and disconfirming evidence, which is likely to decrease the IOC (Carson et al., 2010). However, if the IOC is demonstrative of self-

deception, then people should display illusions even in the face of contradictory evidence. This research increased the number of trials from 40 in previous experiments (Alloy & Abramson, 1979; Carson et al., 2010) to 100 in order to support the hypothesis that the IOC would still be evident, which was successfully demonstrated throughout all of the experiments.

However, a limitation of increasing the number of trials from 40 to 100 is that too many trials will increase the likelihood that the participants will become bored, frustrated, and tired, and will therefore disengage from the task. In general, the length of the learning phase in my task (100 trials and 8 minutes) seemed satisfactory to the majority of the participants, but some people reported boredom, and some reported frustration. However, the frustration occurred due to participants believing that they had found a pattern of responding that activated green light onset, only for it to not always be successful. Future research could explore whether perceiving a successful response-outcome pattern is a factor for inducing the IOC, i.e. were their IOCs larger than participants who did not "identify" a pattern?

The active-passive and active-active task versions will now be discussed. In the active-passive version of the 0% noncontingency task, the two responses that participants could make were to press and not press the space bar. Based on the random experiences in the task, participants could receive more green light onset for pressing the space bar (active responding) or more green lights for not pressing the space bar (passive responding). However, an issue with the active-passive version was that post-hoc the response type appeared to affect the IOCs and the responses made in the maximisation task, so that more reinforced active responding resulted in larger IOCs and more subsequent active responding, compared to more reinforced passive responding. Therefore, components of the task itself appeared to be influential, which will have to be taken into account when using contingency tasks. It also meant that the statistical analysis had to be changed to reflect the between-groups design in which some participants were in the active (ACT) group and some participants in the passive (PAS) group, with the data being analysed in terms of the most reinforced response experienced. This was based on whether they experienced positive or negative actual control. Therefore, if a participant experienced +1 to 100 control, then they were in the ACT group, and if they experienced -1 to -100 control, then they were in the PAS group. However, a limitation of this is that around the lower amounts of control, closer to zero, there was unlikely to be a noticeable difference in the experiences. Therefore, it is possible that 3 groups may have been more

appropriate for the analysis, adding a middle group between the ACT and PAS groups. This middle group could run from -5 to +5 actual control for example, and would include people who experienced close to true noncontingency, and were least likely to notice the greater reinforcement for active or passive responding. The ACT group would then include participants who scored +5 and higher positive control, whilst the PAS group would include participants who scored -5 and higher negative control. It is possible that a different pattern of results may emerge in the middle group, who experienced true noncontingency, and would also adjust the results seen in the ACT and PAS groups. A final issue with the active-passive version is that participants can become idle when one of the response options is passive, and occasionally do not engage with the task, so their data has to be excluded from the analysis.

An advantage of the active-active 0% noncontingency task version, in which the two responses that participants could make were to press the Q-key and P-key on the keyboard, is that the participants were more likely to sample both of the responses evenly, which resulted in fewer people being excluded from the analyses, and allowed the participants to attain a more thorough representation of the noncontingency. Based on the random experiences in the task, participants could receive more green light onset for pressing the Q-key, whilst others received more green lights for pressing the P-key. However, unlike in the active-passive version, it did not result in post-hoc differences across the two responses in terms of explicit judgements of control, IOCs, and pressing in the maximisation task. Therefore, it meant that a between-groups approach to the statistical analysis was unnecessary and omitted from the experiments using the active-active task version, and the sample could be analysed as one group, and did not have to be analysed in terms of most reinforced response. However, a disadvantage of this version is that previous research suggests that response modality may influence which rule/information people use to generate judgements. When both responses in the task are events (active), such as in this version, it appears that people are less likely to estimate their control using the objective contingency. Instead they are more likely to rely on incorrect heuristics, such as confirming cases, i.e. when an event-response is followed by the desired outcome, as there is no information concerning the outcomes that occur when there is a nonevent-response, so all response/outcome pairings are not possible (Jenkins & Ward, 1965). Difficulties in tracking the necessary information for each of the conditional probabilities may also be due to the similarity of the two responses, i.e. both active key-presses, as the participants may not have represented the two key-presses as separate units, but as one unit

known as key-press. Therefore, the design of the task is important to consider, as the mode of representation appears to affect performance.

I will now discuss what the participants might have been trying to learn during the tasks and how this might have influenced the development of the IOCs. Throughout the learning phase of the task, the participants were instructed to learn how much control they had over whether the green light came on or not, and were advised to sample both responses. However, it is not clear which processes each individual went through in order to reach an estimate for their judgements of explicit control and the conditional probabilities. It seems likely that participants may have focused on maximising green light onset, rather than spending equal amounts of time exploring how their responses also affected non-green light onset. For example, during the debrief process, it was interesting that many participants were genuinely surprised when they learned that they had no control, and disclosed the belief that they had figured out a pattern to maximise green light onset. Therefore, referring back to the frequency table in Figure 2.1 (subsection 2.3.2), this may suggest that participants were focused on gathering information for cells 'a' and 'c'. Furthermore, as mentioned above, previous research has found that people often use incorrect heuristics/rules when making judgements, so that instead of using the correct ΔP heuristic, they may use simpler rules such as confirming cases, i.e. when an active response results in the desired outcome, and a passive response does not produce the desired outcome, which would suggest that they were focusing on cells 'a' and 'd' in the 2x2 frequency table (Carson et al., 2010). It can be deduced that if participants were focused on obtaining green lights as a measure of their success in the task, then the experience of more green lights would aid the development of a greater IOC, whilst fewer green lights would reduce the size of an IOC.

Additionally, it is likely that participants who were focused on trying to identify a pattern in responses and outcomes may have been more likely to show higher IOCs, particularly when they believed that they had worked out a pattern. For example, participants relayed stories such as "If I pressed the space bar two times, and then didn't press it one time, I was likely to get more green lights". Also, they may have been trying to deduce whether one response was more responsible for the occurrence of one outcome, and the other response was more responsible for the occurrence of the other outcome. It is more surprising that this occurred in the 0% noncontingent tasks, where the outcomes randomly occurred, as the participants would have observed the irregularity of the

outcomes more so than in the contingent study, especially with such a large number of trials. Indeed, the random nature of the outcomes was also commented on, with participants reporting "I thought I had figured out a pattern, but then it stopped working." Therefore, in the face of disconfirming evidence, this may have reduced the size of the illusion, or eliminated it.

These processes are most likely when participants believe from the outset that they must have a degree of control over the outcomes in the task. However, it is also reasonable to consider that some participants may have already decided that they were unlikely to possess any control prior to starting the noncontingency task. In which case, these participants may have been purposely seeking disconfirmatory evidence for the random relationship between their responses and the outcomes, and would be most likely to show no IOCs, or underestimate their amount of control when a weak contingency was indeed present. Finally, it is also possible that some participants considered the aim of the task too complex to complete, and were unsure of what they were trying to learn. Therefore, it is likely that these participants would have made random responses and guesses for their judgements.

