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Mapping resilience: Expeditions, profiling, and the COVID-19 pandemic

Pettit, Joseph

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Mapping resilience: Expeditions, profiling, and the COVID-19 pandemic

By Joseph Anthony Pettit

Thesis submitted to Bangor University in fulfilment of the requirements for the degree of Doctor of Philosophy at the College of Human Sciences.

May 2022

Author's Declaration

'Yr wyf drwy hyn yn datgan mai canlyniad fy ymchwil fy hun yw'r thesis hwn, ac eithrio lle nodir yn wahanol. Caiff ffynonellau eraill eu cydnabod gan droednodiadau yn rhoi cyfeiriadau eglur. Nid yw sylwedd y gwaith hwn wedi cael ei dderbyn o'r blaen ar gyfer unrhyw radd, ac nid yw'n cael ei gyflwyno ar yr un pryd mewn ymgeisiaeth am unrhyw radd oni bai ei fod, fel y cytunwyd gan y Brifysgol, am gymwysterau deuol cymeradwy.'

Rwy'n cadarnhau fy mod yn cyflwyno'r gwaith gyda chytundeb fy Ngrichwyliwr (Goruchwylwyr)'

'I hereby declare that this thesis is the results of my own investigations, except where otherwise stated. All other sources are acknowledged by bibliographic references. This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree unless, as agreed by the University, for approved dual awards.'

I confirm that I am submitting the work with the agreement of my Supervisor(s)'

Acknowledgements

As I make the final changes to my thesis, it's cold, windy, raining outside, and an angry peacock screams from the street below sounding like a strangled airhorn. I can't say Bangor was where I imagined myself doing a PhD. Despite my initial concerns as a London-born and steadfast urban dweller, North Wales steadily grew on me and as wonderful as my 'captors' are, I can't attribute *all* of my affection to the place on Stockholm Syndrome alone.

It's certainly been a tumultuous four years, especially with the COVID-19 pandemic having such a significant effect on all of us. Personally, it's only added to the vast academic challenge, causing a range of difficulties with my research and partner company. However, amongst the troughs there have undoubtedly been peaks, and working from home has allowed me to reflect on all the supportive people who have been there in their different ways along the journey. From close friends and family, the wonderful other quirky postdocs, to the forever patient (and similarly quirky) staff. It's strange to imagine having done it any other way now, with any other people around me, or even in any place other than Bangor. I managed to adapt and persevere with the support of these people and this place, but also because I knew if I didn't somehow manage, there was the huge, gaping irony that my PhD is about resilience.

Firstly, I want to say a huge thank you to Nichola Callow, Ross Roberts, and Stuart Beattie. Throughout the PhD you have all been limitlessly patient and supportive in pushing me towards being a better academic and scientist. I have always felt that you've all genuinely had my back and I hope to stay connected in the future. Secondly, I'd like to thank Penny Dowdney, without Penny this PhD wouldn't exist, from the initial funding to her hard work in getting us the invaluable project extension when the pandemic hit. Lastly, to all of you, the rest of the department, and to Outlook Expeditions, I'll proudly take these experiences and knowledge into the future, and dare I say that these experiences have made me more resilient.

Presentations and Awards

The work contained in this thesis was originally undertaken in collaboration with an external partner company (Outlook Expeditions), which features largely in Chapter 3. Along with presenting the studies/findings contained in this thesis to audiences internally (e.g., to the partner company, within our academic department), it has also been presented at conferences that include: Two Pan Wales conferences (Welsh National University conference), a KESS (Knowledge Exchange Skills Scholarship)-organised conference in Czech Republic, and the AASP 2021 Las Vegas conference.

In addition, the studies covered in Chapter 4 were awarded the Professor Beatrice Edgell Prize for best postgraduate research 2021 by the BPS, along with a £400 grant.

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Thesis Summary

Across multiple domains of psychology, resilience is a well-researched construct. However, the research literature has been hampered by ambiguities and inadequate in its conceptualisation, assessment, and impact. With these issues in mind, we first offer a comprehensive model of resilience drawn from its contemporary conceptualisations. Second, we develop a self-report resilience measure from this model. Finally, we aimed to test this resilience model and assessment in challenging settings with young people who participate in overseas expeditions. Unfortunately, due to the COVID-19 pandemic, we could not fully utilise these expeditions. Therefore, we further examined and tested our resilience model to another challenging scenario, the pandemic itself.

The thesis comprises six empirical studies organised into three chapters. Chapter 1 takes a critical examination of resilience research, highlighting several limitations we perceived. These included (i) ambiguous and incomplete resilience definitions and conceptualisations; (ii) associated problems with measurement (alongside problematic psychometric properties); and (iii) lack of theory-driven intervention tools and studies. Chapter 1 supports and extends resilience as a state-like, pro-active and reactive response containing the mechanisms of anticipation, minimising, managing, and mending. We also support and extend research where mechanisms can operate in several domains of life, including physical, social, cognitive, emotional, and a general domain. The chapter finishes by discussing applications for this model in expeditions research, interventions, and profiling.

Chapter 2 contains two separate studies aimed at developing a resilience measure in line with our conceptualisation. Study 1 (n = 181) focused on establishing the measure (the Resilience Process Scale, RPS), with items based on the four mechanisms of anticipate, minimise, manage, and mend, with vignettes to separate each domain (general, physical, social, cognitive, & emotional). We used Bayesian Structural Equation Modelling (BSEM) to

validate the model and refine the scale into a 13-item measure (using the same 13-items in each domain or vignette). Study 2 (*n* = 284) further validated the measure using BSEM and a more heterogeneous sample, providing further support for the factorial validity of the RPS.

Chapter 3 contains two separate studies. Study 3 (*n* = 35) examined overseas expeditions as a challenging environment that could enhance resilience mechanisms and domains. Study 4 (*n* = 16) focused on an expedition training weekend to examine the benefits of training and to design and pilot test a theory-driven resilience intervention. The intervention introduced challenges to target the five domains of resilience via evidence-based strategies. The main findings across the studies indicated that expeditions and training weekends provide an environment that enhances resilience, cognitive appraisals, and well-being, in addition to positive correlations between resilience mechanisms with positive self-concept and well-being. However, probably due to the small sample size and an incident that developed over the weekend, there were no significant effects of the intervention.

Chapter 4 contains two separate studies. Using data from studies 1-4, Study 5 (*n* = 555) examined resilience profiles across the four mechanisms using Latent Profile Analysis, revealing four emerging profiles. Study 6 provided confirmation of the replicability of these profiles in a new sample (n = 400). We examined the relationship between the profiles across different cognitive, affective, and behavioural outcomes in relation to the pandemic. We further explored the stability of resilience profiles over a four-month period. The main findings included confirming four profiles: 1. Low resilience – High anticipate. 2. Low resilience – Low anticipate. 3. Moderate resilience. 4. High resilience. Further, resilience is related to greater well-being, coping, and lower anxiety. The profiles were also somewhat replicable with stability across time.

Chapter 5 concludes the thesis, providing a general summary and discussion of the findings, implications for theoretical and applied perspectives, and paths for future research.

Chapter 1: General Introduction and Literature Review

General Introduction and Literature Review

Successfully managing and adapting to life's challenges requires resilience (e.g., Bryan et al., 2019). Given the impact of stress-related illnesses on global economies, resilience is not only a subject of great personal importance but also has major social and financial significance (Joyce et al., 2018). To meet this challenge, research is increasingly focusing on what constitutes resilience and how it can be developed or enhanced. Resilience is a multifaceted phenomenon influenced by the presence or absence of various resilience-promoting resources. When such resources are cultivated, they enhance a person's overall ability to effectively cope with heightened stress and adverse life circumstances (e.g., Joyce et al., 2018). Research has shown that people with higher levels of resilience cope better with and resist the negative effects of mental ill-health (e.g., Edward & Warelow, 2005), feel less emotional stress following adverse events (Masten & Tellegen, 2012), and show faster recovery from such exposures (Zautra et al., 2010). Other research demonstrates that resilient individuals also perform better in settings such as sport (Mummery et al., 2004).

Definitions and Conceptualisations of Resilience

While the benefits of resilience have been well researched (e.g., Joyce et al., 2018), research on resilience has been hampered by ambiguities and inadequate conceptualisations (Windle et al., 2011). Different definitions of resilience have likely led to different methods and methodologies, making progress in this area difficult. Even when conceptualisations are broadly similar, evidential, or other empirical support can differ across applications such as sport or in the workplace (e.g., Martin-Breen & Anderies, 2011).

Ambiguity around definition, underlying components, and its theoretical and applied distinctiveness also make it challenging to separate resilience from similar concepts. The lack of consistent definitions in the research literature has also contributed to the conceptual confusion (e.g., Jones et al., 2002; Martin-Breen & Anderies, 2011). To elaborate, mental

toughness is a term often used somewhat interchangeably with resilience (e.g., Cowden et al., 2016). As Gucciardi and Hanton (2016) discuss, historically, mental toughness was conceived in settings such as sport to describe the psychological qualities and traits of those who achieve outstanding performances, despite pressure and adversity. However, mental toughness research has also been hampered by conceptual inconsistency. Similar to conceptualisations of resilience, the term has since evolved to more closely resemble a process influenced by state factors, and manifesting across different settings (Cowden et al., 2016). Due to the similar nature of the two concepts, one has often been used as a subfactor or part of the other, for example, mental toughness has often been used as a term for the resilient individual's personal protective qualities (with other protective qualities including biological or social resources, e.g., Gucciardi & Mallett, 2010). Nevertheless, distinctions have been noted, as resilience is often used as more of an umbrella and broader term (e.g., a resilient community), and mental toughness often involves a more direct relationship towards goals and challenges than resilience does (e.g., Cowden et al., 2016). Furthermore, as previously alluded to, resilience can involve influences outside of the self, such as social support (e.g., Fletcher and Sarkar, 2012). In any case, going forward researchers should be clear in their definitions and conceptualisations of either that they use.

Coping is another term that is often used interchangeably with resilience. The argument is for example that someone who is resilient is simply good at coping, despite evidence that they are separate concepts and processes, or at least that coping is only a part of resilience (e.g., Campbell-Sills et al., 2006). To elaborate, more resilient people tend not to appraise as many situations as stressful (or at least, less intensely stressful) as those who are less resilient (e.g., Major et al., 1998). This perspective suggests coping has more to do with actions and responses to a stressful situation, and its effectiveness in resolving it (e.g., Fletcher & Sarkar, 2013). Therefore, it could be argued to be a component of resilience. To

summarise, when approaching concepts such as resilience, it is important to state clearly what conceptual approach is being taken and why, in order to add clarity and move the literature forward, as well as ensure a valid way of measuring it is being used (see e.g., Windle et al., 2011).

With the issues in mind, it is important to look at previous ways in which resilience itself has been examined and conceptualised. The term ‘resilience’ originates from Latin, meaning to *bounce-back* or *rebound* (Doorn et al., 2018) which some researchers still focus on within their own definitions. For example, Smith et al. (2008) define resilience as the ability to bounce back or recover from stress. However, definitions of resilience often go beyond this simple focus on bouncing back. For example, some researchers define resilience as an ability to remain functionally stable despite pressure (Joyce et al., 2018), or maintaining growth and adapting to stressful circumstances (Windle et al., 2011).

In addition, there has been considerable debate on whether resilience should be conceived as a trait, or a process that involves some interaction with the environment. As a trait, resilience represents a constellation of characteristics the enable one to adapt to the adverse circumstances they face (Connor & Davidson, 2003). This constellation is often referred to as protective factors or qualities, with examples including optimism and hope (e.g., Bryan et al., 2019; Vanhove et al., 2016). Historically, these factors have been examined extensively in the resilience literature (e.g., Luthar, 2006). However, researchers have since proposed that resilience is a process, and should be considered as an interaction between protective factors, the adversity being faced, and the context in which it is encountered (Pangallo et al., 2015). Moreover, this process approach recognises that resilience can develop over time that is influenced by the type and intensity of the adversity, current state of individual (e.g., mood) as well as other environmental factors such as resources available and their use (e.g., Egeland et al., 1993; Pangallo et al., 2015). This

approach to conceptualising resilience as a state-like process is more comprehensive and reflective of the individual's resilience and should therefore lead to better measurements of the construct (Pangallo et al., 2015).

Therefore, the term *resilience* seems to have evolved beyond its original Latin meaning of 'recovery' and 'bouncing back'. More recently, researchers have also moved towards a more complete conceptualisation of resilience as a process, with a pro-active aspect of resilience referring to its protective qualities and behaviours when under pressure, to the more reactive aspects of resilience referring to its recovery quality, learning, and return to normal functioning (Bryan et al., 2019; Fletcher & Sarkar, 2016; Mummery et al., 2004). Resilience can also be conceptualised as a state-like process, with traits such as optimism that can act as protective qualities and are influenced by more malleable state factors (e.g., social resources; Bryan et al., 2019; Vanhove et al., 2016).

Although the concept of resilience is changing, resilience measurements have not reflected the more contemporary conceptualisations. If the application of resilience research is to progress, measurements would need to reflect this comprehensive and consistent view of resilience (e.g., resilience being defined as a state-like pro-active and reactive process).

Measuring Resilience and Resilience Mechanisms

While numerous measures of resilience exist throughout the literature such as the Brief Resilience Scale (Smith et al., 2008), CD-RISC (Connor & Davidson, 2003), and the Resilience Scale (Wagnild & Young, 1993), many are beset by problems (e.g., Estrada et al., 2016; Fletcher & Sarkar, 2016; Kumar et al., 2010). For example, Estrada et al. (2016) found that many resilience measures examine the concept indirectly via examination of outcomes, correlates, traits, or antecedents. As various definitions of resilience have been proposed throughout the psychology literature, issues surrounding measurement are unsurprising. Before examining the actual current resilience measures that exist, it is important to examine

how such a measure tends to be planned and designed. When developing a resilience measure, many researchers set out to consider three main components that encompass resilience (though usually not covering all three), adversity, positive adaptation, and protective factors which can be considered a critical aspect of resilience measurement (see, for a review, Fletcher & Sarkar, 2012; 2013; Sarkar & Fletcher, 2013). Each of these aspects are discussed in turn below.

Adversity

With regards to the adversity aspect of measurement, the context should be considered. If one defines adversity only by general negative consequences for example, then the inclusion of daily stressors inherent to a domain such as sport may be ignored. Domain specific stressors may be somewhat unique. For example, in the sport domain these could include preparations, rivalries, and the risk of injury (Arnold & Fletcher, 2012). The ability to deal with these context-specific stressors may or may not be transferrable to other contexts (e.g., Estrada et al., 2016; Hayman et al., 2017; Pangallo et al., 2015; Pietrzak & Southwick, 2011). Thus, when considering adversity in a resilience measure, significant life events as well as ongoing daily stressors should be included, as well as the context-specific nature of the adversity. Another adversity-related aspect to consider in resilience measurement is examining intensity or frequency of stressors. Self-reports could be biased if, for example, an athlete had just experienced a performance slump (which could be considered an intense stressor). In addition to considering these details when developing items and when interpreting results, researchers could consider taking measurements over multiple time periods, taking observer ratings, and even consider how they introduce their items with an instructional vignette (e.g., Leighton, 2010). This former aspect may be particularly important to consider with resilience conceptualised as a state-like process that can change over time.

Therefore, assessing it on multiple occasions allows for an examination of the stability of resilience across time.

Positive Adaptation

Positive adaptation largely encompasses good adjustment, competence, performance, and absence of psychopathology, particularly during adverse circumstances (e.g., Luthar et al., 2000). However, these facets are largely tied to the context and adversity faced, therefore can largely vary across individuals and situation. For example, what could be considered a competence in one domain may be considered less so in another, such as seeking out challenges and taking risks to achieve success in sport compared to doing the same things in a community setting (e.g., Fletcher & Sarkar, 2013). In addition to considering context and utilising methods such as an instructional vignette, researchers often measure other constructs to examine positive adaptation outcomes. These may include outcomes such as self-efficacy and well-being (for a more complete examination demonstrating positive adaptation and resilience see e.g., Luthar et al., 2000; Sarkar & Fletcher, 2013). However, factors such as self-efficacy have been considered as both an influence on resilience, and a consequence of it across different studies (e.g., Kinard, 1998). Thus, researchers should provide a clear justification of which approach they take and should reflect relevance to the specific research question being examined (e.g., Luthar & Zelazo, 2003). In sports for example, high self-efficacy can be a protective factor when examining influences on confidence for an athletes' performance. In contrast, improvements in self-efficacy could be a positive outcome when examining what helps injured athletes obtain confidence after experiencing such an incident (see e.g., Fletcher & Sarkar, 2012; Sarkar & Fletcher, 2013).

Protective Factors

Reflecting earlier research into resilience, protective factors are often examined and measured, as they necessitate resilience and positive outcomes during adversity. Measures

that focus on this component explore the more trait-like aspects of resilience and personal factors that protect from negative outcomes. This conceptualisation consists of issues discussed previously in this review, such as the importance of the interaction of these traits with the situation, time, and the nature of the stressor itself (e.g., Pangallo et al., 2015). Nevertheless, these traits can benefit resilience and enable one to adapt to the adverse circumstances they face (Connor & Davidson, 2003). These traits include a sense of humour, self-confidence, optimism, and hope (e.g., Bryan et al., 2019; Luthar, 2006; Rutter, 1987; Vanhove et al., 2016).

Current Resilience Measures

It is clear that some assessments of resilience only measure a more narrowly defined aspect of resilience (such as only one of the three components discussed above). Some demonstrate poor (or do not state any) psychometric properties (e.g., Fletcher & Sarkar, 2016; Martin-Breen & Anderies, 2011; Windle et al., 2011). For example, a commonly used measure called the CD-RISC (Connor & Davidson, 2003) assesses an individual's resources, traits, and behaviours leading into and during adversity, but generally ignores recovery from stress. Further, according to Windle et al. (2011), the conceptualisation of the CD-RISC scale lacks depth and clarification on resilience as a personal quality and trait. Similarly, the Resilience Scale (Wagnild & Young, 1993) assesses traits such as self-reliance and perseverance to encapsulate resilience. Another popular assessment tool called the Brief Resilience Scale (BRS; Smith et al., 2008) provides a clearer definition of resilience. However, the BRS focuses almost exclusively on post adversity recovery. The Ego-Resiliency Scale (Block & Kreman, 1996) only considers resilience as a stable trait and not a dynamic, state-like process. Therefore, there is a need to examine and bring together these differently defined processes as aspects of resilience that can reflect the use of protective factors and positive adaptation.

Resilience Mechanisms

In addressing some of these issues, Alliger et al. (2015) proposed a model covering three behavioural mechanisms that resilient teams use to deal with pressures, stressors, and challenges. These mechanisms include the ability to pro-actively minimise (anticipating and planning for challenges), manage (act and react, navigate, and then adapt as the issue occurs), and mend (react, learn, and recover from the experience) from adversity. Following a similar conceptualisation, Chen et al. (2016) developed The Essential Resilience Scale. Their conceptualisation includes state- and trait-like components of resilience in its items, along with a more comprehensive three-stage resilience process. This resilience process includes the ability to anticipate (i.e., to identify and appraise an upcoming threat), be flexible (adapt and manage as the stressors occur), and to bounce-back (recover) from adversity. The authors provide good psychometric properties for the scale (e.g., good model fit after a confirmatory factor analysis and factor loadings between .60 and .98), and the measure does seem to predict health outcomes such as stress and anxiety, but many items are culturally specific to Chinese populations and are not as relevant to Western participants (Lau et al., 2020). Thus, both approaches provide a more comprehensive conceptualisation of resilience as a process that includes pro-active (pre-event) and reactive (post-event) elements (e.g., Fletcher & Sarkar, 2016).

However, both Alliger et al. (2015) and Chen et al. (2016) chose to combine the processes of anticipate and minimise as a single process and mechanism. Research indicates that the ability to anticipate an upcoming threat should be treated as a separate process to implementing minimising strategies (e.g., coping strategies). Under stress, most humans have an attentional bias towards threats, which usually has evolutionary benefits (MacLeod et al., 1986). However, we do not (or need to) always act upon upcoming or potential threats (e.g., Anderson, 2003). For example, anticipating upcoming stressful events and how we react

(such as minimising strategies) may partially be explained by appraisal theory (Lazarus, 1991). Appraisal theory contains two main components, primary and secondary appraisals. The process of primary appraisals requires a person to anticipate whether an upcoming situation is deemed as a threat, non-threat, or a challenge. If an individual perceives the situations as a threat, they will then engage with secondary appraisals. Secondary appraisals involve the evaluation of their resources and options to deal with the threat. If a person anticipates an upcoming threat but perceives they have enough resources to deal with it, then they may make no behavioural adjustments at all. However, if the person perceives they lack the coping skills to deal with the threat, then they may employ early or additional coping strategies to minimise its potential impact (e.g., seek more information or seek help from a significant other).

In applied settings, Hardy et al. (2014) found that athletes who demonstrated higher levels of performance when under pressure (as rated by their coach), tended to report higher levels of a personality trait called punishment sensitivity, which suggests they pay more attention to cues of potential punishment and threat (Gray & McNaughton, 2000). Hardy et al. found further evidence to suggest that these athletes were predisposed to picking up threats early (e.g., they were good at anticipating upcoming threats), which allowed them more time to minimise and deal with such threats faster, leading to a better performance.

Domains of Resilience

As previously mentioned, another shortcoming of the resilience literature is that research tends to ignore the context in which resilience can function and emerge. Although some resilience resources and behaviours may be effective in multiple contexts, the existence of an overall resilience ability is unlikely as resilience is associated with responses to specific situations in both an interpersonal and intrapersonal sense (Hayman et al., 2017). Further, resilience more likely exists on a continuum, with differing responses and levels across

multiple domains of life and situations (Estrada et al., 2016; Pangallo et al., 2015; Pietrzak & Southwick, 2011). For example, an individual who adapts well to workplace stress or in an academic setting (i.e., cognitive stress) may fail to adapt well in their personal life or their relationships (social stress). We hereafter define a contextual domain as a setting in which certain types of adversity (and associated stress) will be experienced more often than others. However, it is worth acknowledging that examining a more general overview of resilience (in a self-report measure) could be useful. For example, a practitioner may wish to ignore domains and focus primarily on the mechanisms/process of resilience.

Recently, Chen et al. (2016) proposed three domains of functioning in their resilience model based upon physical, emotional, and social domains. However, the authors did not elaborate on how previous research determined or informed these domains. Although we do not deny these are important domains of functioning to assess, other potentially significant domains may have been overlooked. For example, one important domain that seems very relevant to human functioning is resilience to stress from a cognitive perspective (Ringeisen & Raufelder, 2015). Thus, another purpose of this PhD was to expand on the three known domains of resilience to four.

Physical Resilience

Physical and mental reserves tend to be reduced in those who are less physically fit or able to handle physical fatigue (Alliger et al., 2015). Other research demonstrates that those with higher resilience tend to be better at coping with and managing physical illness and pain (e.g., McAllister et al., 2013; Ramírez-Maestre et al., 2019). Additionally, resilience to stress in the physical domain has been linked to maintaining well-being as one advances into old age and therefore should be more clearly examined and understood (Hayman et al., 2017). Pattison (2011) found that when anticipating or experiencing problems with performance outcomes, many athletes pro-actively increase or modify their physical training as a form of

management. Such a method can often help an athlete deal with physical stress and injury, but not necessarily with other forms of stress. For instance, one may have the resilience to manage pain from a physical injury but lack the resilience to deal with the negative emotional responses from long-term injury (e.g., Caine et al., 2016). Indeed, many who are resilient to physiological stressors may not be as resilient in the face of emotional adversity (Rutter, 1987). These studies support the work of Chen et al. (2016) and highlight that physical resilience should be treated and examined as a distinct domain.

Social Resilience

If left unchecked, adversity from social sources can lead to intense forms of stress responses leading to anxiety and depression (e.g., Aydin et al., 2010; Rajaleid et al., 2015; Wood & Bhatnagar, 2015). Adversity within social domains can take the form of social isolation, parental neglect, interpersonal relationship issues, and conflicts (e.g., breakups and arguments). Further, the types of stressors from social relationships can be unique in how they are best dealt with (e.g., knowing when to seek time alone or social support) and how they impact well-being (e.g., Gerhardt et al., 2021). In dynamic environments such as expeditions, these relationships themselves may present unique stressors not normally faced (Stott et al., 2013). These types of stressors may be experienced and dealt with differently for a myriad of reasons. For example, due to reasons such as social stigma, many adolescent girls tend to emotionally numb themselves, leading to internalised feelings of distress and aggression when faced with social stress (Sontag et al., 2011). Having social resilience could potentially buffer the negative effects of these stressors. Research has also shown that active coping (using one's resources to minimise impact), as opposed to passive coping (e.g., avoiding or withdrawing), is associated with enhanced resilience to social forms of adversity and reduced depressive symptoms. However, these coping methods could vary in efficacy

within other stress contexts (Connor-Smith & Compas, 2002; Okafor et al., 2016; Wood & Bhatnagar, 2015).

Cognitive Resilience

A lack of resilience in a cognitive domain could lead to compromised attentional control, poor decision making, reduced information processing, and reduced working memory capacity (e.g., Eysenck et al., 2007). Research has demonstrated that stress from cognitive sources is dealt with differently to other sources of stress such as physical, at a psychological, physiological, and behavioural (actions taken) level (e.g., Dong et al., 2018; Palamarchuk & Vaillancourt, 2021). A lack of resilience in this domain can lead to cognitive overload, high anxiety, burnout, and other mental health issues (e.g., Ćosić et al., 2019; Yaroush & Bourne, 2008). In applied settings, student exams represent a form of cognitive stress that is sometimes referred to as academic adversity. The associated stress can lead to lower performance and negative impacts on mental health, and this type of stress has more unique protective factors and coping methods to deal with it (Fullerton et al., 2021; Putwain et al., 2015). The medical field and air traffic control are two other contexts in which high levels of cognitive stress are often experienced (e.g., Chapman et al., 2017; Ćosić et al., 2019). If not dealt with effectively, the consequences on effective decision making under pressure could be serious or even life threatening. Thus, high levels of cognitive resilience could allow one to better deal with and buffer the negative effects of these types of stress (Chapman et al., 2017; Ćosić et al., 2019; Ringeisen & Raufelder, 2015).

Emotional Resilience

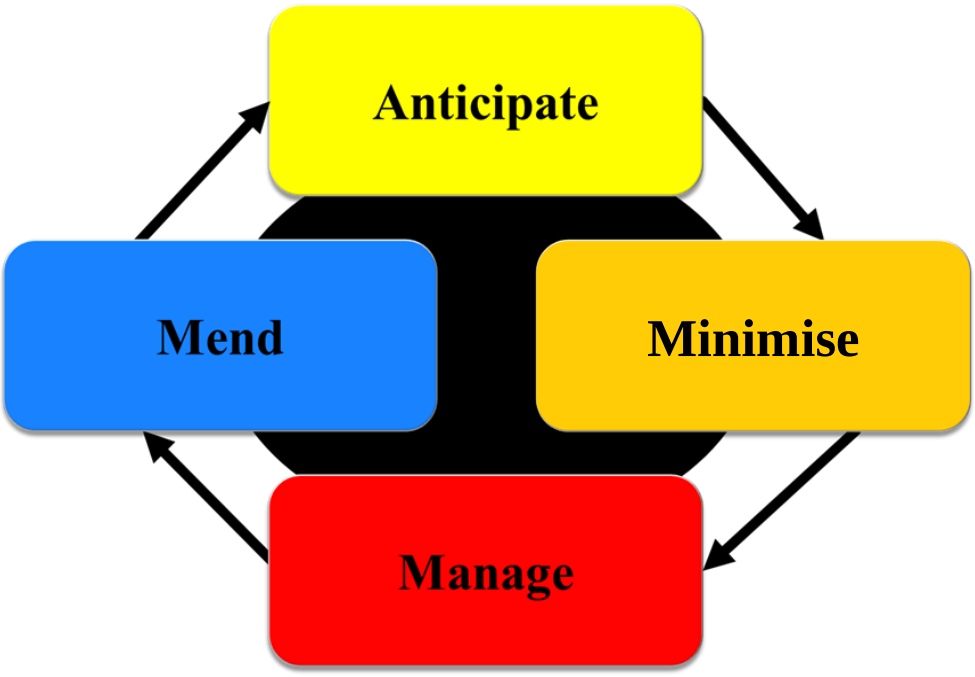
Finally, emotional resilience has been described as the ability to manage positive and negative emotion in times of stress and could be more uniquely associated with emotional awareness and regulation than other forms of resilience (e.g., Resnick et al., 2011; Schneider et al., 2013). Experiencing adversity and stressful events can all potentially cause negative

emotional reactions leading to negative outcomes upon mental health, such as anxiety and depression (e.g., Edward & Warelow, 2005; Masten & Tellegen, 2012). However, some stressors (e.g., bereavement) may cause higher emotional distress than any other domain, requiring emotional resilience. Coifman et al. (2007) found more emotionally resilient people can have a more complex and less negative response to bereavement, leading to more salutary outcomes to aversive life events. Bereavement presents an emotional issue more often faced by older adults. As one gets older, more emotionally resilience people tend to shift towards more adaptive emotion-focused coping (e.g., Hayman et al., 2017). Similarly, emotional resilience may be more generally associated with emotion-focused coping generally, particularly in situations where a stressor cannot itself be controlled (Rose & Palattiyil, 2020). Additionally, emotionally resilient people may be more able to use emotional regulation strategies to help appraise and reappraise before, during, and after a stressful event (e.g., Gross, 2002; Schneider et al., 2013).

To summarise and clarify the conceptualisation of resilience used in this thesis and based on the more contemporary literature, resilience can be defined as a multidimensional, state-like process of anticipating, minimising, managing, and mending from adversity (see Figure 1.1) in a general, physical, cognitive, social, or emotional domain. However, it is important to test such a conceptualisation and model empirically, necessitating the need for an appropriate measure to examine it (see Chapter 2 of this thesis).

Figure 1.1

Visual representation of resilience mechanisms



Resilience and Profiling

Upon the development of a measure that can test our resilience model, it would be beneficial to consider resilience profiles. In the literature (and likely due to issues such as conceptualisation ambiguity), the various components of resilience have yet to be considered in terms of a within-person profile. Such an approach may give a much more nuanced understanding of resilience beyond it being *high* or *low*, given that we are likely to differ on these mechanisms in different contexts (e.g., Pietrzak & Southwick, 2011). This approach would also allow us to examine if certain resilience profiles influence specific outcomes. Methods such as Latent Profile Analysis (LPA; e.g., Gillet et al., 2017) could demonstrate what prevalent mechanisms tend to emerge and how much of a targeted population might fit into each of these patterns. Further, it would allow us to examine what outcomes these profiles might be specifically associated with. Such analysis may also enable researchers to

examine differences between subpopulations in resilience and associated outcomes (e.g., Gooding et al., 2011). These hypothetical profiles and outcomes would need to be tested empirically to further our understanding of resilience processes (see Chapter 4 of this thesis). Some of the specific profiles and outcomes we might expect during the COVID-19 pandemic are discussed in the applications section of resilience research below.

Applications for Resilience Research

Interventions and Building Resilience

With a model and conceptualisation of resilience established, it is important to explore its applicability in different stressful areas of life. Foremost, it is important to examine from the literature how resilience can be developed under the scope of the proposed model. The conceptualisation of resilience as a process is particularly significant in this application, as it proposes resilience is a largely malleable construct, and as such is suitable for intervention (Robertson et al., 2015).

Building resilience can generally be achieved in two different ways. One method is to develop the individual's coping skills and resources to better navigate and make the most of adverse experiences (e.g., Barrett & Martin, 2014; Fletcher & Sarkar, 2016). The other is to learn how to deal with stressful situations through navigating actual stressful environments and successfully processing and dealing with the adverse experiences from it (e.g., Barrett & Martin, 2014; Crane & Searle, 2016; Ewert & Yoshino, 2011). It's worth noting that, successfully dealing with an optimal amount of arousal and stress can lead to longer-term benefits such as lower levels of stress hormone, calmer behaviour toward challenges, and better emotional stability. The individual learns and becomes better at dealing with smaller and controllable adversities that lead to dealing better with more intense events (Barrett & Martin, 2014; Meichenbaum & Novaco, 1985).

Fletcher and Sarkar (2016) discuss three main interconnected aspects to building resilience. These components are personal qualities, a facilitative environment, and a challenge mindset. As previously discussed, personal qualities comprise personality characteristics associated with resilience such as self-confidence and self-concept (e.g., Rutter, 1987). Other learned psychological qualities such as attentional control, self/environmental awareness, and mental preparation also lead to desirable outcomes such as recognising and using support, as well as effective relationship management. Researchers have often used cognitive-behavioural approaches to developing resilience via the use of psychological qualities than can be taught and nurtured, as well as addressing cognitive distortions that can work against the individual (e.g., Beck, 1995; Burns, 1980; Robertson et al., 2015). However, Fletcher and Sarkar (2016) note that the salience of these qualities is dependent on both context and the individual. For example, an athlete resilient to *physical* stress may utilise different (effective or not) methods to deal with the *emotional* stress associated with competition. Such distinctions may prove important when gauging an individual's resilience and coping ability.

As the combination of challenge and support has been found to grow both resilience and psychological well-being, an ideal facilitative environment must involve an optimal amount of challenge as well as support to overcome it (e.g., Frydenberg & Lewis, 1993; Smith et al., 2016). An ideal environment such as this can take many forms, such as sport or the workplace. Similar to theories on stress inoculation (Meichenbaum & Novaco, 1985), exposure to the adversity aspect of a facilitative environment can (in moderation) help individuals deal with future adversities and stressors of a similar nature (Robertson et al., 2015). For example, in elite sport, researchers have found that adversity-related experiences are crucial factors in developing performance in Olympic athletes (Hardy et al., 2017; Howells & Fletcher, 2015). Adversity-based training could be implemented via methods such

as punishment stimuli, which has been found to promote environmental mastery, processing environmental threats, and resilience (e.g., Ávila & Torrubia, 2008; Monpetit & Tiberio, 2016). One pertinent environment to this thesis where challenge and support can both concurrently be present is expeditions. Despite some expedition research suffering from methodological issues (such as small sample sizes; Mutz & Müller, 2016; Stott et al., 2013), such experiences generally lead to positive outcomes from providing adversity paired with, for example, support from a team and expedition leader (e.g., Harrison et al., 2021; Smith et al., 2017; Smith et al., 2018). These positive outcomes include an increase in both general resilience and more context-specific forms of resilience such as physical and social resilience, emotional stability, self-confidence, self-sufficiency, well-being, and positive self-concept (Mutz & Müller, 2016; Neill & Dias, 2001; Stott et al., 2013). Practically, these findings suggest appropriate and relevant challenges should be utilised to help develop resilience. However, this should be implemented carefully as to not compromise participants' ability to facilitate resilience with too much added stress (Roberson et al., 2015).