9.3.2 Statistical Analysis

There were many methods of analysing the data that were discussed before deciding on the chosen analysis that was carried out throughout the thesis (see General Methods, section 3.2). The sign of the data was the biggest challenge to work through. Whilst the explicit judgements from the participants were always positive, i.e. 0-100, the actual control and implicit control data was both positive and negative (-100 to 100). Therefore, these variables were not comparable. However, in the experiments that used the active-passive version, the data was analysed in terms of the most reinforced response. Therefore, after subtracting the least reinforced actual conditional probability from the most reinforced conditional probability, the signs of the values of actual control were all positive, so the explicit and actual scales were then equivalent.

However, the analyses of the data differed in the active-active version of the task. This was due to not needing to separate the data depending on whether participants received more green light onset for active or passive responding, as the two responses were now similar. Therefore, it was not necessary to analyse the data in terms of the most reinforced response. However, this meant that the actual control was both positive and negative again (-100 to 100). There were two options at this point: to change the explicit

judgements of control scale, so that it ran from -100 to 100, or to change the actual control scale so that it ran from 0-100. The difficulty in changing the explicit control scale after data collection was that it was unknown as to whether the participants were consciously aware of receiving more reinforcement for one response over the other. Although, the following questions on the Judgements of Control scale asked the participants to estimate the conditional probabilities, which could indicate the "direction" of the control, it was not appropriate to change the signs of the explicit judgements based on the information that was used to calculate the implicit judgements. Using the estimations of the conditional probabilities, which were used to calculate the implicit judgements would increase the correlation between the explicit and implicit judgements, and complicate the notion that they are separate measures. Subsequent experiments could have asked participants to explicitly specify if their perceived control in the task was affiliated with a particular response. However, there were concerns that this would then influence the estimations of the conditional probabilities, and actively encourage people to use the explicit information in the subsequent maximisation task.

Using a scale that ran from -100 to 100 for both measures would also have lead to complications regarding the calculations of the IOCs, which requires the absolute values of both the explicit and actual control. When both positive and negative values are averaged, this leads to an average closer to 0, than if the signs are all positive. Therefore, the true overestimations of the explicit judgements would have been obscured. Additionally, the idea of someone having minus control seems nonsensical, even though it still signifies that the participant had control in the task. For example, if one participant had 40% control, and a different participant had -40%, they both had the same amount of control. Based on this reasoning, it seemed more logical to use the 0-100 scale for the actual control. This also made the analyses more compatible with the active-passive analyses, as both the explicit and actual scales ran from 0-100 in each version.

Next, the scale for the implicit judgements of control had to be considered. Although analysing the data in terms of most reinforced response in the active-passive version resulted in all positive values for actual control, the implicit judgements were both positive and negative. Therefore, this implicit scale ran from -100 to 100. This was due to participants incorrectly judging the conditional probabilities, for example, if a participant actually received more green light onset for active responding, but estimated that he/she received more reinforcement for passive responding, then this would be incorrect and result in a negative value of implicit control. In the active-active version, the data was

analysed as one group, and not based on most reinforced response, so the implicit judgements also ran from -100 to 100. However, now that the actual control scale ran from 0-100 in both versions, the implicit and actual scales were no longer comparable, in terms of the estimates of the conditional probabilities being matched with the actual conditional probabilities, which is unfavourable.

However, if the implicit judgements scale was made comparable to the explicit and actual control scales by making all the implicit judgements positive, it would have invalidated asking the participants to estimate the conditional probabilities as this information would have been lost. Therefore, with this reasoning, the implicit scale was kept from -100 to 100. However, as discussed in subsection 9.1.2, the explicit judgements of control were consistently higher than the implicit judgements of control, which may have been due partly to the method of statistical analysis described here. Whilst the explicit judgements were always positive, the implicit judgements could be both positive and negative, so the average would have regressed towards an average closer to zero. Although the reasoning behind the chosen statistical analyses was justified and seemed logical, there were still concerns about the compatibility of the three control scales, and the effects on the data analysis. However, there were pros and cons for all the methods of analyses that were considered.

The final issue to be discussed here is how the implicit judgements of control were analysed and their accuracy. The implicit control was calculated using the participants' estimates of the conditional probabilities from questions 4 and 5 on the Judgements of Control scale, i.e. the frequency of green light onset for each response. The limitation of this is whether these frequency judgements can reasonably be considered as implicit, when they were calculated using explicit judgements. However, it was considered to be a more implicit measure of control than the explicit measure due to the absence of a reference to control in the two questions, unlike for the explicit judgements question, which overtly asked how much control they had. It is unlikely that the participants understood that these two estimates would also provide another value of control, and the lack of a correlation between the explicit and implicit measures throughout the thesis provides support for the claim that these are separate measures.

The frequency judgements were hypothesised to be accurate based on the proposal that people are knowledgeable about conditional probabilities in two response-outcome situations (Seligman, Maier & Solomon, 1971), and previous research that participants correctly estimated the conditional probabilities in event-nonevent tasks (Alloy &

Abramson, 1979). However, it is necessary to consider the opposite, in that the frequency judgements may be influenced by biases. In other research, the estimates of the conditional probabilities were less accurate, particularly for the passive responding judgement, and for depressed participants (Carson et al., 2010). Additionally, the frequency judgements were more likely to be biased by how many successful outcomes were experienced, particularly where an active response resulted in the desired outcome (Allan, 1980). Furthermore, participants were less likely to focus on unsuccessful trials, where they did not get the desired outcome. Therefore, it is apparent that people do not always use the correct rules when making judgements, and instead can be influenced by confirming cases and reinforcement biases. If this occurred in the experiments in the thesis, then it is possible that the frequency judgements when pressing the space bar (active response) were more likely to be overestimated, whilst the frequency judgements when not pressing the space bar (passive response) were more likely to be underestimated. Subsequently, the values of implicit control would be affected by these biases; in particular they would be overestimated and therefore inaccurate. Furthermore, the meaningfulness of the correlational data between the implicit and actual control would be questionable and doubtful. However, if the bias affected both of the frequency judgements by a similar amount and in the same direction, so that they were both inflated or reduced, then it would not make a difference to the calculated value of implicit control.

9.4 Applications and Future Research

9.4.1 Clinical psychology and therapy

A sense of control, both real and illusory, is associated with numerous benefits: increased persistence, motivation, activity, confidence, physical health and mental health (Rodin & Langer, 1977; Schulz, 1976; Thompson & Spacapan, 1991). Therefore, it can be insinuated that increases in IOCs would also lead to increases in these variables. In particular, applications for clinical psychology and therapy are based on the associations between positive illusions, IOCs and mental health. Although there was weak support for a relationship between depression and IOCs throughout the experiments in the thesis, there has been a lot of support in previous literature, with a meta-analysis finding significant differences between depressed and nondepressed participants in 79% of the studies (Dobson & Franche, 1989). Furthermore, in 95% of these studies, nondepressed individuals displayed IOCs compared to accurate perceptions of control in depressed

individuals. Likewise, Alloy et al. (1981) found that inducing elation in depressed subjects resulted in an increase in IOC, whereas inducing depression in nondepressed individuals lead to more accurate judgements of control in the noncontingency task. Therefore, it is possible that increasing perceptions of control can reduce symptoms of depression and increase well-being (Alloy & Abramson, 1979; Taylor & Brown, 1988).