In relation to one's own resources, thoughts, and emotions, the challenge mindset is related to an individual's cognitive appraisal of a stressor's demands. This aspect is largely influenced by the former two aspects of personal qualities and a facilitative environment. Challenge and threat appraisals are a psychophysiological response to stress, or rather – motivated performance situations which may frequently occur in expedition environments. A challenge state occurs when one's personal resources are seen to meet the demands of a situation, and a threat state is perceived when a person's resources do not meet the demands (Seery, 2011). Challenge states are more often associated with beneficial outcomes on well-being, positive emotions, and personal growth (Blascovich & Mendes, 2000; Moore et al., 2012). There is also a potential reciprocal relationship between challenge states and resilience

(Seery, 2011). However, this potential relationship is generally overlooked and understudied by resilience researchers (Fletcher & Sarkar, 2016).

A further aspect to consider with regards to a stressor's demands is whether problem-focused or emotion-focused coping is used. These types of coping depend on the environment, support, and resources within and around the individual, as well as the controllability of the stressor (Lazarus & Folkman, 1984). Problem-focused coping generally involves directly resolving or reducing the demands of a stressor (particularly important and more effective if the stressor is controllable). Emotion-focused coping is dealing with the effect it has on the individual themselves (particularly pertinent if the stressor is not controllable), which could involve methods such as seeking support (Blackadder-Weinstein et al., 2019), or attempting to reappraise a situation as with the cognitive-behavioural approach (Jackson & Watkin, 2004; Seligman et al., 2005). Particularly in unknown situations and environments, both methods should ideally be nurtured when designing an intervention.

To conclude, these aspects can be used as a framework to approach and understand how challenges can enhance resilience mechanisms within the different domains, and how practitioners/researchers could teach and nurture the necessary qualities to optimise their benefits and minimise risks. It should be noted that these three areas (personal qualities, facilitative environment, and challenge mindset) are not mutually exclusive and should be addressed collectively to maximise the benefits. In addition, in adverse environments and with individual differences in mind, the controllable nature of stressors will vary, along with what method of coping strategy might work best which practitioners should also consider (Bonanno & Burton, 2013; Kjaergaard et al., 2015). These aspects of developing an intervention need to be tested empirically. To this end, extreme environments such as expeditions seem a fruitful avenue.

Expeditions

Extreme environments are traditionally defined as settings that contain extraordinary physical, psychological, and interpersonal demands which require significant adaption on behalf of the individual (e.g., Harrison et al., 2021). There are a variety of settings that fit this definition, including military, space exploration, and expeditions (Smith et al., 2018). The inherent demands of an expedition or any extreme environment can vary, but specific examples include hostile climates, cramped living spaces, limited communication to the outside world, boredom, sleep deprivation, and interpersonal frustration arising from constant proximity to others (e.g., Smith et al., 2017; Smith et al., 2018; Smith et al., 2021; Suedfield, 2001). Expeditions usually have a particular goal (e.g., traversing a difficult environment, collecting scientific environmental data) that can be for reasons such as educational, scientific, or developmental (e.g., Outlook Expeditions, 2022; Smith et al., 2017; Smith et al., 2018). Expedition teams can often range from 2-15 members, accompanied by an expedition leader with experience of handling such environments, and can range between a week to several months in length (Outlook Expeditions, 2022; Smith et al., 2017; Smith et al., 2018). Despite how some people succumb to the task and environmental demands and experience poor physical and psychological health, many individuals benefit from expedition experiences (e.g., Smith et al., 2019).

Expeditions have been associated with a range of positive outcomes, including increased positive self-concept, positive approaches to challenges, increased self-esteem, and enhanced resilience (e.g., Ewert & Yoshino, 2011; Mutz & Müller, 2016; Neill & Dias, 2001; Stott et al., 2013). An expedition can represent opportunities to learn, grow, and adapt to a range of stressors. For example, one may learn to tolerate physical challenges, hunger, or pain, or develop social resilience from managing new and dynamic relationships not normally faced (Stott et al., 2013). These challenges would require a resilient individual to utilise a

range of coping strategies to deal with them (e.g., Smith et al., 2017). Further, these environments support and nurture traits associated with personal qualities of resilience such as self-sufficiency and self-confidence (e.g., Mutz & Müller, 2016; Neill & Dias, 2001). Expeditions can also provide and have been found to develop the ability and attitude to tackle and overcome challenges (Stott et al., 2013). Although expeditions may seem like a somewhat unique situation to examine resilience, the skills and benefits learned can be applicable to many different situations throughout a person's life.

However, the disparate nature of this research also represents one of several weaknesses of expeditions studies. For example, to examine psychological changes, studies tend to only examine single expeditions with small sample sizes, be cross-sectional in nature, and employ inadequate measures (McElligott et al., 2012; Mutz & Müller, 2016; Stott et al., 2013). These weaknesses make such findings difficult to generalise and apply the outcomes. In addition, the conceptual issues in measuring resilience (e.g., Estrada et al., 2016; Windle et al., 2011) such as examining resilience as a trait and not a dynamic process, may result in an incomplete overview of the potential changes to resilience over the course of an expedition, further leading to ambiguous findings in these settings (e.g., Neill & Dias, 2001; Skehill, 2001). These results may be further skewed by recall bias and decay, as results are often collected after an expedition (Harrison et al., 2021). Indeed, very few studies on expeditions and resilience have collected any data *during* the expedition itself (see e.g., Harrison et al., 2021).

Therefore, there remains a potential need to address these issues in expeditions research.

Expeditions – Self-Concept, Well-being, and Resilience.

Self-concept and self-esteem have been suggested as drivers of behaviour change over the course of adventure experiences, this change could then lead to resilience throughout expeditions (e.g., Hans, 2000; Mutz & Müller, 2016). Self-concept refers to the individual's

beliefs about themselves, including attributes, competencies, and identity (Baumeister, 1999). Resilience and positive self-concept can be found to correlate with each other, aspects of self-concept and associated factors such as self-esteem tend to be protective and are personal qualities that enhance resilience (e.g., Martins & Neto, 2016). However, the relationship between aspects of self-concept and resilience is generally understudied (particularly with our defined resilience mechanisms). Specifically, positive aspects of self-concept could make up some of the personal qualities associated with the four resilience mechanisms. For example, a self-concept such as problem-solving ability, may relate to minimising and managing in resilience.

Expeditions and the meaningful experiences they provide tend to lead to a greater sense of psychological well-being, particularly on reflection (Curtin & Brown, 2018). However, the relationship between resilience and well-being is somewhat ambiguous (Hascher et al., 2021), and there is also little supporting quantitative evidence for expeditions improving well-being (Barton et al., 2016). Nevertheless, some research suggests well-being as a successful outcome of the resilience process (Turner et al., 2017). An expedition study with our resilience model could therefore also clarify well-being as a potential positive outcome of them, as well as offer further insights into if and how well-being relates to resilience (see Chapter 3 of this thesis).

COVID-19 Pandemic

Given the positive outcomes associated with resilience, another potential area of research applicable to our resilience model is the current COVID-19 pandemic (e.g., Yildirim et al., 2020). The COVID-19 pandemic has caused significant psychological, financial, and physical adversity to many (e.g., Labrague et al., 2020; WHO, 2020a), with the UK particularly affected (cf. Howie, 2021; BBC, 2021). In addition to the risks of the disease itself, researchers have demonstrated that the pandemic has been characterised by social

isolation (via quarantine), negative impacts on physical health, education, and finances, and has led to increasing levels of stress, depression, and anxiety, as well as reduced levels of well-being in the population (Arslan et al., 2020; Cao et al., 2020; Hull, et al., 2020; Yildirim & Arslan, 2020). In the US, anxiety and depressive disorders have increased from 1 in 10, to 4 in 10 during the pandemic (Panchal et al., 2021). These multiple stressors from different sources related to the pandemic may have a compounding effect on top of 'regular' stressors experienced throughout daily life (e.g., Petzold et al., 2020).

Some of these issues such as the imposed isolation via restrictions, lockdowns, and quarantines are uniquely problematic. This is because the emotional distress they can cause may be aggravated by limited or impaired coping resources and strategies the individual may have previously relied on. Impaired coping resources and strategies could include a lack of outdoor exercise (e.g., Garber, 2017) and the reduced availability of social support via social isolation (Usher et al., 2020; Bavel et al., 2020). These issues may be of particular importance with resilience being a dynamic process, as some individuals may have previously relied on such coping strategies and resources heavily before the pandemic and in certain environments and situations that they would more typically deal with (e.g., Hayman et al., 2017; Pangallo et al., 2015). In a novel situation such as the pandemic, they may not find themselves as resilient as they would usually be and would need to adapt and learn new strategies to cope with the stressors they face. Killgore et al. (2020) found that resilience levels during the pandemic have been found to be generally lower than published norms. However, this study used the approach of resilience as trait-like (though the authors conclude resilience can be improved in the pandemic to lead to better outcomes). Such impacts would need to be further investigated with resilience as a dynamic process, individual differences such as those outlined in our resilience process model would likely impact how people have taken to dealing with the new situation and may even contain benefits. For example, researchers have found some

individuals demonstrated benefits such as increased creativity in lockdown (Michinov & Michinov, 2021) and improved social relationships (Bleil et al., 2021). The latter in turn could facilitate further increases in resilience (e.g., Kılınç & Sis Çelik, 2021).

Recognising how resilient individuals deal with the unique adversities associated with the pandemic might allow researchers to better understand how resilience may be able to reduce the associated negative consequences of it. Indeed, researchers have found that protective qualities and outcomes associated with resilience such as maintaining a healthy lifestyle, social contacts, fostering self-efficacy, and engaging more in preventative behaviours (e.g., washing hands) have all led to less psychological distress during this time (e.g., Balkhi, 2020; Petzold et al., 2020). To better understand the influence of resilience, one method to examine how the four resilience mechanisms could predict thoughts, feelings, and behaviours in the pandemic is profiling. As previously discussed, Latent Profile Analysis would allow not only the examination of patterns of the four mechanisms during the pandemic, but what outcomes they might be associated with (see Chapter 4 of this thesis). For example, those with higher overall resilience across all mechanisms would be expected to have a higher well-being and coping effectiveness. However, profiles that may contain high anticipation but with lower levels in all other mechanisms may be associated with higher anxiety and depression (e.g., Byrne & Eysenck, 1995; Stein & Nesse, 2011; O'Connor et al., 2007). High levels of anticipation along with high minimising would likely be associated with taking more preventative measures such as mask-wearing or adhering to strict lockdown guidance (e.g., Balkhi, 2020; Wang & Zhao, 2020). Those with high relative reactive mechanisms (manage and mend) may be more associated with high risk-taking strategies due to their perceived coping effectiveness (e.g., Herman et al., 2018).

Purpose of Thesis

The original aim of this thesis was to examine the effects of overseas expeditions in collaboration with Outlook Expeditions (an overseas expeditions company). Upon inspection of the resilience literature however, it became clear that we had to consider the limitations of the literature and potential applications of resilience. Therefore, the first stage in the present research attempts to develop a new model of resilience as a process of four mechanisms across five domains of functioning. The intention is to establish validity for this conceptualisation using current theory and create a new measure validated by Bayesian Structural Equation Modelling (BSEM). More specifically, the thesis had four main objectives. The first was to conceptualise and operationalise resilience in a way that brings together previous literature to address its limitations, along with explicitly establishing the new mechanism of anticipation and a new domain of functioning in cognitive resilience. Second, the thesis sets out to develop a valid and reliable measure of resilience based on four mechanisms of anticipate, minimise, manage, and mend, across five contextual domains of general, physical, social, cognitive, and emotional. The third objective represents our original main aim with this PhD in collaboration with our partner company and examine overseas expeditions as a challenging but facilitative environment that can nurture resilience and other factors (cognitive appraisals and well-being). In addition, we explored the relationship between resilience and other factors of cognitive appraisals, self-concept, and well-being. Alongside this aim was to pilot interventions based on the established resilience process model. The final aim was to apply this resilience model and measure to the COVID-19 pandemic, creating resilience profiles of the four mechanisms to examine how they may predict thoughts, feelings, and behaviours.

Thesis Format

The remainder of the thesis comprises three empirical chapters comprising six separate studies designed to meet the objectives stated above, followed by a general discussion chapter to conclude the thesis. The structure of the thesis is as follows:

1. Chapter 2 presents two studies that conceptualise resilience as a process of anticipating, minimising, managing, and mending from general, physical, social, cognitive, and emotional adversity. These two studies contain varied samples to aid in developing a questionnaire based on this model known as the Resilience Process Scale.
2. Chapter 3 presents two studies examining the relationship between resilience and overseas expeditions (which was the original primary focus of the PhD). The first study examines a sample of young adults and how overseas expeditions can enhance resilience and associated factors (e.g., well-being) in a challenging but facilitative environment and how these factors relate to each other. The second study presents a pilot study in which a resilience training intervention was introduced to expedition teams over a weekend (a few months prior to their expedition) with the aim of increasing resilience.
3. Chapter 4 presents two studies examining resilience profiles using Latent Profile Analysis (LPA) and Latent Transition Analysis (LTA). The first study explored what resilience profiles tend to emerge based on the four mechanisms presented above. The second study further explored these profiles with a new, more heterogeneous sample and examined how these profiles could predict psychological and behavioural outcomes, particularly those around the COVID-19 pandemic.

The thesis was structured in its condensed manner in line with the University policy to meet the dual needs of completing a thesis as well as learning to write empirical papers for publication. Therefore, some of the content from introductions and discussions (including the above) is repeated in the following chapters in varying abbreviated formats to be compatible with publication standards and function as standalone multi-study papers. Consistent with convention from APA guidelines, I utilise the pronoun 'I' where appropriate. However, I emphasise that this PhD was collaborative and so, where appropriate, the pronoun 'we' is utilised. These chapters are followed by Appendices, and it should be noted that tables and figures are labelled cumulatively with reference to their respective chapter followed by a period (for example, Table 3.1 would be the first table within Chapter 3).

Chapter 2: Development and Initial Validation of the Resilience Process Scale (RPS)

Abstract[1]

The resilience literature is often criticised for its ambiguity in its definitions and purpose. Not only does research highlight limitations in how resilience is measured, but resilience is quite often proposed as a general process where an individual has an ability to deal with and recover from adversity regardless of the source of adversity. Building from existing research, we propose a model where resilience is seen as a four-step process that can function independently within five separate domains. To test our hypotheses, we validated a reliable measure across two studies using Bayesian Structural Equation Modelling (BSEM). Study 1 focused on item development of four resilience processes (anticipation, minimising, managing, and mending) based within five separate domains (general, physical, social, cognitive, and emotional) assessed via five separate vignettes. Results revealed a good model fit of a final 13-item measure for each domain from a sample of 181 young adult students (M_{age} = 16.8, SD = 0.7). Study 2 further validated this model using BSEM from a larger, more heterogeneous sample (n = 284; M_{age} = 26.4, SD = 10.5). The final 13-item model provided further evidence of the measure's structural validity. Implications and directions for future research are then discussed.

[1] This research has been presented at in-University conferences, two Pan Wales conferences, and at a KESS-organised conference in Czech Republic in both verbal and poster presentation formats.

Development and Initial Validation of the Resilience Process Scale (RPS)

Successfully managing and adapting to life's challenges require resilience (e.g., Bryan et al., 2019). Research has demonstrated several benefits to being highly resilient, such as coping better with and resisting the negative effects of mental ill-health (e.g., Edward & Warelow, 2005), feeling less emotional stress following adverse events (Masten & Tellegen, 2012), and show faster recovery from such exposures (Zautra et al., 2010). The study of psychological resilience has generally been undertaken to understand why some individuals are able to withstand or even thrive when under pressure and adversity (see e.g., Fletcher & Sarkar, 2013). However, research in resilience has been hampered by ambiguities and inadequate conceptualisations, which in turn has led to issues in the measurement of resilience (Windle et al., 2011). Much of this ambiguity surrounds its definition, underlying components, and its theoretical and applied distinctiveness from similar concepts such as hardiness or mental toughness (e.g., Martin-Breen & Anderies, 2011). The term 'resilience' originates from Latin, meaning to *bounce-back* or *rebound* (Doorn et al., 2018). However, definitions of resilience often go beyond this simple process. For example, some researchers define resilience as remaining functionally stable despite pressure (Joyce et al., 2018), or maintaining growth and adapting to stressful circumstances (Windle et al., 2011). Furthermore, there is some debate as to whether resilience is a collection of static traits, or a collection of dynamic and interactive process influenced by state factors such as the environment and adversity being faced (Pangallo et al., 2015).

Recent conceptualisations take a more comprehensive view that suggests resilience is a pro-active and reactive process that can function in different domains (e.g., Chen et al., 2016; Fletcher & Sarkar, 2016). In addition, resilience is state-like with stationary traits (e.g., positive personality) influenced by malleable state factors (e.g., social resources; Bryan et al., 2019; Vanhove et al., 2016). The current set of studies aims to bridge together various

theoretical and conceptual issues to develop a more inclusive model and measure of resilience.

Measuring Resilience and Resilience Mechanisms

According to research, some assessments of resilience only measure a narrow aspect of resilience (e.g., managing and coping under adversity, or recovery) or demonstrate poor (or do not state any) psychometric properties (e.g., Fletcher & Sarkar, 2016; Martin-Breen & Anderies, 2011; Windle et al., 2011). For example, although the CD-RISC (Connor & Davidson, 2003) demonstrates good psychometric properties and examines an individual's resources, traits, and behaviours leading into and during adversity, it generally ignores recovery from stress. Further, according to Windle et al. (2011), the conceptualisation of the CD-RISC scale lacks depth and clarification on resilience as a personal quality and trait. Similarly, measures such as the Ego-Resiliency Scale (Block & Kreman, 1996) only consider resilience as a stable trait and not a dynamic process as more contemporary research suggests (e.g., Pangallo et al., 2015). Another popular assessment tool (i.e., the Brief Resilience Scale; Smith et al., 2008) provides a clearer definition of resilience along with good psychometric properties. However, the BRS focuses almost exclusively on recovery post-adversity.

In addressing some of these issues, Chen et al. (2016) developed The Essential Resilience Scale that includes state- and trait-like components of resilience in its items, along with a more comprehensive three-stage process of resilience that consists of an individual's ability to anticipate (i.e., identify upcoming threat), be flexible (adapt and manage), and bounce-back from adversity. The measure does provide good psychometric properties and does predict health outcomes such as stress and anxiety, but many items are culturally specific to Chinese populations (Lau et al., 2020). Alliger et al. (2015) proposed a similar model where mechanisms of resilience contain the ability to pro-actively minimise (including both the ability to identify and appraise threats), manage (act and react, navigate, and then

adapt as the issue occurs), and mend (react, learn, and recover from the experience) from adversity. Thus, both approaches provide a more comprehensive conceptualisation of resilience as a process that includes pro-active (pre-event) and reactive (post-event) elements (e.g., Fletcher & Sarkar, 2016).

However, Alliger et al. (2015) and Chen et al. (2016) chose to combine the processes of anticipate and minimise as a single process. Research indicates that the ability to anticipate upcoming threats should be treated as a separate process to implementing minimising strategies (e.g., coping strategies). For example, Hardy et al. (2014) found that athletes who demonstrated higher levels of performance under pressure (as rated by their coach) tended to report higher levels of a personality trait called punishment sensitivity (Gray & McNaughton, 2000). Hardy et al. found further evidence to suggest that these athletes were predisposed to picking up threats early (e.g., they were good at anticipating upcoming threats), allowing them more time to minimise and deal with such threats sooner.

However, not every potential threat will need to be minimised (hence the need for their distinction in the literature). For example, anticipating upcoming stressful events and reactions to such events (i.e., minimising strategies) may partially be determined by appraisal theory (Lazarus, 1991). Appraisal theory contains two main components, primary and secondary appraisals. The process of primary appraisals requires a person to anticipate whether an upcoming situation is deemed as a threat, non-threat, or a challenge. If individuals perceive the situation as a threat, they will then engage with secondary appraisals (i.e., what am I going to do about this [minimising the threat]). However, if a person anticipates an impending threat but perceives they have enough resources to deal with it, then they may make no behavioural adjustments at all. However, if the person perceives they lack the coping skills to deal with the same threat, then they may employ early or additional coping strategies to minimise its potential impact (e.g., seek more information or seek help from a

significant other). Except for The Essential Resilience (Chen et al., 2016), no measure has yet to examine resilience as a pro-active and reactive process in this way. However, conceptualising and measuring resilience as a state-like process would also require considering the context and type of adversity being faced, that previous resilience measures have also generally overlooked.

Domains of Resilience

Another shortcoming of the resilience literature is that research tends to ignore important domains of functioning, in which the pro-active and reactive processes might differ. For example, the resilience required to deal with adversity in an office environment (e.g., social) would likely be different from situations containing military conflict (e.g., physical). However, even though Chen et al.'s (2016) resilience model does reflect different domains of stress (i.e., physical stress, emotional stress, & social stress), the authors do not elaborate on how these domains were determined or informed by previous research. Although we do not deny these are key domains of functioning to assess, other potentially significant domains may have been overlooked. For example, one essential domain that seems very relevant to human functioning is resilience to cognitive stress (Ringeisen & Raufelder, 2015). Therefore, an important expansion to this line of research would be to build upon and theoretically justify why different domains of resilience are important. Examining a more general overview can be useful to focus primarily on the mechanisms and indicate how the individual may deal with most situations in line with most approaches to measuring resilience (e.g., Alliger et al., 2015; Bryan et al., 2019; Windle et al., 2011). However, we define a contextual domain as a setting in which certain types of adversity will be experienced more often than others and expand on four of them below.

First, previous research has demonstrated that those with higher levels of resilience tend to be better at coping with physical illness and pain (e.g., McAllister et al., 2015). In

interviews with athletes, Pattison (2011) found that when anticipating or experiencing problems with performance outcomes, many athletes pro-actively increase or modify their physical training as a form of management. This can often help the athlete deal with physical stress and injury, but not necessarily with other forms of stress. For instance, one may have the resilience to manage pain from a physical injury but lack the resilience to deal with the negative emotional responses from long-term injury (e.g., Caine et al., 2016).

Second, adversity within social domains can take the form of social isolation, parental neglect, interpersonal relationship issues, and conflicts (e.g., breakups and arguments). Social adversity can lead to one of the most common and intense forms of stress responses (Wood & Bhatnagar, 2015), and if left unchecked or undealt with, can lead to anxiety and depression-related mental health issues (e.g., Aydin et al., 2010; Rajaleid et al., 2015). Having social resilience could potentially buffer the negative effects of these stressors. For example, research has shown that active coping (using one's resources to minimise impact) as opposed to passive coping (e.g., avoiding or withdrawing) increases resilience to social forms of adversity, but that these methods of coping could vary in efficacy within other stress contexts (Connor-Smith & Compas, 2002; Wood & Bhatnagar, 2015).

Third, when under pressure, it is quite often found that cognitions are compromised. This could reflect a loss of attentional control, poor decision making, reduced information processing, and a reduction in working memory capacity (e.g., Eysenck et al., 2007). A lack of resilience in this domain can lead to cognitive overload, high anxiety, burnout, and other mental health issues (e.g., Ćosić et al., 2019; Yaroush & Bourne, 2008). Student exams represent a form of cognitive stress that is sometimes referred to as academic adversity, the associated stress of which can lead to lower performance and negative impacts on mental health (Putwain et al., 2015). Air traffic controllers are another context in which high levels of cognitive stress is often experienced. Experiencing such stress could be extreme and life-

threatening to others. Thus, high levels of cognitive resilience could buffer any potential negative effects of stress from this type of adversity (Ćosić et al., 2019; Ringeisen & Raufelder, 2015).

Finally, emotional resilience has been described as the ability to manage positive and negative emotions in times of stress (Resnick et al., 2011). Experiencing adversity and stressful events could cause negative emotional reactions, leading to negative outcomes on mental health (e.g., Edward & Warelow, 2005; Masten & Tellegen, 2012). Emotional resilience may buffer these negative responses, with strategies around emotional regulation to help appraise and reappraise before, during, and after a stressful event (e.g., Gross, 2002; Schneider et al., 2013).

The Present Studies

Given the issues of ambiguous conceptualisations and resilience measurement, there is a need to combine the above findings into one multidimensional process. It is clear from this review that at least a large amount of variance in the concept of resilience can be explained as a state-like process that involves the ability to anticipate, minimise, manage, and mend to general adversity, but also in the face of physical, social, cognitive, and emotional adversity. Specifically, the current set of studies aims to extend recent research by separating the mechanisms of anticipate and minimise, and proposing cognitive resilience as a domain. Study 1 involved a process of developing items from extant literature, while Study 2 re-tested the construct with a separate sample.

Study 1: Item Development & Exploratory Validation of the Resilience Process Scale

Method

Resilience Process Item Development

Following a review of relevant literature and discussions with psychology researchers and expedition leaders, the first part of the study involved creating an initial set of potential

items. These items assessed the resilience process across the four mechanisms of anticipate, minimise, manage, and mend. We created an initial pool of 94 items that fitted an overall view of resilience. We then used a rigorous and iterative process to modify, amalgamate, and delete items where necessary (e.g., Chen et al., 2016; McEwan et al., 2018; Smith et al., 2008). Specifically, we ensured that the wording was straightforward, "double-barrelled" items were avoided, and that the item reflected the four mechanisms of interest.

Next, we used a similar procedure outlined by MacKenzie et al. (2011) to assess the content validity of these items. Three psychologists with expertise in resilience, sport, performance and exercise psychology, and measurement development assessed the extent to which each item related to its mechanism (i.e., anticipate, minimise, manage, and mend) on a 5-point Likert scale ranging from 1 (*not at all*) to 5 (c*ompletely*). Items that achieved an overall agreement by two of the three judges *and* scored four and above were retained. We modified items scoring less than four until all researchers' ratings increased to at least 4. Items deemed too similar in wording and phrasing were also removed.

Following guidelines from Cassidy (2016) and with consideration to other similar measures (e.g., Leighton, 2010), we used instructional vignettes to separate domains of resilience into physical, social, cognitive, and emotional – in addition to a general domain of resilience. Using a general domain allows an overall examination of the resilience mechanisms, in addition to context-specific examinations if specific domains are not of interest (as opposed to creating a mean value of the four domains, which may not be practical). An example vignette for physical is as follows "Please think of different tough **physical** situations, life events, challenges, and obstacles that you may have experienced in the past or may experience in the future. This could range from exercise, sport, outdoor activities, illness, injury in which you have or may experience exhaustion, hunger, thirst, or any other physical issue" (see Appendix A for the complete list of vignettes and items). The

general domain vignette is less specific: “Please think of different tough situations, life events, challenges and obstacles that you may have experienced in the past or may experience in the future. This could be any event in which you have, or could experience stress, pressure, or hardship”.

To assess resilience in each domain, items were assessed on a 7-point Likert-type response scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) with a midpoint of 4 (*neither agree nor disagree*). Example items include “I can anticipate when a situation will stress me” (anticipate), “I tend to organise myself well to deal with challenges” (minimise), “When things get bad, I don’t let them get to me” (manage), and “I bounce-back easily after a challenge” (mend). The questionnaire was analysed using the Flesch-Kincaid algorithm to ensure its potential utility amongst a broader population, predicting that individuals up to a reading level of grade 7.7 (M_{age} = 13) and above could understand it. Following the above process, 20-items were created relating to each mechanism (5-items per mechanism) to be identical across each domain. An instructional vignette was used to distinguish each domain from the others. All five domains presented together totalled 100-items.

Participants

Following institutional ethical approval, a convenience sample of 181 students (M_{age} = 16.8 years, SD = 0.74 years; *n* = 95 Females, *n* = 86 Male) were recruited from UK secondary schools and sixth form colleges. These students were recruited through our partner company (Outlook Expeditions) and were about to depart on oversea expeditions (i.e., within 24hrs of departure). Participants stated their ethnicity with one of them Afro-Caribbean, two Asian, six mixed, and 172 White, and stated their Nationalities with 176 of them British, one Caribbean, one Irish, one New Zealander, one Polish, and one Tanzanian. This sample was relevant due the nature of overseas expeditions being varied in threats and challenges.

Measures

The Resilience Process Scale (RPS) under development was used, with each of the five domains being presented in random order.

Procedure

Following institutional ethical approval on Final Preparation Days (FPD) prior to departing for their respective expedition destinations, expedition leaders were approached at an Outlook Expeditions' FPD centre and introduced to the study. Following approval, schoolteachers from each team were then approached for informed consent to approach their team. After consent, the purpose and content of the study were explained to each student along with a hard copy of the RPS, including basic demographic questions. To reduce social desirability bias, confidentiality was emphasised, and participants were informed that there were no right or wrong answers, and their responses had no bearing on their participation in their expedition. Each domain scale with its associated vignette was also presented in a random order to reduce issues such as question order effects or boredom leading to inaccurate answers. Once completed, the RPS was collected from each team member, and they were thanked for their participation.

Analysis and Model Testing Strategy

We used a Bayesian approach to Structural Equation Modelling (BSEM) to confirm the factor structure. This approach has several advantages, such as being strictly confirmatory in nature and less restrictive than more conventional and common methods (see Niven & Markland, 2016). The Bayesian approach views parameters as variables with a mean and distribution, thus allowing specification of informative priors on cross-loadings and residual correlations with *approximate* zero means and small variances within a specified/identified model. Variances are specified a priori, and setting a small variance implies estimates are close to zero (and can depend on empirical findings, substantive theory, or with non-

informative priors with no restrictions on the estimated parameter distributions). BSEM also provides information about potential modifications with all parameters estimated simultaneously and allows the researcher to specify more realistic models (cf. Arthur et al., 2019). Additionally, BSEM is not reliant on large sample normal theory, and Bayesian credibility intervals are not assumed to be symmetric – thus accommodating parameters with highly skewed distributions. Addressing these issues results in Bayesian approaches to SEM having advantages over traditional Maximum Likelihood approaches (see Niven & Markland, 2016).

We performed separate analyses for each resilience domain, including the general domain. First, we standardised each domain before estimating three BSEM models (cf. Arthur et al., 2019; Myers et al., 2018; Niven & Markland, 2016). We ran models with non-informative priors for major loadings, exact zero cross-loadings and zero residual correlations. Next, we estimated models with non-informative priors for the major loadings, informative approximate zero cross-loadings and exact zero residual correlations. Finally, we estimated models with non-informative priors for the major loadings, informative approximate zero cross-loadings, and residual correlations.

For the analyses, we specified prior variances for cross-loadings and residual correlations at ± .01. With the indicators and factors standardised, this corresponds to factor loadings and residual correlations with a 95% limit of ±.20, representing relatively small cross-loadings and residual correlations (Muthén & Asparouhov, 2012). Parameter estimates are influenced by the prior chosen; thus, the stability of the estimates should be assessed. It is recommended that a sensitivity analysis be performed by examining the effects of adjusting the variance of the chosen priors on the estimates (Muthén & Asparouhov, 2012; Markland et al., 2015). As such, the final models were re-run with smaller (.005) and larger (.015) prior variances for the cross-loadings. We compared the parameter estimates for divergences with

those obtained with a prior variance of .01. These divergences were noted when the difference in estimates was greater than .05 (cf. Niven & Markland, 2016).

We estimated all models with the Markov chain Monte Carlo algorithm with the Gibbs sampler and two chains to ensure convergence on stable estimates and used 100,000 iterations to check convergence and the stability of the estimates. We examined convergence using the potential scale reduction factor (PSR) and Kolmogorov-Smirnov (K-S) tests. Supporting evidence for successful convergence is displayed when a PSR is between 1.0 and 1.1 (Gelman et al., 2013). The K-S tests should demonstrate no significant differences between estimated parameter distributions across the multiple chains. Furthermore, we visually inspected trace plots to assess mean and variance stability across chains.

We assessed the model fit with posterior predictive checks indicating the degree of discrepancy between the model and observed data, using the likelihood ratio $\chi 2$ test and associated posterior predictive p-value (PP*p*). For a model to fit well, the PP*p* should approach .50, with a symmetric 95% credibility interval for the difference between the observed and replicated $\chi 2$s centred around zero (Muthén & Asparouhov, 2012). Following this model fit, items were examined for low factor validity and escaping their priors consistently across the domains; these items could be removed to improve the overall model fit. In addition to BSEM, we followed up with a repeated measures ANOVA to examine post-hoc differences between domains and mechanisms.

Results

Factorial Validity

All models converged adequately, except when adding a model using only cross-loadings for each domain (without residual correlations; see Table 2.1). For all domains, the BSEM models with zero cross-loadings and zero residual correlations converged

successfully, but the PP*p* for the model indicated a poor fit to the data. The fit was also unacceptable for the models with informative small variance priors on the cross-loadings.

Across all domains however, models with informative small variance priors on the cross-loadings and residual correlations had a better fit to the data, with PP*p* s around .50 and symmetric 95% posterior predictive confidence intervals centred close to zero. While the initial 20-item models across each domain had an acceptable model fit, there were items with relatively low standardised factor loadings, along with some of these items significantly loading above the tolerance set by the prior to one or more other items. These particularly problematic items were individually examined, assessed on the quality of the question in relation to the underlying construct, and removed where appropriate across each domain for consistency (see Table 2.2 for final list of items, Appendix A for full list of initial 20-items). This item removal process is common and accepted throughout measurement development, if removals are based on both theory as well as relevant data (e.g., Markland, 2007). This resulted in 13-item models across each domain, with good model fits evident.

Table 2.1

BSEM fit statistics and convergence, including PPp and 95% credibility intervals

			Difference between observed and replicated χ^2 95% CI	
	BSEM Fit statistics	PP*p*	Lower 2.5%	Upper 2.5%
General	20-item Non-Informative	.000	209.92	312.41
	20-item Informative Priors (cross-loadings)	N/A	N/A	N/A
	20-item Informative Priors (cross-loadings + residual correlations)	.59	-68.95	53.90
	13-item Non-Informative	.000	39.17	110.77
	13-item Informative Priors (cross-loadings)	N/A	N/A	N/A
	13-item Informative Priors (cross-loadings + residual correlations)	.54	-43.78	38.87
Physical	20-item Non-Informative	.000	221.88	325.07
	20-item Informative Priors (cross-loadings)	N/A	N/A	N/A
	20-item Informative Priors (cross-loadings + residual correlations)	.60	-68.04	54.41
	13-item Non-Informative	.000	50.99	122.68
	13-item Informative Priors (cross-loadings)	N/A	N/A	N/A
	13-item Informative Priors (cross-loadings + residual correlations)	.55	-44.35	37.71
Social	20-item Non-Informative	.000	267.76	368.69
	20-item Informative Priors (cross-loadings)	N/A	N/A	N/A
	20-item Informative Priors (cross-loadings + residual correlations)	.60	-68.43	54.14
	13-item Non-Informative	.000	66.20	137.31
	13-item Informative Priors (cross-loadings)	N/A	N/A	N/A
	13-item Informative Priors (cross-loadings + residual correlations)	.54	-43.32	38.20
Cognitive	20-item Non-Informative	.000	227.00	330.89
	20-item Informative Priors (cross-loadings)	N/A	N/A	N/A
	20-item Informative Priors (cross-loadings + residual correlations)	.60	-68.56	54.59
	13-item Non-Informative	.02	4.11	75.56
	13-item Informative Priors (cross-loadings)	N/A	N/A	N/A
	13-item Informative Priors (cross-loadings + residual correlations)	.55	-43.86	39.12
Emotional	20-item Non-Informative	.000	272.00	373.19
	20-item Informative Priors (cross-loadings)	N/A	N/A	N/A
	20-item Informative Priors (cross-loadings + residual correlations)	.60	-68.87	54.47
	13-item Non-Informative	.000	28.61	100.61
	13-item Informative Priors (cross-loadings)	.30	-31.61	85.79
	13-item Informative Priors (cross-loadings + residual correlations)	.55	-44.44	39.29

PSR values for the final models reached the 1.1 criterion at approximately 20,000 iterations for each domain. K-S tests for all parameters for both instruments were non-significant ($p > .05$). Visual inspection of the trace plots (162 parameters for each of the domains) all showed stability, with no upward or downward trends in the means and the two chains overlapping in variability.