This has implications for therapeutic interventions, such as CBT, which encourages people to form more realistic perceptions of themselves and their environment. Instead, people may benefit from interventions that encourage positive illusions and IOCs, in order to alleviate symptoms of depression. As discussed in Chapter Six (section 6.3.3), an intervention could follow a 3 Good Things format (Seligman et al., 2005), but instead of describing three positive experiences per day, the participants could describe three situations where they felt in control.

Likewise, positive psychology interventions, such as attribution retraining, that aim to increase well-being may also indirectly increase IOCs. In AR interventions, therapists encourage people to change their attributional style to a more healthy and optimistic one. This includes changing the controllability of causes, so that the person believes that they are more in control of outcomes and events. After the AR intervention in Experiment 8, although the usual increase in well-being was not observed, there was weak support that the IOCs were increased in the experimental condition. Therefore, this provides further support for the notion that well-being increases as perceptions of control increase.

9.4.2 Employment and recruitment

Previous literature has shown that there are benefits and costs associated with the possession of illusions, which can have implications for the workplace. For example, positive illusions have been linked to increases in motivation and persistence when working towards a goal, in that they encourage people to work longer (Gollwitzer & Kinney, 1989; Taylor & Gollwitzer, 1995). Therefore, it may be reflective of greater productivity. Additionally, IOCs and positive illusions have been connected with better physical and mental health and higher levels of happiness (Rodin, 1986a; Taylor & Brown, 1988), which may be reflected in greater job satisfaction, and fewer sick days. Similarly, IOCs have been identified as a buffer against the adverse effects of stress (Friedland et al., 1992), so this could facilitate coping with challenges and deadlines in the workplace. Therefore, an IOC could be viewed as an advantage.

However, an IOC could also motivate someone to persevere on a project that is likely to fail, as they have potentially overestimated their influence, and not made a balanced appraisal using all the available information (Weinstein, 1984). Furthermore, if there actually is no control in the situation, then it will be futile trying to influence the outcomes. Relevant to Experiment 5 in the thesis investigating trainee traders, Fenton-O'Creevy et al. (2003) explored the impact of the IOC on traders and found that as IOCs increased, the traders annual salary decreased, they contributed less towards the company's profits, and were poorer at managing risks. Likewise, Houghton et al. (2000) found that increases in IOCs were accompanied by lower perceptions of risk. Therefore, it appears that people who display IOCs are less likely to make balanced assessments, and more likely to make risky decisions that affect their job performance. However, the IOC needs to be considered in the context of the job role, as to whether it would be an asset or a disadvantage. For example, if the CEO has a high IOC and therefore has unrealistic perceptions regarding their environment, then this could potentially result in costly decisions, particularly if the high IOC is combined with a high risk-appetite.

9.4.3 Back-to-work schemes

Unemployment is an important issue at the present time, and the dependency of people on benefits, food banks, and other support services is a prominent feature in the media and the political agendas. It is vital that people receive encouragement and support in order to motivate them back in to the workplace. However, it is important to acknowledge that people are disillusioned by the prospect of job-seeking due to their low self-esteem, their perceived lack of appropriate skills, job availability, and high competition for vacancies. Therefore, it is important to understand both their current explicit and implicit attitudes to work.

As described in Chapter Six, the DWP have identified eight subgroups of people based on their explicit judgements concerning job-seeking, such as determined seekers, people who have been defeated by circumstances, and people who think staying on benefits is better (DWP, 2011). In line with the focus of this thesis, future research could look at both the explicit and implicit associations that people hold about getting back to work. As well as assessing their judgements of control using the noncontingency task, it could also be useful to explore their implicit associations with control and work via IATs, similar to the methods used in Experiment 5.

The people in each subgroup may then benefit from different interventions, targeted to their specific needs. For example, similar to Experiment 8, and as outlined in the previous section describing clinical applications, positive psychology interventions, such as Attribution Retraining, Signature Strengths and 3 Good Things may be beneficial for increasing well-being, self-esteem and therefore have an indirect effect on perceptions of control. AR interventions should encourage a more optimistic attributional style, by attributing positive events to more internal, unstable, global, changeable, controllable factors, which could lead to better coping with the challenges of finding work. For example, if a person attends an interview but does not get the job, rather than globalising it so that they conclude they will never succeed in any interview, the attributions can be changed so the failure is seen as specific to that one interview. Additionally, the signature strengths intervention encourages people to assess their strengths, e.g. leadership, social intelligence, persistence and creativity, and provides the opportunity to elicit hidden strengths, and then apply them to different areas of their lives (Linley et al., 2007; Proctor, Maltby & Linley, 2011). Using signature strengths means that people are better able to achieve things and to work towards fulfilling their potential (Linley & Harrington, 2006). For example applying the persistence strength to job-seeking may increase the amount of time spent looking for employment. Furthermore, a consistent finding from the experiments in the thesis was that higher IOCs were associated with active involvement (Langer, 1975). Therefore, a perceived control intervention, such as the one described in subsection 9.4.1, could be successful at increasing peoples' perceptions of control, which might encourage more active involvement in job-seeking.

9.5 Concluding Comments

The experiments in the thesis aimed to provide evidence for the existence of a dissociation between explicit and implicit systems, in order to explain the facilitation of the classic case of self-deception, in which two contradictory beliefs could be held simultaneously. Some support was found for the evolutionary theory of self-deception, in which inaccurate and socially desirable information appeared to be prominent in the explicit system, whilst the more accurate information was apparent in the implicit system concurrently. However, against the hypothesis that the explicit information should be more influential on future decision-making, which is associated with negative consequences,

subsequent responses were mostly based on the implicit information. Therefore, this increases the adaptiveness of the theory.

The findings from the experiments also provided strong evidence for the phenomenon of the illusion of control. It was observable across all experiments, whether the situation was noncontingent or contingent, the participants were reinforced more for active responding or passive responding, the two responses were both events or an event and a nonevent, people were primed with high or low power and competence. Therefore, this is supportive of the notion that illusions are pervasive, enduring, and characteristic of mentally healthy individuals.

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Appendix A: Alloy and Abramson's (1979) Standardised Task Instructions

Now, in this problem-solving experiment, it is your task to learn what degree of control *you* have over whether or not this green light comes on. Each time the yellow light comes on indicates the start of a new trial, the occasion to do something. For each trial, after the yellow light comes on, you have the option of either making a button press response or not making a button press response. A button press response consists of pressing this button *once and only once* immediately after the yellow light comes on. Not making a button press response consists, of course, of doing nothing when the yellow light comes on. If you do intend to press the button on a given trial, you must press within three seconds after the yellow light comes on; otherwise the trial will be counted as a not press trial. So, in this experiment there are only two possibilities as to what you can do on each of the trials: either press the button within three seconds after the yellow light comes on, or else, just sit back and do nothing. Any questions so far?