For the general domain, the estimated correlations between the four mechanisms ranged between .322 to .693 with five out of six of these relations being significant. For the physical domain, correlations between the four mechanisms ranged between .505 to .688 and were significant. For the cognitive domain, correlations ranged between .570 to .703 all being significant. For the social domain, correlations ranged between .538 to .713 all being significant. Finally, for the emotional domain, correlations ranged between .626 to .759 all being significant. Overall, these correlations are expected, with the results suggesting that these four mechanisms are related but different sharing around 50% of the variance.

Across each domain all major loadings of the final model were significant and acceptable by conventional criteria (e.g., > .4; Ford et al., 1986). Across all domains, all cross-loadings and residual correlations were shrunk toward their zero prior means and most items were within their a priori limits of + .20. However, four items escaped their a priori bounds for the correlation between the residuals (manage item 1 & 4 in physical; anticipate item 3 and manage item 3 in social; manage item 3 and mend item 2 in social; mend item 1 and mend item 3 in cognitive). Upon re-examination, there were no identifiable patterns or meanings between these four items and therefore were deemed acceptable to keep as they were.

Sensitivity analyses indicated that the factor loadings and cross-loadings were relatively stable when specifying prior variances for cross-loadings at smaller (.005) and greater (.015) values. However, the physical domain model would not converge on the

smaller value prior, therefore it was run at 150,000 iterations in which no such issues occurred (Depaoli & Schoot, 2016). For the general domain, 100% of the discrepancies fell between ± .05 with prior variance set at .005 and with .015. For the physical domain, 100% of the discrepancies fell between ± .05 with prior variances set at .005 (with 50,000 iterations). With prior variances set at .015, 99.38% of the discrepancies fell between ± .05 and the maximum discrepancy was -.054. For the social domain, 100% of the discrepancies fell between ± .05 with prior variance set at .005 and with .015. For the cognitive domain, 100% of the discrepancies fell between ± .05 with prior variance set at .005 and with .015. For the emotional domain, 99.38% of the discrepancies fell between ± .05 and the maximum discrepancy was .073 with prior variance set at .005. 99.38% of the discrepancies fell between ± .05 and the maximum discrepancy was .064 with prior variances set at .015. Taken together, the minimal change in parameter estimates across the different analyses provides support for the stability of the scales, although the sensitivity of the physical domain model should be viewed with some caution, due to the non-convergence on a smaller prior at 100,000 iterations. We also took note of correlations between the mechanisms, with *r* scores generally ranging from .32 to .76 and significantly relating to one another (see Table 2.3).

Table 2.2

Study 1 BSEM standardized factor loadings of each item, including 95% credibility intervals

	Standardised factor loadings for final items	Anticipate	Minimise	Manage	Mend
General	I can anticipate when help is going to be needed.	**.69 [.25, 1.02]**	.02 [-.18, .21]	-.01 [-.20,.18]	-.01 [-.20, .19]
	I can anticipate when a situation will stress me.	**.65 [.13, .99]**	.02 [-.14, .18]	.04 [-.23, .15]	-.04 [-.23, .15]
	I notice possible difficult situations early.	**.70 [.33, .99]**	.00 [-.19, .18]	.05 [-.14, .24]	.06 [-.14, .25]
	I make back-up plans for when things might go wrong.	-.02 [-.21, .17]	**.73 [.30, 1.02]**	.03 [-.22, .16]	-.04 [-.23, .15]
	I tend to organise myself well to deal with challenges.	-.02 [-.21, .16]	**.79 [.49, 1.04]**	.01 [-.17, .20]	.01 [-.18, .20]
	I prepare myself for upcoming challenges.	.05 [-.13, .23]	**.69 [.37, .97]**	.03 [-.16, .21]	.04 [-.15, .23]
	I remain positive, even when things seem hopeless.	.01 [-.17, .18]	.01 [-.17, .19]	**.77 [.44, 1.17]**	-.01 [-.20, .18]
	When things get bad, I don't let them get to me.	-.04 [-.22, .14]	-.04 [-.22, .15]	**.78 [.41, 1.17]**	.02 [-.18, .22]
	I keep a clear head under pressure.	.04 [-.15, .23]	.02 [-.17, .21]	**.52 [.03, .88]**	.02 [-.18, .22]
	I give my best effort no matter the obstacle.	.01 [-.18, .20]	.05 [-.14, .25]	**.55 [.08, .93]**	-.01 [-.21, .19]
	I bounce-back easily after a challenge.	-.00 [-.18, .18]	.01 [-.18, .18]	.03 [-.18, .22]	**.81 [.49, 1.07]**
	I quickly get over set-backs.	-.01 [-.18, .19]	-.03 [-.21, .15]	.04 [-.17, .23]	**.77 [.40, 1.06]**
	I know how to stop the same things getting to me in the future.	-.01 [-.17, .20]	-.04 [-.15, .23]	-.04 [-.24,.16]	**.71 [.33, 1.03]**
Physical	I can anticipate when help is going to be needed.	**.74 [.38, 1.08]**	.00 [-.19, .19]	.03 [-.17,.23]	.00 [-.19, .19]
	I can anticipate when a situation will stress me.	**.82 [.49, 1.09]**	-.01 [-.19, .17]	-.02 [-.21,.17]	-.01 [-.20, .18]
	I notice possible difficult situations early.	**.74 [.39, 1.05]**	.02 [-.17, .20]	.01 [-.19, .20]	.02 [-.17, .21]

	I make back-up plans for when things might go wrong.	.03 [-.16, .21]	**.79 [.49, 1.07]**	.02 [-.17, .20]	.01 [-.18, .20]
	I tend to organise myself well to deal with challenges.	.03 [-.15, .22]	**.79 [.49, 1.06]**	-.01 [-.19,.17]	.01 [-.18, .20]
	I prepare myself for upcoming challenges.	-.05 [-.23, .13]	**.82 [.48, 1.10]**	.01 [-.18, .19]	-.00 [-.20, .23]
	I remain positive, even when things seem hopeless.	.05 [-.16, .25]	.03 [-.17, .19]	**.53 [.12, .91]**	.04 [-.16, .23]
	When things get bad, I don't let them get to me.	.01 [-.19, .21]	.01 [-.22, .15]	**.74 [.40,1.10]**	.01 [-.18, .20]
	I keep a clear head under pressure.	.01 [-.18, .20]	-.01 [-.19, .17]	**.82 [.51,1.09]**	-.00 [-.19, .18]
	I give my best effort no matter the obstacle.	-.03 [-.22, .17]	-.01 [-.20, .18]	**.70 [.31,1.03]**	-.01 [-.21, .17]
	I bounce-back easily after a challenge.	.00 [-.19, .19]	.04 [-.17, .24]	-.01 [-.21,.18]	**.71 [.28, 1.05]**
	I quickly get over set-backs.	-.01 [-.20, .18]	-.03 [-.23, .16]	.02 [-.18, .21]	**.79 [.44, 1.08]**
	I know how to stop the same things getting to me in the future.	-.01 [-.18, .20]	.02 [-.18, .21]	.01 [-.18,.20]	**.79 [.47, 1.08]**
Social	I can anticipate when help is going to be needed.	**.77 [.43, 1.08]**	.02 [-.18, .20]	.02 [-.18,.22]	.01 [-.18, .20]
	I can anticipate when a situation will stress me.	**.80 [.43, 1.11]**	-.03 [-.21, .16]	.00 [-.20, .20]	-.02 [-.21, .17]
	I notice possible difficult situations early.	**.82 [.53, 1.09]**	.02 [-.16, .20]	-.00 [-.20,.19]	.02 [-.16, .19]
	I make back-up plans for when things might go wrong.	.06 [-.21, .17]	**.76 [.49, 1.05]**	.04 [-.15, .22]	.01 [-.18, .19]
	I tend to organise myself well to deal with challenges.	-.03 [-.21, .16]	**.88 [.59, 1.15]**	-.08 [-.26,.11]	.01 [-.18, .19]
	I prepare myself for upcoming challenges.	-.02 [-.13, .23]	**.82 [.52, 1.09]**	-.06 [-.14,.25]	-.00 [-.19, .18]
	I remain positive, even when things seem hopeless.	-.02 [-.22, .18]	-.03 [-.22, .16]	**.77 [.43,1.01]**	-.00 [-.19, .18]
	When things get bad, I don't let them get to me.	.02 [-.19, .22]	.03 [-.16, .22]	**.74 [.40, 1.05]**	.02 [-.17, .21]
	I keep a clear head under pressure.	.04 [-.17, .23]	.01 [-.18, .20]	**.62 [.23, .97]**	.03 [-.17, .22]
	I give my best effort no matter the obstacle.	.00 [-.20, .20]	.01 [-.18, .20]	**.67 [.27, 1.01]**	-.01 [-.20, .18]

	I bounce-back easily after a challenge.	-.02 [-.21, .18]	.02 [-.18, .21]	-.01 [-.21,.19]	**.81 [.41, 1.09]**
	I quickly get over set-backs.	-.01 [-.21, .18]	-.03 [-.22, .17]	.03 [-.17, .22]	**.77 [.19, .98]**
	I know how to stop the same things getting to me in the future.	.04 [-.17, .23]	.02 [-.18, .22]	.00 [-.19,.20]	**.71 [.36, 1.11]**
Cognitive	I can anticipate when help is going to be needed.	**.73 [.32, 1.07]**	.02 [-.18, .21]	.03 [-.17, .23]	.02 [-.18, .21]
	I can anticipate when a situation will stress me.	**.79 [.40, 1.10]**	-.02 [-.21, .17]	-.03 [-.22,.17]	-.01 [-.20, .19]
	I notice possible difficult situations early.	**.77 [.42, 1.09]**	.02 [-.17, .21]	.02 [-.19, .22]	.01 [-.19, .20]
	I make back-up plans for when things might go wrong.	.06 [-.13, .24]	**.82 [.57, 1.08]**	.06 [-.13, .23]	-.00 [-.19, .18]
	I tend to organise myself well to deal with challenges.	-.03 [-.22, .15]	**.87 [.60, 1.12]**	-.05 [-.22,.13]	.03 [-.16, .21]
	I prepare myself for upcoming challenges.	-.02 [-.21, .16]	**.89 [.61, 1.15]**	-.01 [-.19,.17]	-.01 [-.20, .17]
	I remain positive, even when things seem hopeless.	.03 [-.18, .23]	.01 [-.18, .20]	**.66 [.29, .99]**	.02 [-.18, .22]
	When things get bad, I don't let them get to me.	.02 [-.18, .22]	.05 [-.15, .24]	**.71 [.35, 1.04]**	-.00 [-.20, .19]
	I keep a clear head under pressure.	-.00 [-.20, .19]	-.02 [-.21, .16]	**.75 [.03, 1.07]**	.02 [-.18, .22]
	I give my best effort no matter the obstacle.	-.02 [-.22, .18]	-.02 [-.22, .18]	**.73 [.32, 1.08]**	-.01 [-.21, .19]
	I bounce-back easily after a challenge.	-.03 [-.22, .17]	.01 [-.19, .21]	-.03 [-.22,.17]	**.80 [.39, 1.13]**
	I quickly get over set-backs.	.05 [-.15, .25]	.03 [-.17, .22]	.02 [-.18, .22]	**.64 [.25, .99]**
	I know how to stop the same things getting to me in the future.	.00 [-.19, .19]	-.02 [-.21, .17]	.03 [-.17, .23]	**.86 [.54, 1.16]**
Emotional	I can anticipate when help is going to be needed.	**.72 [.36, 1.02]**	.03 [-.17, .22]	.04 [-.16, .24]	.02 [-.18, .22]
	I can anticipate when a situation will stress me.	**.65 [.54, 1.17]**	-.04 [-.23, .14]	-.01 [-.20,.18]	-.05 [-.24, .14]
	I notice possible difficult situations early.	**.78 [.48, 1.08]**	.03 [-.16, .22]	-.01 [-.20,.17]	.04 [-.16, .22]
	I make back-up plans for when things might go wrong.	.03 [-.15, .21]	**.79 [.50, 1.10]**	.02 [-.17, .20]	.03 [.17, .23]

I tend to organise myself well to deal with challenges.	-.01 [-.19, .17]	**.88 [.56, 1.16]**	-.02 [-.21,.16]	-.02 [-.22, .17]
I prepare myself for upcoming challenges.	-.03 [-.21, .16]	**.83 [.51, 1.12]**	.01 [-.18, .19]	.00 [-.20, .19]
I remain positive, even when things seem hopeless.	.01 [-.19, .21]	.01 [-.19, .21]	**.66 [.25, 1.02]**	.01 [-.19, .20]
When things get bad, I don't let them get to me.	.04 [-.17, .24]	.07 [-.14, .26]	**.64 [.23, 1.01]**	.05 [-.15, .25]
I keep a clear head under pressure.	-.00 [-.19, .18]	-.03 [-.22, .15]	**.75 [.40, 1.05]**	-.01 [-.20, .18]
I give my best effort no matter the obstacle.	-.03 [-.22, .17]	-.02 [-.12, .18]	**.76 [.36, 1.09]**	-.03 [-.22, .17]
I bounce-back easily after a challenge.	.01 [-.19, .20]	.04 [-.18, .24]	-.01 [-.21,.18]	**.76 [.39, 1.11]**
I quickly get over set-backs.	.02 [-.19, .22]	-.02 [-.22, .18]	.04 [-.17, .24]	**.72 [.33, 1.08]**
I know how to stop the same things getting to me in the future.	-.01 [-.20, .19]	-.04 [-.20, .20]	.00 [-.20,.20]	**.82 [.47, 1.16]**

Note. PP*p* = posterior predictive *p* value; BSEM = Bayesian Structural Equation Modelling. Factor loadings and 95% credibility intervals in bold correspond to the items in each row.

Table 2.3

Study 1 BSEM correlations between mechanisms

General	Anticipate	Minimise	Manage	Mend
Anticipate	1			
Minimise	0.32*	1		
Manage	0.31*	0.39*	1	
Mend	0.46**	0.40*	0.69***	1
Physical				
Anticipate	1			
Minimise	0.51**	1		
Manage	0.68***	0.57***	1	
Mend	0.57***	0.67***	0.62***	1
Social				
Anticipate	1			
Minimise	0.62***	1		
Manage	0.71***	0.58***	1	
Mend	0.54***	0.61***	0.59***	1
Cognitive				
Anticipate	1			
Minimise	0.57***	1		
Manage	0.70***	0.58***	1	
Mend	0.63***	0.64***	0.69***	1
Emotional				
Anticipate	1			
Minimise	0.63***	1		
Manage	0.67***	0.63***	1	
Mend	0.68***	0.76***	0.70***	1

Note. $p < .05$*; $p < .01$**; $p < .001$***

Differences Across Domains and Mechanisms

Further analysis examined the main differences within the domains and mechanisms to provide reference scores and baselines for future studies (see Table 2.4 for mean scores across domains and mechanisms). This analysis allowed for the exploration and clarification of these domains and mechanisms as distinct from each other – despite relatively high correlations between the mechanisms during the Bayesian analysis. A repeated measures (domain x mechanism) ANOVA revealed a main effect for domain F (3.54, 615.48) = 14.24, $p < .001$, $\eta^2 = .076$, mechanism F (2.28, 395.87) = 3.42, $p = .028$, $\eta^2 = .019$, and a domain x mechanism interaction, F (10.37, 1804.62) = 2.49, $p = .014$, $\eta^2 = .014$. Follow-up tests on the interaction (see Table 2.4) showed that in the general domain, anticipate was significantly higher than manage ($M_{diff} = 0.22$, t = 3.197, d = 0.204) and mend ($M_{diff} = 0.29$, $t = 4.361$, $d = 0.270$). Within the cognitive domain, minimise was significantly higher than manage ($M_{diff} = 0.19$, $t = 2.784$, $d = 0.164$), and within the emotional domain, anticipate was significantly higher than mend ($M_{diff} = 0.22$, $t = 3.226$, $d = 0.185$).

Internal Consistency

Composite reliability coefficient of the anticipation, minimise, manage, and mend subscales demonstrated acceptable reliabilities (see Table 2.4).