You may find that the green light will go on, on some percentage of the trials on which you make a button press response. You may also find that the green light will go on, on some percentage of the trials when you do not make a button press response. And, you may find that the green light will *not* go on, on some percentage of the trials on which you do make a button press response. And, you may find that the green light will *not* go on, on some percentage of the trials when you do *not* make a button press response. So, there are four possibilities as to what may happen on any given trial: 1) you press and the green light does come on; 2) you press and the green light does not come on; 3) you don't press and the green light does come on; 4) you don't press and the green light does not come on. Since it is your job to learn how much control *you* have over whether the green light comes on, as well as whether the green light does not come on, it is to your advantage to press on some trials and not on others, so you know what happens when you *don't* press as well as when you *do* press. Moreover, the knowledge that you gain from this problem will enable you to earn some money later on in the study. Any questions?

Forty trials will constitute the problem. After the problem, you will be asked to indicate your judgment of control by putting an "X" someplace on this scale: at 100 if you have complete control over the onset of the green light, at 0 if you have no control over the

onset of the green light, and somewhere between these extremes if you have some but not complete control over the onset of the green light. Complete control means that the onset of the green light on any given trial is determined by your choice of responses, either pressing or not pressing. In other words, whether or not the green light goes on is totally determined by whether you choose to press or to just sit back and not press. No control means that you have found no way to make response choices so as to influence in any way the onset of the green light. In other words, the onset of green light onset has nothing to do with what you do or don't do. Another way to look at having no control is that whether or not the green light comes on, on any given trial, is totally determined by factors such as chance or luck, rather than by your choice of pressing or not pressing. Intermediate degrees of control means that your choice of responses, either pressing or not pressing, influences the onset of the green light even though it does not completely determine whether the green light goes on or not. In other words, what you do or don't do matters to some extent but not totally. Another way to look at having intermediate control is that one response, either pressing or not pressing, produces the green light onset more often than does the other response. So, it may turn out that you will have no control, that is, your responses will not affect the onset of the green light, or it may turn out that you will have some degree of control, either complete or intermediate, that is, one response produces green light onset more often than does the other. Any questions before we begin?

After the 40 trials and judgement scales

Now, in this last part of the study, you have a chance to earn money by demonstrating what you have just learned in the first part of the study. You will now receive 10 trials from the problem you just learned about. The relationship between your responses and the onset of the green light remains exactly the same. But this time your objective is to maximize the number of trials on which the green light goes on. On each trial on which the green light does go on, you will earn a quarter. Alternatively, on each trial on which the green light does not go on, you will not earn any money. At the end of the 10 trials you will get to keep all of the money you have earned. So, it is to your advantage to maximise the number of trials on which the green light goes on. Any questions?

Appendix B: Standardised Instructions

The aim of the task is to learn how much control you have over whether the green light comes on or not.

The yellow light indicates the start of a new trial. It will stay on for 1.5 seconds. Within these 1.5 seconds, you have 2 possible responses:

- Make a button press (space bar).
- Do not make a button press (do nothing).

The yellow light will then go off, and the green light will either come on, or stay off. Therefore, there are 4 outcomes:

1. Press space bar, green light comes on.
2. Press space bar, green light stays off.
3. Do not press space bar, green light comes on.
4. Do not press space bar, green light stays off.

You will see a fixation cross between each trial.
As you need to learn how much control you have, it is to your advantage to press on some trials and to not press on other trials.

Press SPACE BAR to begin.

Appendix C: Judgements of Control Scales

Please read the following carefully:

0% - no control – your response choices had no influence over green light onset, i.e. it was random.

50% - intermediate control – your response choices influenced green light onset but did not always determine it.

100% - complete control – your response choices completely determined green light onset.

Answer in 5% increments, e.g., 35%, 80%.

1. How much control did you have over the green light?

_____ %

2. How frequently did you press the space bar?

_____ %

3. How frequently did the green light come on?

_____%

4. On the trials where you pressed the space bar, how often did the green light come on?

_____%

5. On the trials where you did not press the space bar, how often did the green light come on?

_____%

6. How many times did the green light come out of the 10-trials?

_____

Appendix D: Information Sheet and Consent Form

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STUDY INFORMATION SHEET

TITLE: Judgements of control

PURPOSE: The purpose of this study is to examine how much control people feel they have over the outcomes of a problem-solving task. We are also interested in whether there is a relationship between this feeling of control, a person's personality, and decision-making,

PROCEDURES: The study will take approximately 30 minutes. If you choose to participate, you will first complete a simple problem-solving task where you will be asked to judge how much effect your responses had on the outcome of the task. Secondly, we will ask you to complete a short behavioural task based on the previous problem-solving task. Finally, you will be asked to complete some questionnaires.

CONFIDENTIALITY: All information that we obtain from you is confidential. All information will be collected using a unique participant code, which will never be linked to your name. Any paper-based information will be kept in a locked filing cabinet and any computer-based information will be kept in a password-protected file. Only the research staff will have access to this information. Should the results of this study be published, neither your name nor any information that identifies you will be included.

RISKS: Although the tasks are simple, there are a great number of trials in the problem solving task, so there is a risk that you may become bored, frustrated or fatigued. To prevent this, the task is divided into blocks of trials and we encourage you to take breaks as necessary, for as long as you need. In addition, if you feel uncomfortable answering certain items on the questionnaires, you may skip those items.

BENEFITS: There is no direct benefit to you for participating in this study. However, your participation will help us to better understand people's perceptions of the degree of their control over outcomes and how this influences decision-making, providing groundwork for future studies. To compensate you for your time, you will receive course credit. You will receive credit regardless of your performance.

RIGHT TO REFUSE OR WITHDRAW: Participation in this study is voluntary. You are free to withdraw from the study at any time and without penalty, even after the research has concluded. You do not need to provide a reason. You may withdraw from the study by telling the experimenter or by contacting Prof. Robert Ward (r.ward@bangor.ac.uk) and submitting your participant code as it appears below.

COMPLAINTS: If you wish to make a complaint about the conduct of this research, you may do so by contacting Mr. Hefin Francis, School Manager, School of Psychology, Bangor University, Gwynedd, LL57 2AS.

Please retain this information sheet for your records.
If you decide to participate, your participant code is:

_____

School of Psychology
Adeilad Brigantia
Bangor University
Gwynedd LL57 2AS

CONSENT TO PARTICIPATE

By signing this form below, you agree to the following statements:

1) I have read and understood the information sheet.

2) I agree to participate in this study.

3) I understand that all data will remain confidential with regard to my identity.

4) I understand that my participation is voluntary and that I may withdraw from the study at any time, without penalty, and without giving a reason.

5) I have the right to receive a summary of the study results if I choose. If I wish to receive this information, I will include my email address below.

_____
Printed Name

_____ _____
Signature Date

I would like to receive a summary of the study results when the research is complete. Please email this to me at:

_____

Appendix E: Debriefing Information

School of Psychology
Adeilad Brigantia
Bangor University
Gywnedd LL57 2AS

DEBRIEFING INFORMATION

STUDY TITLE: Judgements of control

PURPOSE AND BACKGROUND: The purpose of this research is to examine illusions of control in which people think they have control and influence over random events.

You completed a task in which you were asked to judge how much control you felt you had over the onset of the green light. The actual degree of control was fixed and the onset of the green light varied randomly. Previous research shows that people's ratings of their control are often not well matched to reality. By participating, you have allowed us to explore people's accuracy in perceived control between their responses and environmental outcomes, whether this is related to personality traits and how this affects future decision-making behaviours.

Ultimately, this research will build on existing work on contingency learning; will help us to understand how people have evolved to develop illusions of control, and to explore the advantages and disadvantages of this within specific domains such as employment.

QUESTIONS: If you provided your email address on the consent form, you will be sent a summary of the research results when data analysis is complete. If you did not do so but would like to receive a study summary, please tell the experimenter.

If you have questions about how or why this research was conducted or would like more information about the research in general, please contact Prof. Robert Ward on 01248 38 2211 or via email (r.ward@bangor.ac.uk).

THANK YOU FOR PARTICIPATING!

Appendix F: Judgements of Control Scales – QP Version

Please read the following carefully:

0% - no control – your response choices had no influence over green light onset, i.e. it was random.

50% - intermediate control – your response choices influenced green light onset but did not always determine it.

100% - complete control – your response choices completely determined green light onset.

Answer in 5% increments, e.g., 35%, 80%.

1. (a) How much control did you have over the green light?

   _____ %

2. How frequently did you press the **'Q'** key?

   _____ %

3. How frequently did the green light come on over all the trials?

   _____%

4. On the trials where you pressed the **'Q'** key, how often did the green light come on?

   _____%

5. On the trials where you pressed the **'P'** key, how often did the green light come on?

   _____%

6. How many times did the green light come on out of the 10-trials?

   _____

Appendix G: Mini-IPIP Scale

Here are a number of phrases describing people's behaviours. Please write a number next to each statement to indicate the extent to which **that statement accurately describes you.** Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age.

1 Very Inaccurate	**2** Moderately Inaccurate	**3** Neither Inaccurate nor Accurate	**4** Moderately Accurate	**5** Very Accurate

1	Am the life of the party.	
2	Sympathize with others' feelings.	
3	Get chores done right away.	
4	Have frequent mood swings.	
5	Have a vivid imagination.	
6	Don't talk a lot.	
7	Am not interested in other people's problems.	
8	Often forget to put things back in their proper place.	
9	Am relaxed most of the time.	
10	Am not interested in abstract ideas.	
11	Talk to a lot of different people at parties.	
12	Feel others' emotions.	
13	Like order.	
14	Get upset easily.	
15	Have difficulty understanding abstract ideas.	
16	Keep in the background.	
17	Am not really interested in others.	
18	Make a mess of things.	
19	Seldom feel blue.	
20	Do not have a good imagination.	

Appendix H: Zuckerman-Kuhlman Personality Questionnaire Cross-Cultural 50-item Version (ZKPQ-50-CC)

Instructions: On this page you will find a series of statements that people might use to describe themselves. Read each statement and decide whether or not it describes you. If you agree with a statement or decide that it describes you answer TRUE, marking the letter T with a cross. If you disagree with a statement or feel that it is not descriptive of you, answer FALSE, marking the letter F with a cross.

T = TRUE F = FALSE

(Mark the chosen letter with a cross) Answer every statement either True (T) or False (F) even if you are not entirely sure of your answer.

Example:	T	F	I have always told the truth.
1.	T	F	I do not like to waste time just sitting around and relaxing.
2.	T	F	When I get mad, I say ugly things.
3.	T	F	It's natural for me to curse when I am mad.
4.	T	F	I do not mind going out alone and usually prefer it to being out in a large group.
5.	T	F	I lead a busier life than most people.
6.	T	F	I often do things on impulse.
7.	T	F	I almost never feel like I would like to hit someone.
8.	T	F	I spend as much time with my friends as I can.
9.	T	F	My body often feels all tightened up for no apparent reason.
10.	T	F	I frequently get emotionally upset.
11.	T	F	If someone offends me, I just try not to think about it.
12.	T	F	I like to be doing things all of the time.
13.	T	F	I would like to take off on a trip with no preplanned or definite routes or timetables.
14.	T	F	I tend to be oversensitive and easily hurt by thoughtless remarks and actions of others.
15.	T	F	I do not need a large number of casual friends.
16.	T	F	I can enjoy myself just lying around and not doing anything active.
17.	T	F	I enjoy getting into new situations where you can't predict how things will turn out.
18.	T	F	I am easily frightened.
19.	T	F	If people annoy me I do not hesitate to tell them so.
20.	T	F	I tend to be uncomfortable at big parties.
21.	T	F	I do not feel the need to be doing things all of the time.
22.	T	F	I sometimes feel panicky.
23.	T	F	At parties, I enjoy mingling with many people whether I already know them or not.
24.	T	F	I sometimes like to do things that are a little frightening.
25.	T	F	When on vacation I like to engage in active sports rather than just lie around.
26.	T	F	I'll try anything once.
27.	T	F	I often feel unsure of myself.
28.	T	F	I would not mind being socially isolated in some place for some period of time.

29.	T	F	I like to wear myself out with hard work or exercise.
30.	T	F	I would like the kind of life where one is on the move and travelling a lot, with lots of change and excitement.
31.	T	F	I often worry about things that other people think are unimportant.
32.	T	F	When people disagree with me I cannot help getting into an argument with them.
33.	T	F	Generally, I like to be alone so I can do things I want to do without social distractions.
34.	T	F	I sometimes do "crazy" things just for fun.
35.	T	F	I have a very strong temper.
36.	T	F	I like to be active as soon as I wake up in the morning.
37.	T	F	I can't help being a little rude to people I do not like.
38.	T	F	I am a very sociable person.
39.	T	F	I prefer friends who are excitingly unpredictable.
40.	T	F	I often feel like crying sometimes without a reason.
41.	T	F	I like to keep busy all the time.
42.	T	F	I often get so carried away by new and exciting things and ideas that I never think of possible complications.
43.	T	F	I don't let a lot of trivial things irritate me.
44.	T	F	I am always patient with others even when they are irritating.
45.	T	F	I usually prefer to do things alone.
46.	T	F	I often feel uncomfortable and ill at ease for no real reason.
47.	T	F	I probably spend more time than I should socialising with friends.
48.	T	F	When I do things, I do them with lots of energy.
49.	T	F	I like "wild" uninhibited parties.
50.	T	F	When people shout at me, I shout back.