Table 2.4

Study 1 Means (M), Standard Deviations (SD), and Composite Reliability (CR) of each mechanism within their domains

	Anticipate			**Minimise**			**Manage**			**Mend**			**Mean**	
	M	***(SD)***	**CR**	***M***	***(SD)***	**CR**	***M***	***(SD)***	**CR**	***M***	***(SD)***	**CR**	***M***	***(SD)***
General	4.84	(0.91)	0.72	4.83	(1.04)	0.78	4.69	(1.04)	0.76	4.72	(1.06)	0.81	4.77	(1.01)
Physical	4.91	(1.02)	0.81	4.84	(1.05)	0.84	5.01	(1.05)	0.80	4.88	(1.01)	0.81	4.91	(1.03)
Social	4.78	(1.04)	0.84	4.64	(1.17)	0.86	4.56	(1.12)	0.80	4.48	(1.18)	0.81	4.62	(1.13)
Cognitive	4.89	(1.05)	0.81	4.89	(1.11)	0.90	4.70	(1.20)	0.81	4.73	(1.14)	0.81	4.80	(1.13)
Emotional	4.62	(1.12)	0.76	4.51	(1.14)	0.87	4.50	(1.27)	0.81	4.40	(1.25)	0.81	4.64	(1.20)
Mean	4.81	(1.03)		4.75	(1.10)		4.69	(1.14)		4.64	(1.13)			

Discussion

The results of Study 1 provide initial support for the proposed resilience scale with modified 13-item scales based on the findings of the BSEM. As expected, the models with no variance using a Bayesian Structural Equation Modelling approach, priors or cross-loadings produced poor fits, as did models with small variance priors on the cross-loadings alone. However, allowing small variance priors on cross-loadings and residual correlations produced very good model fits. Further, factor loadings of individual items were also good and the RPS indicated good internal consistency.

The positive correlations between the mechanisms were expected and provides good evidence of construct validity. For example, manage was highly correlated with mend (likely due to their temporal proximity). Mechanisms with less temporal proximity such as anticipate and mend tended to have lower correlations, with ANOVA and post-hoc testing further

demonstrating significant differences between the mechanisms. The overall ability to anticipate stressors was rated significantly higher than the ability to bounce-back and recover. Perhaps those with strong anticipation strategies experience less disruption leading to a lesser need for recovery strategies (if they have minimised and managed well with the stressor).

Significant differences were found between resilience domains, where the emotional domain was relatively rated the lowest, with physical as the highest followed by cognitive. Perhaps young students in this sample may have less experience dealing with emotional stressors such as depression and grieving (e.g., Frydenberg & Lewis, 1993). Such exposures and experience with certain types of adversity can lead to growth and greater resilience at dealing with them (e.g., via stress inoculation; Meichenbaum & Novaco, 1985). Further, a main finding in this study is the extension for the mechanisms of anticipation and the cognitive domain, with analysis having highlighted their distinctiveness from other mechanisms and domains. However, further testing with a more heterogeneous sample is required to further confirm the model beyond the use of young adults. Therefore, the purpose of Study 2 is to confirm the proposed model and measure from a more diverse population.

Study 2: Further Confirmatory Validation of the Final Resilience Process Scale

Method

Participants

In this study, we recruited a convenience sample of 284 participants (M_{age} = 26.4 years, *SD* = 10.5 years; *n* = 139 Female, *n* = 144 Male) via social media, posters, and face-to-face recruitment of members of the public (*n* = 87; M_{age} = 30.2 years, *SD* = 12.5 years, *n* = 60 Female, *n* = 27 Male) and University students (*n* = 197; M_{age} = 22.1 years, *SD* = 5.3 years; *n* = 78 Female, *n* = 116 Male, *n* = 3 preferred not to say). Participants stated their ethnicity as, three Afro-Caribbean, 47 Asian, three mixed, 222 White, and nine preferred not to say. Their Nationalities were varied, with 13 of them American, one Austrian, one Bahraini, one

Belgian, 171 British, two Canadian, 36 Chinese, one Danish, one French, five German, three Greek, three Indian, one Iranian, three Irish, six Italian, one Japanese, one Lithuanian, one Malaysian, one New Zealander, one Nigerian, four Pakistani, six Polish, one Portuguese, one Romanian, one Russian, one Saudi Arabian, four Singaporean, two Spanish, one Turkish, one Vietnamese, and nine preferred not to say.

Procedure

Through links in social media, online groups for study recruitment, and posters featuring an online link, members of the public completed the refined, 13-item measure of each of the five domains online through a computer, tablet, or phone at their convenience. University students were recruited via similar methods using social media, posters, and face-to-face recruitment through lectures and seminars, questionnaires were completed both in hard copy and online formats at the participants' convenience. Both the hard copies and the online version of the scale presented the domains in a random order to reduce ordering effects. Of these participants, 204 completed the questionnaires online with 87 by hand.

Analysis

We used the same BSEM approach from Study 1 starting from zero cross-loadings and residual correlations at first, then small variance priors on cross-loadings, then both small variance priors for cross-loadings and residual correlations using the final 13-items per domain.

Results

All models with priors set to zero did converge, but as expected they produced poor model fits. With small priors on cross-loadings only, only the emotional domain model converged. Analysis demonstrated a good model fit for the final models with PP*p*'s around .50 and symmetric 95% posterior predictive confidence intervals centred close to zero. As with the previous study, PSR values for the final models reached the 1.1 criterion at

approximately 20,000 iterations. K-S tests for all parameters for both instruments were non-significant ($p > .05$). Visual inspection of the trace plots (162 parameters for each of the domains) all showed stability, with no upward or downward trends in the means and the two chains overlapping in variability.

The general domain had a PP*p* of .52, with lower and upper confidence intervals (CI) of -42.22 and 39.37, respectively. The physical domain had a PP*p* of .51, with CIs of -40.63 and 40.16. Social domain has a PP*p* of .52, with CIs of -41.54 and 39.16. Cognitive domain had a PP*p* of .52, with CIs of -41.57 and 40.02. Lastly, the emotional domain had a PP*p* of .51, with CIs of -41.37 and 41.01.

Cross-loadings and residual correlations all produced similar acceptable findings to the initial sample. Factor loadings (FL) across the domains were between .50 and .89. The only items less than .67 in FL were manage item 3 (.52) and 4 (.55) within the general domain and manage item 1 (.53) in the physical domain (see Table 2.5 for exact factor loadings and CI of the final 13-items). We also took note of correlations between the mechanisms, with *r* scores generally ranging from .40 to .83 and significantly relating to one another (see Table 2.6).

Table 2.5

Study 2 BSEM standardized factor loadings of each item, including 95% credibility intervals

	Standardised factor loadings for final items	Anticipate	Minimise	Manage	Mend
General	I can anticipate when help is going to be needed.	**.73 [.40, 1.00]**	-.01 [-.20, .17]	.02 [-17, .19]	-.01 [-.20, .19]
	I can anticipate when a situation will stress me.	**.82 [.50, 1.06]**	-.02 [-.20, .15]	-.05 [-.23, .13]	-.04 [-.23, .15]
	I notice possible difficult situations early.	**.73 [.45, .99]**	.04 [-.14, .22]	.05 [-.14, .22]	.06 [-.14, .25]
	I make back-up plans for when things might go wrong.	-.02 [-.20, .16]	**.82 [.51, 1.07]**	-.03 [-.21, .15]	-.04 [-.23, .15]
	I tend to organise myself well to deal with challenges.	-.02 [-.20, .14]	**.82 [.57, 1.04]**	.02 [-.16, .20]	.01 [-.18, .20]
	I prepare myself for upcoming challenges.	.04 [-.14, .22]	**.70 [.40, .96]**	.02 [-.16, .20]	.04 [-.15, .23]
	I remain positive, even when things seem hopeless.	-.01 [-.18, .16]	-.00 [-.18, .17]	**.78 [.49, 1.05]**	-.01 [-.20, .18]
	When things get bad, I don't let them get to me.	.02 [-.15, .20]	.02 [-.16, .19]	**.75 [.40, 1.02]**	- .02 [-.18, .22]
	I keep a clear head under pressure.	-.01 [-.19, .17]	-.02 [-.20, .26]	**.56 [.42, 1.04]**	.02 [-.18, .22]
	I give my best effort no matter the obstacle.	.03 [-.17, .21]	.04 [-.15, .24]	**.50 [.08, .90]**	-.01 [-.21, .19]
	I bounce-back easily after a challenge.	-.01 [-.18, .17]	.02 [-.17, .20]	.02 [-.19, .22]	**.78 [.46, 1.07]**
	I quickly get over set-backs.	-.01 [-.19, .17]	-.04 [-.22, .13]	.03 [-.18, .23]	**.82 [.48, 1.09]**
	I know how to stop the same things getting to me in the future.	.05 [-.15, .24]	.04 [-.15, .22]	-.02 [-.22,.18]	**.73 [.40, 1.04]**
Physical	I can anticipate when help is going to be needed.	**.75 [.42, 1.06]**	.02 [-.18, .22]	.02 [-.18,.20]	.02 [-.19, .21]

	I can anticipate when a situation will stress me.	**.77 [.39, 1.07]**	-.04 [-.23, .14]	-.05 [-.24, .13]	-.07 [-.25, .12]
	I notice possible difficult situations early.	**.74 [.46, 1.02]**	.03 [-.16, .22]	.014[-.15, .22]	.06 [-.14, .25]
	I make back-up plans for when things might go wrong.	.01 [-.17, .19]	**.78 [.50, 1.06]**	.02 [-.17, .20]	.02 [-.17, .21]
	I tend to organise myself well to deal with challenges.	-.01 [-.20, .16]	**.89 [.62, 1.15]**	-.01 [-.20,.17]	-.01 [-.19, .18]
	I prepare myself for upcoming challenges.	01[-.18, .20]	**.79 [.48, 1.09]**	.01 [-.19, .19]	-.01 [-.19, .18]
	I remain positive, even when things seem hopeless.	-.02 [-.20, .16]	.02 [-.17, .21]	**.79 [.47, 1.08]**	.01 [-.19, .20]
	When things get bad, I don't let them get to me.	-.01 [-.20, .17]	-.01 [-.20, .18]	**.72 [.39, 1.04]**	.00 [-.20, .21]
	I keep a clear head under pressure.	.01 [-.16, .20]	-.01 [-.20, .18]	**.76 [.46, 1.05]**	.01 [-.19, .21]
	I give my best effort no matter the obstacle.	.02 [-.17, .20]	.00 [-.19, .19]	**.74 [.41, 1.05]**	.00 [-.20, .20]
	I bounce-back easily after a challenge.	-.01 [-.19, .16]	-03 [-.22, .16]	-.00 [-.20, .19]	**.87 [.57, 1.16]**
	I quickly get over set-backs.	-.02 [-.20, .16]	-.01 [-.20, .17]	.03 [-.18, .22]	**.82 [.51, 1.11]**
	I know how to stop the same things getting to me in the future.	.05 [-.14, .23]	.05 [-.16, .24]	.01 [-.20, .21]	**.75 [.42, 1.08]**
Social	I can anticipate when help is going to be needed.	**.77 [.46, 1.05]**	.02 [-.18, .21]	.02 [-.17,.20]	.02 [-.17, .21]
	I can anticipate when a situation will stress me.	**.77 [.44, 1.04]**	-.01 [-.20, .17]	-.03 [-.21, .15]	-.03 [-.22, .16]
	I notice possible difficult situations early.	**.78 [.47, 1.06]**	.02 [-.17, .20]	.02 [-.17, .21]	.03 [-.17, .22]
	I make back-up plans for when things might go wrong.	-.01 [-.19, .18]	**.85 [.58, 1.09]**	.03 [-.16, .21]	-.02 [-.20, .16]
	I tend to organise myself well to deal with challenges.	.01 [-.18, .19]	**.78 [.47, 1.05]**	.01 [-.18, .21]	.02 [-.18, .20]
	I prepare myself for upcoming challenges.	.03 [-.17, .21]	**.78 [.47, 1.05]**	-.01 [-.20, .20]	.03 [-.16, .21]

	I remain positive, even when things seem hopeless.	-.01 [-.19, .18]	.01 [-.17, .20]	**.81 [.50, 1.08]**	.03 [-.18, .22]
	When things get bad, I don't let them get to me.	-.01 [-.18, .18]	.01 [-.18, .19]	**.72 [.39, 1.01]**	.04 [-.16, .24]
	I keep a clear head under pressure.	.00 [-.18, .18]	-.00 [-.19, .18]	**.78 [.46, 1.06]**	-.01 [-.20, .18]
	I give my best effort no matter the obstacle.	.02 [-.17, .21]	.01 [-.19, .21]	**.61 [.23, .96]**	-.02 [-.22, .18]
	I bounce-back easily after a challenge.	.00 [-.17, .18]	.01 [-.18, .18]	.01 [-.19,.19]	**.85 [.59, 1.12]**
	I quickly get over set-backs.	-.00 [-.18, .17]	-.04 [-.22, .13]	.05 [-.16, .24]	**.80 [.50, 1.08]**
	I know how to stop the same things getting to me in the future.	.02 [-.17, .21]	.05 [-.15, .24]	-.03 [-.22,.17]	**.77 [.45, 1.07]**
Cognitive	I can anticipate when help is going to be needed.	**.73 [.42, 1.02]**	.00 [-.19, .19]	.04 [-.15, .22]	.01 [-.17, .20]
	I can anticipate when a situation will stress me.	**.82 [.52, 1.06]**	-.01 [-.20, .18]	-.04 [-.22,.15]	-.02 [-.21, .16]
	I notice possible difficult situations early.	**.81 [.56, 1.05]**	.01 [-.17, .20]	.01 [-.18, .19]	.01 [-.17, .20]
	I make back-up plans for when things might go wrong.	-.00 [-.19, .17]	**.82 [.52, 1.11]**	.00 [-.19, .19]	.01 [-.19, .20]
	I tend to organise myself well to deal with challenges.	-.00 [-.18, .17]	**.77 [.46, 1.05]**	.01 [-.18, .20]	.01 [-.18, .19]
	I prepare myself for upcoming challenges.	.00 [-.18, .18]	**.79 [.47, 1.07]**	.00 [-.19, .19]	.01 [-.18, .19]
	I remain positive, even when things seem hopeless.	-.00 [-.18, .17]	.01 [-.18, .20]	**.81 [.52, 1.09]**	-.01 [-.21, .18]
	When things get bad, I don't let them get to me.	.01 [-.17, .19]	-.01 [-.19, .18]	**.70 [.33, 1.00]**	.02 [-.18, .23]
	I keep a clear head under pressure.	-.04 [-.22, .14]	-.02 [-.21, .16]	**.81 [.51, 1.10]**	.03 [-.18, .22]
	I give my best effort no matter the obstacle.	.06 [-.13, .26]	.07 [-.15, .27]	**.55 [.16, .92]**	-.00 [-.20, .20]
	I bounce-back easily after a challenge.	-.01 [-.19, .16]	.02 [-.17, .21]	.00 [-.20, .20]	**.81 [.50, 1.09]**
	I quickly get over set-backs.	-.02 [-.19, .17]	-.04 [-.23, .15]	.03 [-.18, .23]	**.80 [.47, 1.09]**
		.04 [-.14, .21]	.03 [-.17, .22]	.01 [-.21, .19]	**.80 [.50, 1.08]**

	I know how to stop the same things getting to me in the future.				
Emotional	I can anticipate when help is going to be needed.	**.81 [.51, 1.07]**	.00 [-.19, .18]	.04 [-.16, .24]	.01 [-.18, .19]
	I can anticipate when a situation will stress me.	**.85 [.58, 1.08]**	-.03 [-.21, .14]	.01 [-.18,.19]	-.03 [-.21, .14]
	I notice possible difficult situations early.	**.67 [.37, .95]**	.05 [-.14, .23]	-.04 [-.22,.14]	.05 [-.14, .23]
	I make back-up plans for when things might go wrong.	-.01 [-.19, .17]	**.82 [.56, 1.07]**	.05 [-.13, .23]	.00 [-.19, .19]
	I tend to organise myself well to deal with challenges.	-.02[-.20, .16]	**.86 [.61, 1.09]**	.01 [-.18, .19]	.00 [-.19, .18]
	I prepare myself for upcoming challenges.	.04 [-.15, .22]	**.76 [.46, 1.04]**	.00 [-.19, .18]	.01 [-.19, .19]
	I remain positive, even when things seem hopeless.	-.02 [-.19, .16]	.01 [-.18, .18]	**.82 [.53, 1.10]**	.01 [-.19, .21]
	When things get bad, I don't let them get to me.	.03 [-.20, .15]	.01 [-.17, .18]	**.77 [.44, 1.07]**	.02 [-.18, .22]
	I keep a clear head under pressure.	.05 [-.16, .21]	-.03 [-.22, .15]	**.78 [.45, 1.07]**	.00 [-.20, .20]
	I give my best effort no matter the obstacle.	-.03 [-.16, .24]	.04 [-.17, .23]	**.53 [.14, .93]**	-.01 [-.21, .19]
	I bounce-back easily after a challenge.	-.03 [-.21, .15]	.04 [-.15, .20]	.02 [-.19, .22]	**.84 [.56, 1.11]**
	I quickly get over set-backs.	.01 [-.17, .18]	-.03 [-.21, .14]	.02 [-.18, .22]	**.84 [.55, 1.12]**
	I know how to stop the same things getting to me in the future.	.04 [-.15, .23]	.02 [-.17, .20]	-.02 [-.22, .18]	**.72 [.37, 1.04]**

Note. PP*p* = posterior predictive *p* value; BSEM = Bayesian Structural Equation Modelling. Factor loadings and 95% credibility intervals in bold correspond to the items in each row.