Appendix I: Beck's Depression Inventory (BDI)

This questionnaire consists of twenty statements. Please read each statement carefully, and then write your answer in the box next to it. Your choice should best reflect the way you have been feeling during the **past two weeks, including today**.

0 Strongly Disagree	**1**	**2**	**3** Strongly Agree

1	I feel sad all the time.	
2	I feel discouraged about the future.	
3	I feel like a failure.	
4	I get very little pleasure from the things I used to enjoy.	
5	I often feel guilty.	
6	I expect to be punished.	
7	I am disappointed in myself.	
8	I criticise myself for all of my faults.	
9	I cry over every little thing.	
10	I am so restless or agitated that it's hard to stay still.	
11	I have lost most of my interest in other people or things.	
12	I have much greater difficulty in making decisions than I used to.	
13	I feel more worthless as compared to other people.	
14	I don't have enough energy to do very much.	
15	I sleep a lot more/less than usual **(delete as appropriate)**	
16	I am much more irritable than usual.	
17	My appetite is much less/greater than usual **(delete as appropriate)**	
18	It's hard to keep my mind on anything for very long.	
19	I am too tired or fatigued to do a lot of the things I used to do.	
20	I am much less interested in sex than I used to be.	

Appendix J: Standardised Instructions – QP Version

The aim of the task is to learn how much control you have over making the green light come on.

The onset of the yellow light indicates the start of a new trial. It will stay on for 1.5 seconds. Within these 1.5 seconds, you can make one of 2 possible responses:

- Press the ‘Q’ key
- Press the ‘P’ key

The yellow light will then go off, and the green light will either come on, or stay off.

If you do not respond within the 1.5 seconds, an error message will appear. If this happens, wait until the next trial begins.

You will see a fixation cross between each trial.
As you need to learn how much control you have, it is to your advantage to press ‘Q’ on some trials and to press ‘P’ on other trials.

Press SPACE BAR to begin.

Appendix K: Demographics Information

PID: _____

Demographics Questionnaire

Age: _____

Sex (circle one): Female Male

Ethnicity (e.g., White, Black, Asian, etc.): _____

First Language: _____

Appendix L: High Power Recall Essay Sheet

Please recall a particular incident in which you had power over another individual or individuals. By power, we mean a situation in which you controlled the ability of another person or persons to get something they wanted, or were in a position to evaluate those individuals. Please describe this situation in which you had power – what happened, how you felt, etc.

Appendix M: Low Power Recall Essay Sheet

Please recall a particular incident in which someone else had power over you. By power, we mean a situation in which someone had control over your ability to get something you wanted, or was in a position to evaluate you. Please describe this situation in which you did not have power – what happened, how you felt, etc.

Appendix N: Self-report Power Manipulation Check

Please write a number next to each word to indicate the extent to which it accurately describes how you felt during the writing task.

1 Very Inaccurate	**2** Moderately Inaccurate	**3** Neither Inaccurate nor Accurate	**4** Moderately Accurate	**5** Very Accurate

When I was working on the writing task, I felt…

… powerful _____

… dependent _____

… influential _____

Appendix O: Motives Studies Information Sheet

School of Psychology
Adeilad Brigantia
Bangor University
Gwynedd LL57 2AS

STUDY INFORMATION SHEET

TITLE: Judgements of control

PURPOSE: The purpose of this study is to examine how much control people feel they have over outcomes. We are also interested in whether there is a relationship between this feeling of control, a person's personality, and decision-making,

PROCEDURES: The study will take no longer than 45 minutes. If you choose to participate, you will firstly complete a short problem-solving task. Secondly, you will complete a simple computer task where you will be asked to judge how much effect your responses had on the outcome of the task. This will be followed by a short behavioural task based on the previous computer task. Finally, you will be asked to complete some questionnaires.

CONFIDENTIALITY: All information that we obtain from you is confidential. All information will be collected using a unique participant code, which will never be linked to your name. Any paper-based information will be kept in a locked filing cabinet and any computer-based information will be kept in a password-protected file. Only the research staff will have access to this information. Should the results of this study be published, neither your name nor any information that identifies you will be included.

RISKS: Although the tasks are simple, there are a great number of trials in the computer task, so there is a risk that you may become bored, frustrated or fatigued. To prevent this, the task is divided into blocks of trials and we encourage you to take breaks as necessary, for as long as you need. In addition, if you feel uncomfortable answering certain items on the questionnaires, you may skip those items.

BENEFITS: There is no direct benefit to you for participating in this study. However, your participation will help us to better understand people's perceptions of the degree of their control over outcomes and how this influences decision-making, providing groundwork for future studies. To compensate you for your time, you will receive course credit. You will receive credit regardless of your performance.

RIGHT TO REFUSE OR WITHDRAW: Participation in this study is voluntary. You are free to withdraw from the study at any time and without penalty, even after the research has concluded. You do not need to provide a reason. You may withdraw from the study by telling the experimenter or by contacting Prof. Robert Ward (r.ward@bangor.ac.uk) and submitting your participant code as it appears below.

COMPLAINTS: If you wish to make a complaint about the conduct of this research, you may do so by contacting Mr. Hefin Francis, School Manager, School of Psychology, Bangor University, Gwynedd, LL57 2AS.

Please retain this information sheet for your records. If you decide to participate, your participant code is: _____

Appendix P: Power Debriefing Information

School of Psychology
Adeilad Brigantia
Bangor University
Gywnedd LL57 2AS

DEBRIEFING INFORMATION

STUDY TITLE: Judgements of control

PURPOSE AND BACKGROUND: The purpose of this research is to examine the effects of priming power on illusions of control, which is the phenomenon where people think they have control and influence over random events.

The first task completed by those in the experimental conditions was designed to prime power (either high or low power), whilst the task for people in the control condition was not designed to manipulate feelings of power. You all then completed a task in which you were asked to judge how much control you felt you had over the onset of the green light. The actual degree of control was fixed and the onset of the green light varied randomly. Previous research shows that people's ratings of their control are often not well matched to reality. By participating, you have allowed us to explore people's accuracy in perceived control between their responses and environmental outcomes, and whether these judgements of control are influenced by the individual's experience of power, and how this affects future decision-making behaviours.

Ultimately, this research will build on existing work on contingency learning; will help us to understand how people have evolved to develop illusions of control and how our motivations can be manipulated to affect this, and to explore the advantages and disadvantages of this within specific domains such as employment.

QUESTIONS: If you provided your email address on the consent form, you will be sent a summary of the research results when data analysis is complete. If you did not do so but would like to receive a study summary, please tell the experimenter.

If you have questions about how or why this research was conducted or would like more information about the research in general, please contact Prof. Robert Ward on 01248 38 2211 or via email (r.ward@bangor.ac.uk).

THANK YOU FOR PARTICIPATING!

Appendix Q: High Competence Recall Essay Sheet

Please recall a particular incident in which you felt competent. By competent, we mean that you felt you had the skills and abilities to be effective and meet the demands in the situation. Please describe the situation in which you had competence – events, feelings, thoughts, etc.

Appendix R: Low Competence Recall Essay Sheet

Please recall a particular incident in which you lacked competence. By this, we mean that you felt that you did not have the skills or abilities to be effective and did not meet the demands in the situation. Please describe this situation in which you lacked competence – events, feelings, thoughts, etc.

Appendix S: Self-report Competence Manipulation Check

Please write a number next to each word to indicate the extent to which it accurately describes how you felt during the writing task.

1 Very Inaccurate	**2** Moderately Inaccurate	**3** Neither Inaccurate nor Accurate	**4** Moderately Accurate	**5** Very Accurate

When I was working on the writing task, I felt…

… competent _____

… unsuccessful _____

… skilled _____

… valuable _____

Appendix T: Competence Debriefing Information

School of Psychology
Adeilad Brigantia
Bangor University
Gywnedd LL57 2AS

DEBRIEFING INFORMATION

STUDY TITLE: Judgements of control

PURPOSE AND BACKGROUND: The purpose of this research is to examine the effects of priming competence on illusions of control, which is the phenomenon where people think they have control and influence over random events.

The first task completed by those in the experimental conditions was designed to prime competence (either success or failure), whilst the task for people in the control condition was not designed to manipulate feelings of competence. You all then completed a task in which you were asked to judge how much control you felt you had over the onset of the green light. The actual degree of control was fixed and the onset of the green light varied randomly. Previous research shows that people's ratings of their control are often not well matched to reality. By participating, you have allowed us to explore people's accuracy in perceived control between their responses and environmental outcomes, and whether these judgements of control are influenced by the individual's experience of success, and how this affects future decision-making behaviours.

Ultimately, this research will build on existing work on contingency learning; will help us to understand how people have evolved to develop illusions of control and how our motivations can be manipulated to affect this, and to explore the advantages and disadvantages of this within specific domains such as employment.

QUESTIONS: If you provided your email address on the consent form, you will be sent a summary of the research results when data analysis is complete. If you did not do so but would like to receive a study summary, please tell the experimenter.

If you have questions about how or why this research was conducted or would like more information about the research in general, please contact Prof. Robert Ward on 01248 38 2211 or via email (r.ward@bangor.ac.uk).

THANK YOU FOR PARTICIPATING!

Appendix U: Attributional Style Assessment Test (ASAT-I)

Reasons for Success and Failure (ASAT--I)

This questionnaire presents some common situations with different possible explanations for the outcome (success and failure) of each situation. Imagine yourself in each situation, and consider each possible reason for the situation turning out as it did. Then circle the letter that corresponds to the one reason or explanation that would most likely account for the outcome if it happened to you. There is no right or wrong answer, of course, so do not spend a lot of time making your judgments. Simply choose the reason that would best explain the outcome if it actually happened to you.

1. You have just attended a party for new students and made some new friends.

    a. I used the right strategy to meet new people.
    b. I am good at meeting people at parties.
    c. I tried very hard to meet new people.
    d. I have the personality traits necessary for meeting new people.
    e. I was in the right mood for meeting new people.
    f. Other circumstances (people, situations, etc.) produced this outcome.

2. You have just succeeded at coordinating an outing for a group of people you like very much.

    a. I used the right strategy in coordinating the outing.
    b. I am good at coordinating outings.
    c. I tried very hard to coordinate the outing.
    d. I have the personality traits necessary for coordinating outings.
    e. I was in the right mood for coordinating the outing.
    f. Other circumstances (people, situations, etc.) produced this outcome.

3. You have just failed the midterm test in a class.

    a. I did not use the right strategy for the test.
    b. I am not good in that particular subject area.
    c. I did not try very hard to do well on the test.
    d. I do not have the personality traits necessary to do well on tests.
    e. I was not in the right mood to take the test.
    f. Other circumstances (people, situations, etc.) produced this outcome.

4. You have just won a competitive match in a sporting event.

    a. I used the right strategy to win the match.
    b. I am good at this sport.
    c. I tried very hard to win the match.
    d. I have the personality traits necessary for this sport.
    e. I was in the right mood for the match.
    f. Other circumstances (people, situations, etc.) produced this outcome.

5. You find yourself alone on almost every Saturday night and regret that you had not arranged to do something with a friend.

a. I did not use the right strategy in arranging social activities.
b. I am not good at arranging social activities.
c. I did not try very hard to arrange social activities.
d. I do not have the personality traits necessary for arranging social activities.
e. I was not in the right mood for arranging social activities.
f. Other circumstances (people, situations, etc.) produced this outcome.

6. While working as a volunteer caller for the American Red Cross, you failed to persuade very many people to donate blood.

a. I did not use the right strategy to persuade people.
b. I am not good at persuading people.
c. I did not try very hard to persuade people.
d. I do not have the personality traits necessary for persuading people.
e. I was not in the right mood for persuading people.
f. Other circumstances (people, situations, etc.) produced this outcome.

7. You have just succeeded at completing the crossword puzzle in the daily paper.

a. I used the right strategy to complete the puzzle.
b. I am good at crossword puzzles.
c. I tried very hard to complete the puzzle.
d. I have the personality traits necessary for completing crossword puzzles.
e. I was in the right mood for a crossword puzzle.
f. Other circumstances (people, situations, etc.) produced this outcome.

8. You were recently unsuccessful at trying to cheer up your roommate who was having a personal problem.

a. I did not use the right strategy to cheer him/her up.
b. I am not good at cheering up other people.
c. I did not try very hard to cheer him/her up.
d. I do not have the personality traits necessary for cheering people up.
e. I was not in the right mood to cheer him/her up.
f. Other circumstances (people, situations, etc.) produced this outcome.

9. You have succeeded in selling your best photographs to a national magazine.

a. I used the right strategy in taking the photographs.
b. I am good at photography.
c. I tried very hard to take good photographs.
d. I have the personality traits necessary for taking good photographs.
e. I was in the right mood for taking good photographs.
f. Other circumstances (people, situations, etc.) produced this outcome.

10. You have just lost a game of Scrabble (the word game).

a. I did not use the right strategy in playing the game.
b. I am not good at playing games like Scrabble.
c. I did not try very hard to play the game well.
d. I do not have the personality traits necessary for playing word games.
e. I was not in the right mood for playing the game.
f. Other circumstances (people, situations, etc.) produced this outcome.

11. You discover that in the recent past you have enjoyed some social activity almost every Saturday night.

a. I used the right strategy in arranging social activities.
b. I am good at arranging social activities.
c. I tried very hard to arrange social activities.
d. I have the personality traits necessary for arranging social activities.
e. I was in the right mood for arranging social activities.
f. Other circumstances (people, situations, etc.) produced this outcome.

12. You have just attended a party for new students and failed to make any new friends.

a. I did not use the right strategy to meet new people.
b. I am not good at meeting people at parties.
c. I did not try very hard to meet new people.
d. I do not have the personality traits necessary for meeting new people.
e. I was not in the right mood for meeting new people.
f. Other circumstances (people, situations, etc.) produced this outcome.