Table 2.6

Study 2 BSEM correlations between mechanisms

General	Anticipate	Minimise	Manage	Mend
Anticipate	1			
Minimise	0.44**	1		
Manage	0.40**	0.48***	1	
Mend	0.46**	0.51***	0.77***	1
Physical				
Anticipate	1			
Minimise	0.60***	1		
Manage	0.52***	0.68***	1	
Mend	0.57***	0.69***	0.83***	1
Social				
Anticipate	1			
Minimise	0.59***	1		
Manage	0.49**	0.59***	1	
Mend	0.54***	0.58***	0.73***	1
Cognitive				
Anticipate	1			
Minimise	0.58***	1		
Manage	0.49***	0.62***	1	
Mend	0.47**	0.65***	0.79***	1
Emotional				
Anticipate	1			
Minimise	0.54***	1		
Manage	0.51***	0.59***	1	
Mend	0.52***	0.58***	0.79***	1

Note. $p < .05$*; $p < .01$**; $p < .001$***

Differences Across Domains and Mechanisms

Further analysis examined the main differences within the domains and mechanisms to provide reference scores and baselines for future studies. In addition, it allowed for exploration and clarification of these domains and mechanisms as distinct. A repeated measures (domains × mechanism) ANOVA revealed main effects for domain F (4, 835.01) = 14.76, $p < .001$, $\eta^2 = .500$, mechanism F (2.42, 684.87) = 27.81, $p < .001$, $\eta^2 = .089$, and interaction F (9.12, 2580.66) = 2.54, $p = .007$, $\eta^2 = .009$. Follow-up tests on the interaction (see Table 2.7) showed that in the general domain, anticipate was significantly higher than manage ($M_{diff} = 0.23$, $t = 3.61$, $d = 0.216$) and mend ($M_{diff} = 0.25$, $t = 3.92$, $d = 0.237$), and minimise was significantly higher than mend ($M_{diff} = 0.20$, $t = 3.14$, $d = 0.188$). In the physical domain, anticipate was significantly higher than manage ($M_{diff} = 0.56$, $t = 8.79$, $d = 0.509$), and minimise was significantly higher than manage ($M_{diff} = 0.48$, $t = 7.53$, $d = 0.400$). In the social domain, anticipate was significantly higher than manage ($M_{diff} = 0.35$, $t = 5.49$, $d = 0.305$) and mend ($M_{diff} = 0.46$, $t = 7.22$, $d = 0.382$), and minimise was significantly higher than mend ($M_{diff} = 0.29$, $t = 4.55$, $d = 0.223$). In the cognitive domain, anticipate was significantly higher than manage ($M_{diff} = 0.30$, $t = 4.71$, $d = 0.262$) and mend ($M_{diff} = 0.36$, $t = 5.65$, $d = 0.309$), and minimise was significantly higher than manage ($M_{diff} = 0.28$, $t = 4.39$, $d = 0.232$) and mend ($M_{diff} = 0.34$, $t = 5.33$, $d = 0.278$). Lastly in the emotional domain, anticipate was significantly higher than manage ($M_{diff} = 0.32$, $t = 5.02$, $d = 0.269$) and mend ($M_{diff} = 0.46$, $t = 7.22$, $d = 0.371$), and minimise was significantly higher than mend ($M_{diff} = 0.22$, $t = 5.65$, $d = 0.285$).

Table 2.7

Study 2 Means (M) and Standard Deviations (SD) of each mechanism within their domains

	Anticipate		**Minimise**		**Manage**		**Mend**		**Mean**	
	M	***(SD)***	***M***	***(SD)***	***M***	***(SD)***	***M***	***(SD)***	***M***	***(SD)***
General	5.05	(1.02)	5.00	(1.04)	4.82	(1.11)	4.80	(1.09)	4.92	(1.07)
Physical	5.16	(0.99)	5.08	(1.20)	4.60	(1.20)	4.98	(1.19)	5.06	(1.15)
Social	4.95	(1.09)	4.78	(1.21)	4.60	(1.20)	4.49	(1.31)	4.70	(1.20)
Cognitive	5.08	(1.10)	5.06	(1.22)	4.78	(1.19)	4.72	(1.23)	4.80	(1.19)
Emotional	4.88	(1.14)	4.78	(1.19)	4.56	(1.24)	4.42	(1.33)	4.68	(1.23)
Mean	5.03	(1.07)	4.92	(1.17)	4.75	(1.19)	4.68	(1.23)		

Discussion

The results of Study 2 provide further confirmatory support for the proposed resilience scale in a more general population. The analysis demonstrated an acceptable model fit with good factor loadings of the final 13-item scale within each domain. Emotional resilience was found to be the lowest rated with physical being the highest. Thus, even in more general populations, self-perceptions are consistently higher in resilience to physical adversity over emotional adversity, and emotional resilience is again rated lowest. This finding is explored in the general discussion below.

Further analysis demonstrated that the mechanisms also significantly differed. That is, the anticipate mechanism was rated significantly higher than all other mechanisms. Once more, this difference highlights the significant distinction of an individual's ability to

anticipate and detect threats, to their ability to act upon them (i.e., minimising). The increase in reported anticipation scores may reflect those threats are easier to pick up requiring little effort but dealing with them requires some form of behavioural regulation and input. It may also be due to more experience of appraising threats, or individuals generally feeling more intense emotions during the anticipation of stressful events than upon retrospection such as during the more reactive aspects of resilience (e.g., Van Boven & Ashworth, 2007). In addition, this study also adds further support to Study 1, where the cognitive domain of resilience separated out as a distinct subfactor. Further research looking at this domain of could prove useful for researchers and practitioners when considering reactions to adverse situations that are primarily cognitive in nature.

General Discussion

The purpose of the current set of studies was to build upon previous research and provide a new model and resilience measurement that accounted for resilience as a multidimensional process within five domains of functioning. Results across both studies not only show support for previous distinct components of minimising, managing, and mending (cf. Alliger et al., 2015; Chen et al., 2016) but that the ability to anticipate should be treated as a separate component. Further, a new distinct domain of cognitive resilience was also supported across both studies.

Resilience as a Process

Pro-Active Resilience

The studies support and extend upon previous research on pro-active resilience (e.g., Alliger et al., 2015; Chen et al., 2016; Fletcher & Sarkar, 2016). Moreover, the studies provide preliminary evidence for a new mechanism of resilience defined as *anticipation* and refers to the awareness/self-awareness of upcoming adversity, followed by minimising, associated with actions taken to reduce the impact of adversity. An interesting finding in both

studies was that anticipation was consistently rated higher than minimising, managing, and mending. The results suggest that individuals are very aware of upcoming potential stressors and threats, but that they may or may not be required to act upon them (e.g., Anderson, 2003). Most individuals have an attentional bias towards threats, which can generally be a beneficial evolutionary process to maintain personal safety (MacLeod et al., 1986). Minimise was the second highest-rated mechanism across both studies. Indeed, anticipation may be the first skill employed with any upcoming event, followed by minimising. Hence, these processes may become the more dominant and 'practiced' mechanisms and aspects of resilience (e.g., Fletcher & Sarkar, 2016; Meichenbaum & Novaco, 1985), however, this would need to be tested. Further, if the anticipation of threats causes one to avoid or then minimise the stressor adequately, there may be less subsequent adversity to deal with.

Reactive Resilience

Reactive resilience becomes more salient when individuals fail to anticipate threats or lack the resources to deal with them adequately. Reactive resilience is more commonly associated with adapting and bouncing back from adversity and its associated stressors. This definition fits with the more traditional approach to resilience (Smith et al., 2008; Windle et al., 2011) before its conceptualisation evolved and expanded (Alliger et al., 2015; Chen et al., 2016; Fletcher & Sarkar, 2016). The current studies support the idea that adapting and bouncing back is an essential *part* of what encapsulates resilience. As expected, there were significant correlations between the mechanisms, particularly those with closer temporal proximity (e.g., anticipate and minimise) than distal (e.g., anticipate and mend). In addition to the somewhat downward trend in mean scores from anticipate to mend, this also supports the idea of these four mechanisms as more closely linked as a pro-active response followed by a reactive response. However, future research would have to examine more longitudinal data to examine these reciprocal effects.

Domains of Functioning

Another purpose of the current studies was to support and extend previous research showing that resilience functions both generally and in specific domains (e.g., physical, social, and emotional). Overall, similar significant differences were found in both studies, where the emotional domain was rated the lowest, and physical as the highest. This may reflect how general populations from these groups navigate and experience these types of adversity. For example, physical forms of stress such as illness, fatigue, pain etc. can be more tangible and recognisable issues (for example, physical pain is one of the most reported problems in medical care; Lumley et al., 2011). But, more importantly, they tend to have more obvious solutions over psychological issues where one could rest, see a doctor, or deal with the pain with over-the-counter prescriptions. However, emotional distress is not always so clear in its symptoms or solutions, contributing to the prevalence of mental health issues (e.g., McManus et al., 2009).

The commonality of recognising and successfully dealing with emotional issues may be more cognizant upon emotional awareness and regulation (e.g., Cejudo et al., 2018; Salovey et al., 1999), which also may follow through to seeking some form of counselling. Another possible reason is that mental illness is still stigmatised and simply not as understood or appreciated as physical illnesses across society (e.g., Malla et al., 2015). Individuals may also self-stigmatize their mental health problems, leading to further issues coping with emotional stressors, encouraging withdrawal, and lowering self-efficacy (Holmes & River, 1998). This may lead to further reductions in seeking help such as therapy (Radez et al., 2021). Social resilience tended to only marginally be higher than emotional resilience; once more, this could highlight that social adversity (e.g., relationship issues) may be more difficult to recognise and deal with (e.g., Wood & Bhatnagar, 2015) over physical issues.

We hypothesised that cognitive resilience was an important yet untapped domain for resilience. Recognising and understanding how one can be resilient to varying cognitive stressors could be vital in situations and jobs where performance relies upon complex cognitive task performances (e.g., air traffic control; Ćosić et al., 2019). Neglecting to deal with cognitive stressors such as the demands of attentional control and working memory (e.g., Eysenck et al., 2007) could lead to mental health issues (e.g., Putwain et al., 2015; Ringeisen & Raufelder, 2015). This is in addition to any poor performance in the tasks at hand (e.g., Eysenck et al., 2007) that resilience could protect against (e.g., Derakhshan, 2020; Putman et al., 2014).

Applied Implications

From an applied perspective, pro-active and reactive mechanisms can better inform practitioners to understand and improve resilience. For example, building both general and specific coping techniques that encompass or target specific mechanisms could provide a more individually tailored intervention. Within dynamic environments, coping can be a complex process (Hardy et al., 1996) that requires a range of strategies to help deal with each domain of stress (e.g., Gould et al., 1993). The present model and measurement can allow this complex process to be better understood when developing future resilience interventions. For example, each domain (physical, social, cognitive, emotional, or just general) or process (anticipate, minimise, manage, and mend) could be examined individually for a practitioner's chosen context of interest.

Developing Resilience

Following screening or profiling resilience (using the RPS from the current studies), strategies could be put in place targeting resilience mechanisms by creating a challenging but supportive environment. These strategies could nurture and grow resilience above and beyond what such experiences may already offer (e.g., Fletcher & Sarkar, 2016; Griffith &

West, 2013; Mutz & Müller, 2016; Reivich et al., 2011). For example, creating interventions that utilise pressure and punishment has been linked to detecting, processing, and learning from aversive and potentially dangerous environmental cues, which can relate to an individual's resilience mechanisms (Ávila & Torrubia, 2008; Bell et al., 2013). An optimal amount of arousal and stress in these contexts has been demonstrated to lead to better outcomes as well as resilience (e.g., Barrett & Martin, 2014; Meichenbaum & Novaco, 1985; Montpetit & Tiberio, 2016). This has value when performance is somewhat reliant on resilience (e.g., physical/emotional resilience within the military; Griffith & West, 2013) or cognitive resilience in air traffic control (Ćosić et al., 2019). However, further testing would be needed to examine potential interventions using this model.

Strengths, Limitations, and Future Directions

The findings of this study provide preliminary support for the credibility of the psychometric properties of the RPS. They establish the new mechanism of anticipation, as well as the cognitive domain of resilience. However, instrument development is an ongoing process, and further studies are required to corroborate and validate these findings. For example, distinct population groups or cultures may identify with certain items differently or experience and deal with certain types of adversity differently and to varying degrees (Pattison, 2011). For example, some young people who are also athletes may have an enhanced pro-active and reactive ability to deal with physical and emotional stressors (as part of their sport) due to the time dedicated to nurturing these skills that other youths may not experience. But this could be to the potential detriment of developing resilience to other types of stressors which would lack such attention (e.g., Caine et al., 2016). Thus, future researchers could examine the resilience profiles of population groups that differ by age, gender, or occupation across time.

Although the current studies provide evidence for a theoretically grounded measurement tool, it would still need to be linked to other meaningful outcomes for further validation, such as well-being or self-esteem (e.g., Grant & Kinman, 2012). Research findings such as these could help provide an understanding of how resilience and its mechanisms could mediate the relationship between stress and ill-health across multiple domains of functioning (e.g., Sarrionandia et al., 2018). For example, cognitive resilience could act as a buffer and reduce the manifestation and impact of cognitive related stress (e.g., Bong et al., 2016; Ćosić et al., 2019; Kirsh, 2000; Matthews et al., 2019). Future research could examine if cognitive resilience can protect from the effects of cognitive anxiety on cognitive-based tasks (e.g., Hardy et al., 2007). Furthermore, it could be explored how these domains could have some considerable crossover and overlap into others (e.g., social and emotional adversity can cause similar stressors to deal with; Hellerstein, 2011). This could provide insight for practitioners on how an individual might cope with forms of adversity not directly being examined.

Conclusions

The findings of these studies provide initial evidence that the RPS has acceptable psychometric properties. Specifically, the studies have extended previous resilience research by separating the mechanisms of anticipation and minimising, along with the inclusion of the cognitive resilience domain. The studies provide insight and a measure that can credibly examine the mechanisms of resilience as a more comprehensive four-stage pro-active and reactive process, along with four distinct domains of stress, that is hoped to drive research in this area further. In this way, resilience interventions can have a more bespoke implementation, targeting specific mechanisms within domains if required.

However, it is important to note that despite the encouraging results, the scale's predictive validity should be examined and assessed with longitudinal studies. The

mechanisms and domains of resilience should theoretically express relevant outcome variables, which are further examined in this thesis (see Chapters 3 and 4). Nevertheless, the findings of these studies suggest that the RPS will serve as a useful tool in future research. Notably, the definitions and model of resilience presented here could be an essential psychological reference for practitioners and researchers going forward.

Chapter 3: Examining the Effects of Expeditions and Interventions on Resilience

Preface

The PhD research program set out to examine the psychological effects of expeditions and the design and implementation of a psychological resilience intervention based on the resilience model proposed in Chapter 2. This part of the PhD programme was to be presented in two separate PhD chapters. However, due to the COVID-19 pandemic, these studies could not be continued beyond initial testing and piloting. We had originally hoped that these studies would lay the foundation for a more extensive data collection, allow for the use of control groups, and enable an examination of the potential long-term benefits of expeditions. Thus, the originally planned studies have been combined into one chapter as a first step in examining the resilience model within the potentially challenging environments of expeditions.

Abstract

Challenging environments such as expeditions should be facilitative to and enhance resilience. However, the literature in this area is often criticised for its ambiguity in conceptualisation and methodological weaknesses, making conclusions difficult to draw from them. The current studies aimed to address some of these issues and extend previous research by operationalising resilience based on four constituent mechanisms from pro-active (anticipation & minimising) to reactive (managing & mending) within five distinct domains (general, physical, social, cognitive, and emotional). In Study 3, we examined changes in resilience and relationships between resilience and related outcomes such as well-being throughout expeditions. Thirty-five participants (M_{age} = 16.8, *SD* = 0.8) completed measures of resilience, self-concept, challenge/threat appraisal, and well-being at the beginning, middle, and end of their expeditions (these ranged from 14 days to 30 days; *M* = 25.3, *SD* = 5.5 days on expedition). The main findings demonstrated overall increases in resilience across expeditions and positive relationships between resilience and outcomes such as

positive self-concept and well-being. In Study 4, we developed and pilot-tested a resilience intervention to take place during a training weekend of camping and hiking, preceding participants' respective expeditions. Sixteen participants (M_{age} = 17.0, SD = 1.1) were recruited and completed psychological measures at the beginning and end of the training weekend. The intervention had two distinct features; the first half focused on providing extra challenges to participants (e.g., team games with consequences for losing & banning phones) based on each resilience domain. The second half focused on teaching different coping strategies to support the four resilience mechanisms (e.g., relaxation techniques & what-if scenarios and planning). The main findings demonstrated an overall increase in resilience over the training weekend, but there were few significant differences between the intervention and non-intervention groups in resilience. Implications and directions for future research are discussed.

Examining the Effects of Expeditions and Interventions on Resilience

Resilience is a process of managing and adapting to life's challenges (e.g., Bryan et al., 2019; see Chapter 2 of this thesis). High resilience is associated with a range of benefits, such as enhanced well-being (e.g., Fisk & Dionisi, 2010; Grant & Kinman, 2012; Sanders et al., 2015), an improved ability to dealing with mental health issues (e.g., Labrague et al., 2020), and the use of more adaptive coping behaviours (e.g., Balmer et al., 2013). Highly resilient individuals tend to feel less emotional stress following adverse events (Masten & Tellegen, 2012), and have a faster recovery from the ill effects of the associated stress from these adversities (Zautra et al., 2010). With regards to young adults, adolescents must make continuous efforts to learn, adapt, and cope with physical, cognitive, and social challenges that are new to them and associated with this time of development (Frydenberg & Lewis, 1993). Given these challenges, it is important to understand how facilitative, demanding environments could benefit young adults and improve their resilience and associated outcomes such as well-being. Despite the view that demanding, extreme environments such as expeditions can be overwhelming and detrimental to mental health, they have in fact been found to be beneficial in terms of increasing resilience and other psychological outcomes (e.g., Barratt & Martin, 2014; Smith et al., 2019). However, to better understand *how* these challenges benefit resilience, and how resilience leads to better psychological outcomes, it is important to understand the underlying mechanisms of resilience, as well as how different contextual domains can differ in this process. Furthermore, this increased understanding would allow us to better understand how to improve resilience.