13. You have lost a competitive match in a sporting event.

a. I did not use the right strategy for winning the match.
b. I am not good at this sport.
c. I did not try very hard to win the match.
d. I do not have the personality traits necessary for this sport.
e. I was not in the right mood for the match.
f. Other circumstances (people, situations, etc.) produced this outcome.

14. You have just received a high score on the midterm test in a class.

a. I used the right strategy for the test.
b. I am good in that particular subject area.
c. I tried very hard to do well on the test.
d. I have the personality traits necessary for doing well on tests.
e. I was in the right mood for taking the test.
f. Other circumstances (people, situations, etc.) produced this outcome.

15. You have just failed at coordinating an outing for a group of people you like very much.

a. I did not use the right strategy in coordinating the outing.
b. I am not good at coordinating outings.
c. I did not try very hard to coordinate the outing.
d. I do not have the personality traits necessary for coordinating outings.
e. I was not in the right mood for coordinating the outing.
f. Other circumstances (people, situations, etc.) produced this outcome.

16. While working as a volunteer caller for the American Red Cross you succeeded at persuading a lot of people to donate blood.

a. I used the right strategy to persuade people.
b. I am good at persuading people.
c. I tried very hard to persuade people.
d. I have the personality traits necessary for persuading people.
e. I was in the right mood for persuading people.
f. Other circumstances (people, situations, etc.) produced this outcome.

17. You have just won a game of Scrabble (the word game).

a. I used the right strategy in playing the game.
b. I am good at playing games like Scrabble.
c. I tried very hard to play the game well.
d. I have the personality traits necessary for playing word games.
e. I was in the right mood for playing the game.
f. Other circumstances (people, situations, etc.) produced this outcome.

18. You have failed to complete the crossword puzzle in the daily paper.

a. I did not use the right strategy to complete the puzzle.
b. I am not good at crossword puzzles.
c. I did not try very hard to complete the puzzle.
d. I do not have the personality traits necessary for completing crossword puzzles.
e. I was not in the right mood to complete the puzzle.
f. Other circumstances (people, situations, etc.) produced this outcome.

19. You were recently successful at cheering up your roommate who was having a personal problem.

a. I used the right strategy to cheer him/her up.
b. I am good at cheering other people up.
c. I tried very hard to cheer him/her up.
d. I have the personality traits necessary for cheering people up.
e. I was in the right mood to cheer him/her up.
f. Other circumstances (people, situations, etc.) produced this outcome.

20. You have failed to sell you best photographs to a national magazine.

a. I did not use the right strategy in taking the photographs.
b. I am not good at photography.
c. I did not try very hard to take good photographs.
d. I do not have the personality traits necessary for taking good photographs.
e. I was not in the right mood for taking good photographs.
f. Other circumstances (people, situations, etc.) produced this outcome.

Appendix V: Revised Life Orientation Test (LOT-R)

Instructions:
Please answer the following questions about yourself by indicating the extent of your agreement using the following scale:

[0] = strongly disagree
[1] = disagree
[2] = neutral
[3] = agree
[4] = strongly agree

Be as honest as you can throughout, and try not to let your responses to one question influence your response to other questions. There are no right or wrong answers.

_____ 1. In uncertain times, I usually expect the best.
_____ 2. It's easy for me to relax.
_____ 3. If something can go wrong for me, it will.
_____ 4. I'm always optimistic about my future.
_____ 5. I enjoy my friends a lot.
_____ 6. It's important for me to keep busy.
_____ 7. I hardly ever expect things to go my way.
_____ 8. I don't get upset too easily.
_____ 9. I rarely count on good things happening to me.
_____ 10. Overall, I expect more good things to happen to me than bad.

Appendix W: Week 2 Scenarios: The Attributional Style Questionnaire (ASQ)

Scenarios

(1) You meet a friend who compliments you on your appearance.
(2) You have been looking for a job unsuccessfully for some time.
(3) You become very rich.
(4) A friend comes to you with a problem and you don't try to help.
(5) You give an important talk in front of a group and the audience reacts negatively.
(6) You do a project that is highly praised.
(7) You meet a friend who acts hostilely towards you.
(8) You can't get all the work done that others expect of you.
(9) Your spouse (boyfriend/girlfriend) has been treating you more lovingly.
(10) You apply for a position that you want very badly (e.g. important job, graduate school admission) and you get it.
(11) You go out on a date and it goes badly.
(12) You get a raise.

Appendix X: Attribution Exercise Sheet – Experimental Group

Antecedents Situation	**Beliefs/Behaviour** What did you think when this situation occurred? How did you react? In what way did you behave?	**Causality** Why do you think this happened? Who or what is to blame for what happened?	**Disputing Evidence** What other causes could there be? What other factors may there have been that influenced/caused situation?	**Evaluate** Has your view changed? What do you believe was the cause/causes of the situation now?

Appendix Y: Attribution Exercise Sheet – Control Group

Antecedents Situation	**Beliefs/Behaviour** What did you think when this situation occurred? How did you react? In what way did you behave?	**Causality** Why do you think this happened? Who or what is to blame for what happened?

Appendix Z: Week 3 Scenarios: The Attributional Style Questionnaire for General Use

Week 3 Scenarios:

Try to imagine yourself in the following situation:

(1) You have trouble sleeping.

(2) You feel sick and tired most of the time.

(3) You have a serious injury.

(4) You can't find a job.

(5) You can't get the work done that others expect of you.

(6) You are fired from your job.

(7) You don't help a friend who has a problem.

(8) You have financial problems.

(9) You don't understand what your boss wants you to do.

(10) A friend is very angry with you.

(11) You are guilty of breaking the law.

(12) You have a serious argument with someone in your family.

Appendix AA: Attribution Retraining Debriefing Information

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DEBRIEFING INFORMATION

STUDY TITLE: Judgements of control

PURPOSE AND BACKGROUND: The purpose of this research is to examine illusions of control in which people think they have control and influence over random events.

You completed a task in which you were asked to judge how much control you felt you had over the onset of the green light. The actual degree of control was fixed and the onset of the green light varied randomly. This research was conducted in collaboration with an Attribution Retraining study, which aimed to improve attributional style and increase well-being. Previous research shows that people's ratings of their control are often not well matched to reality, and that these illusions are associated with well-being. By participating, you have allowed us to explore people's accuracy in perceived control between their responses and environmental outcomes, whether this is related to well-being, and how this affects future decision-making behaviours.

Ultimately, this research will build on existing work on contingency learning; will help us to understand how people have evolved to develop illusions of control, and to explore the advantages and disadvantages of this within specific domains such as employment and clinical therapy.

QUESTIONS: If you provided your email address on the consent form, you will be sent a summary of the research results when data analysis is complete. If you did not do so but would like to receive a study summary, please tell the experimenter.

If you have questions about how or why this research was conducted or would like more information about the research in general, please contact Prof. Robert Ward on 01248 38 2211 or via email (r.ward@bangor.ac.uk).

THANK YOU FOR PARTICIPATING!