Conceptualisations and Mechanisms of Resilience

There has been a myriad of definitions of resilience offered, with conceptualisations ranging from an ability to adapt positively in the face of adversity (cf. Joyce et al., 2018), or simply rebounding from adversity's negative impact (cf. Doorn et al., 2018). The conceptual

differences have hampered resilience research and resilience measurement. For example, different definitions of resilience generate different methods and methodologies, leading to confusion (cf. Estrada et al., 2016; Windle et al., 2011). Further, some conceptualisations of resilience only define a narrow aspect of resilience (e.g., navigating adversity or recovery) or demonstrate poor (or do not state any) psychometric properties in their measures (e.g., see Fletcher & Sarkar, 2016; Martin-Breen & Anderies, 2011; Windle et al., 2011 for more on these issues). For example, the CD-RISC (Connor & Davidson, 2003) demonstrates good psychometric properties, and examines an individual's resources, traits, and behaviours leading into and during adversity but generally ignores recovery from stress. Another popular assessment tool, the Brief Resilience Scale (Smith et al., 2008), provides a clearer definition of resilience along with good psychometric properties but focuses almost exclusively on recovery post-stress. These issues have impeded resilience research by only examining parts of what is believed to be resilience. Moreover, historically there has been debate on whether resilience should be conceived as a collection of traits or protective qualities in the individual (e.g., Block & Kreman, 1996; Connor & Davidson, 2003). The more contemporary view is that resilience should be seen as a dynamic and interactive process. This latter process view suggests that resilience can change over time and can be influenced by the type of adversity and resources of the environment (e.g., Pangallo et al., 2015).

To address some of these issues, Chen et al. (2016) proposed a more comprehensive three-stage process of resilience that includes an individual's ability to anticipate (i.e., identify upcoming threats), be flexible (adapting and manage), and bounce back from adversity. Alliger et al. (2015) proposed a similar conceptualisation where mechanisms of resilience contain the ability to pro-actively minimise (including both the ability to identify and appraise threats), manage (act and react, and then adapt as the issue occurs), and mend

(learn and recover from the experience) from adversity. Thus, both approaches provide a more comprehensive conceptualisation of resilience as a process that includes pro-active and reactive elements (e.g., Fletcher & Sarkar, 2016).

Alliger et al. (2015) and Chen et al. (2016) chose to combine the processes of anticipate and minimise. However, the ability to anticipate upcoming threats should be treated as a separate process to implementing minimising strategies (e.g., coping strategies). For example, Hardy et al. (2014) found that some athletes were predisposed to picking up threats early (e.g., anticipating upcoming threats), which allowed them more time to better minimise and deal with such threats sooner. Yet not every potential stressor will need to be minimised (hence the need for the distinction between anticipate and minimise). Anticipating upcoming stressful events and subsequent reactions to stress may partly be explained by appraisal theory (Lazarus, 1991), which contains two main components of primary and secondary appraisals. Primary appraisals require a person to anticipate whether an upcoming situation is deemed as a threat, non-threat, or a challenge. If an individual perceives the situation as a threat they cannot currently deal with, they then engage with secondary appraisals (i.e., minimising the threat, assessing, and engaging in coping strategies). However, if an upcoming threat is not deemed to surpass an individual's resources and abilities, then they may make no behavioural adjustments. These studies demonstrate and highlight the distinction and need to separate the ability to anticipate and minimise stressors.

Recent research has also criticised the general over-reliance on self-report measures with similar concepts. One method to circumvent this limitation is developing measures that an observer can complete to correlate and cross-reference with the self-report data (e.g., Hardy et al., 2013). A reliable solution is to try to utilise both methods when able, with more judgements enhancing the stability and reliability of the results in what is known as the

'principle of aggregation', as well as enhancing the accuracy of the data (McDonald, 2008), unless other explicit behavioural outcomes of resilience can also be observed.

To summarise, a more contemporary and comprehensive conceptualisation of resilience is as a pro-active and reactive process (of anticipation, minimising, managing, and mending) that can function in different domains (e.g., Chen et al., 2016; Fletcher & Sarkar, 2016). This conceptualisation is reflected in the Resilience Process Scale to measure and assess these four mechanisms (see Chapter 2 of this thesis). Moreover, the conceptualisation of resilience as a process is particularly significant, as it suggests resilience is a largely malleable construct, and as such is suitable for intervention (Robertson et al., 2015).

Domains of Resilience

Another shortcoming of the resilience literature is that the domains in which resilience functions tend to be ignored. Although some resilience resources and behaviours may be effective in multiple contexts, the existence of an overall resilience ability is unlikely. Resilience is associated with responses to specific situations in both an interpersonal and intrapersonal sense (Estrada et al., 2016; Hayman et al., 2017; Pietrzak & Southwick, 2011). For example, the types of adversity and associated stressors from an office environment (primarily social and cognitive) would likely be very different to those of an elite athlete (primarily physical). Therefore, a domain can be defined as a setting in which one contextual form of adversity (e.g., physical) and associated stress is experienced more than others. This may become more salient in more extreme environments, in which a wide variety of types of adversity and stressor are faced (e.g., Harrison et al., 2021). Chen et al.'s (2016) resilience model does reflect different domains of stress that one can be resilient to (physical stress, emotional stress, & social stress), but the authors do not elaborate on how these domains were determined. These may indeed be key distinct domains to examine, but another significant domain that seems essential to our functioning is resilience to cognitive stress

(e.g., Ringeisen & Raufelder, 2015). An essential expansion to resilience conceptualisations is to theoretically justify why different domains of resilience are significant, these domains can then be investigated in dynamic and adverse environments such as expeditions.

It could be argued that examining a more general domain of resilience can be useful to focus primarily on the mechanisms and indicate how the individual may deal with most situations (e.g., Alliger et al., 2015; Bryan et al., 2016; Windle et al., 2011). However, for the purpose of this PhD, we define a contextual domain as a setting in which certain types of adversity will be experienced more often than others and expand on four of them below. These are in addition to a general domain and allow us to apply and examine resilience to more specific types of adversity such as those faced in sport (e.g., Caine et al., 2016) or expeditions (e.g., Beames, 2005).

First, high resilience tends to be important in dealing with physical illness and pain (e.g., McAllister et al., 2013). In extreme environments, a more resilient person may engage with specific coping strategies when faced with fatigue or hostile climates (e.g., Smith et al., 2017; Smith et al., 2018). However, these strategies won't necessarily be useful for all types of adversities. For instance, one may have the physical resilience to manage pain from an injury but lack the resilience to deal with the negative emotional responses if the injury is long-term (e.g., Caine et al., 2016).

Second, stressors from social adversity can lead to one of the most common and intense forms of stress responses (Wood & Bhatnagar, 2015). If not dealt with, these stressors can lead to mental health issues such as depression (e.g., Aydin et al., 2010; Rajaleid et al., 2015). Social resilience could represent how one deals with this type of adversity. For example, when faced with social stressors such as interpersonal frustrations common on expeditions (Smith et al., 2017; Smith et al., 2018), active coping (using one's resources), as

opposed to passive coping (e.g., withdrawing), tends to increase resilience to their negative effects (e.g., Connor-Smith & Compas, 2002; Wood & Bhatnagar, 2015).

Third, a lack of resilience in a cognitive domain can lead to cognitive overload, high anxiety, burnout, and other mental health issues (e.g., Ćosić et al., 2019; Eysenck et al., 2007; Yaroush & Bourne, 2008). Air traffic control is a context in which high levels of cognitive stress is often experienced. The consequences of not dealing with this stress could be extreme. Promoting higher levels of cognitive resilience could buffer any potential negative effects of stress from this type of adversity (Ćosić et al., 2019; Ringeisen & Raufelder, 2015).

Lastly, emotional resilience can be defined as successfully managing one's emotions in times of stress (Resnick et al., 2011). Experiencing adversity and its associated stress could potentially cause negative emotional reactions that must be navigated, otherwise they can lead to negative mental health outcomes (e.g., Edward & Warelow, 2005; Masten & Tellegen, 2012). Emotional resilience represents strategies around emotional regulation to help appraise and reappraise before, during, and after a stressful event (e.g., Gross, 2002; Schneider et al., 2013).

Developing Resilience and Expeditions Research

One method of developing resilience is through navigating the challenges of a stressful environment and successfully processing and dealing with the adverse experiences such as those faced in extreme environments such as an expedition (e.g., Barrett & Martin, 2014; Meichenbaum & Novaco, 1985). The process of growing from smaller, controllable adversities is known as stress inoculation (Barrett & Martin, 2014; Meichenbaum & Novaco, 1985). Another method develops upon this principle but focuses on building up the individual's coping skills and resources to better navigate and make the most of these adverse experiences (e.g., Gould et al., 1993; De Terte et al., 2009); both of these methods are elaborated upon by Fletcher & Sarkar (2016).

Fletcher and Sarkar (2016) discuss three main interconnected aspects to building resilience: Personal qualities, a facilitative environment, and a challenge mindset. Personal qualities are made of characteristics associated with resilience, such as self-confidence and self-concept (e.g., Rutter, 1985). These qualities can be developed with teachable psychological skills such as attentional control, self/environmental awareness, and mental preparation. Teaching these skills can lead to desirable outcomes such as recognising and using support, as well as effective relationship management. However, Fletcher and Sarkar note that the salience of these qualities depends on both context and individual. For example, an athlete resilient to *physical* stress may utilise different (effective or not) methods to deal with the *emotional* stress associated with competition.

With reference to a *facilitative environment,* research indicates it must involve an optimal amount of challenge and support to overcome it to develop both resilience and psychological well-being (e.g., Frydenberg & Lewis, 1993; Smith et al., 2016). Extreme environments, particularly expeditions have the potential to be facilitative in this context. Extreme environments are traditionally defined as settings that contain extraordinary physical, psychological, and interpersonal demands that require significant adaption. The inherent demands of an expedition can vary depending on the environment and purpose. But typically, expeditions usually have a particular goal (e.g., traversing a difficult environment) that can be for reasons such as scientific or educational benefits (e.g., Smith et al., 2018; Smith et al, 2018). Expeditions teams can often range from 2–15 members, accompanied by an expedition leader with experience of handling such environments, and usually range between a week to several months in length (Outlook Expeditions, 2022; Smith et al., 2018; Smith et al, 2018). Expeditions offer an opportunity to meet and overcome unique physical, emotional, environmental, and mental challenges and stressors (Beames, 2005) with the support of an expedition group and group leader. Despite a common pathogenic view that

extreme environments are usually detrimental to our physical and psychological health due to the task and environmental demands, generally, such experiences lead to positive outcomes (Smith et al., 2016; Smith et al., 2019). These outcomes include an increase in both general resilience and more context-specific resilience such as physical and social resilience resulting from, for example, managing new and dynamic relationships not normally encountered (Stott et al., 2013). Other potential benefits include increased emotional stability, well-being, and positive self-concept (e.g., Mutz & Müller, 2016; Neill & Dias, 2001; Stott et al., 2013).

However, the disparate nature of this research also represents one of several weaknesses of expeditions studies. Studies tend to only examine a particular expedition environment, with small sample sizes, are snapshot in nature, and employ inadequate or only self-report measures to examine psychological changes and relationships (cf. McElligott et al., 2012; Mutz & Müller, 2016; Stott et al., 2013). These weaknesses make such research difficult to generalise. In addition, due to the conceptual issues in measuring resilience (e.g., Estrada et al., 2016; Windle et al., 2011), such problems may result in an incomplete examination of the potential changes to resilience over the course of expeditions, leading to ambiguous findings in these settings (e.g., Neill & Dias, 2001; Skehill, 2001). Adding observer ratings would enhance the reliability of any findings when practical (e.g., Hardy et al., 2014; McDonald, 2008). Furthermore, previous findings may be further skewed by recall bias, as the findings in these studies are often collected some time *after* an expedition (Harrison et al., 2021). Addressing these weaknesses should allow potential psychological changes to resilience and related concepts to be observed across an expedition.

A challenge mindset involves the appraisal of a stressor's demands in relation to one's resources, thoughts, and emotions and is largely influenced by the former two aspects of personal qualities and facilitative environment. Cognitive challenge and threat appraisals are a psychophysiological response to stress, or rather – motivated performance situations which

may frequently occur in expedition environments. A challenge state occurs when personal resources are seen to meet the demands of a situation, and a threat state when they do not (Seery, 2011). Challenge states are more often associated with beneficial outcomes on well-being, positive emotions, and personal growth (Blascovich & Mendes, 2000; Moore et al., 2012). There is a potential reciprocal relationship between challenge states and resilience (Seery, 2011). However, this relationship is generally overlooked by resilience researchers (Fletcher & Sarkar, 2016).

The Present Studies

Based on the current literature, it would be expected that an expedition environment should provide adequate adversity to enhance resilience. This should be demonstrated through the expeditions provided by Outlook Expeditions, whom this research was undertaken in collaboration with. In Study 3, we aimed to explore how the mechanisms and domains of resilience change throughout an expedition. We expected that resilience would not only increase over the course of an expedition but would also correlate with related factors such as well-being. In Study 4, we tested a pilot intervention during expedition training (not while on expedition). We expected that a resilience intervention based on its mechanisms and domains can be easily implemented into training to facilitate resilience pre-expedition. The weekend is expected to increase resilience, and the intervention could further increase this effect.

Study 3: Resilience, Overseas Expeditions, and Related Outcomes

Expeditions are undertaken for a range of reasons with developmental, social, educational, and therapeutic aims and are particularly popular as a method of encouraging personal growth in young adults (Mutz & Müller, 2016). These experiences represent a unique opportunity to overcome unique physical, emotional, environmental, and mental challenges (Beames, 2005), usually by being undertaken within an extreme environment with

a team and expedition leader (e.g., Smith et al., 2018). For example, one may learn to better tolerate physical challenges, such as hunger or pain, or develop social resilience from managing new and dynamic relationships not normally faced (Stott et al., 2013). Further, these environments support and nurture traits associated with the personal qualities of resilience, such as self-sufficiency and self-confidence (e.g., Mutz & Müller, 2016; Neill & Dias, 2001). The benefits of expeditions can be wide-ranging, from a more positive self-concept, resilience, positive approaches to challenges, and self-esteem (e.g., Ewert & Yoshino, 2011; Mutz & Müller, 2016; Neill & Dias, 2001; Stott et al., 2013). Many of these benefits (such as resilience with a positive self-concept) tend to correlate with and likely reciprocate each other (e.g., Bonanno, 2004; Martins & Neto, 2016). However, expeditions studies have several weaknesses, such as only examining one particular expedition environment, employing small sample sizes, and employing inadequate measures (cf. McElligott et al., 2012; Mutz & Müller, 2016; Stott et al., 2013). This may have resulted in an incomplete look at the potential improvements to resilience and related outcomes over the course of expeditions, leading to ambiguous findings in these settings (e.g., Neill & Dias, 2001; Skehill, 2001). In addition, with regards to resilience measures, such an environment provides the opportunity to examine observer ratings of resilience to cross-reference with self-reports (e.g., Hardy et al., 2013). To examine a more complete look at the potential benefits of expeditions, we should also explore other related psychological concepts to resilience, including challenge states, self-concept, and well-being.

Expeditions – Challenge states, Self-Concept, Well-being, and Resilience

Resilience should relate to a challenge mindset and a challenge state approach to adversity. Combined with a facilitative environment such as an expedition, resilience could encourage individuals to see stressors as challenges to overcome rather than threats (cf. Fletcher & Sarkar, 2016). A challenge mindset is related to the appraisal of a stressor's

demands in relation to one's resources, thoughts, and emotions, with similarities to cognitive challenge appraisals. Challenge and threat appraisals are a psychophysiological response to stress, or rather – motivated performance situations which may frequently occur in expedition environments. A challenge state occurs when personal resources are seen to meet the demands of a situation, and a threat state when they do not (Seery, 2011). Challenge states tend to be more beneficial and are associated with higher performance, resilience, self-efficacy, effort, and perceived control (e.g., Rossato et al., 2016; Seery, 2011). Specifically, it seems likely that appraising threats associated with an expedition as a challenge should relate to the pro-active mechanisms of resilience, in which the individual determines they positively evaluate their ability and resources to deal with a threat (such as with appraisal theory; Lazarus, 1991). In addition, challenge states may also be associated with coping tools and resources themselves as appraised by the individual (Seery & Quinton, 2016), so they may be influenced by the manage mechanism. Challenge mindsets may be particularly salient on an expedition, in which a variety of threats may be frequently faced and reflect a positive way in which they can be dealt with. If resilience improves throughout an expedition, a challenge mindset and state would likely also follow.

Self-concept refers to the individual's belief about themselves, including their attributes, competencies, and identity (Baumeister, 1999). Resilience and positive self-concept can be found to correlate with each other, as many aspects of self-concept and associated factors such as self-esteem (e.g., Marsh, 1986) tend to be protective and personal qualities that enhance resilience (e.g., Martins & Neto, 2016). Indeed, a positive self-concept can be a core attribute when combined with adversity to contribute to resilience throughout our lives (Hicks & Conner, 2013). Self-concept and self-esteem have been suggested as a driver of behaviour change throughout adventure experiences that could lead to resilience throughout expeditions (e.g., Hans, 2000; Mutz & Müller, 2016). However, the relationship

between the underpinning mechanisms of self-concept and resilience is generally understudied (and hasn't been examined in relation to resilience mechanisms) and could be explored further if they can indeed influence each other. Specifically, it should be investigated if aspects of self-concept could make up some of the personal qualities associated with the four resilience mechanisms. For example, these findings may provide insights into both concepts with how aspects of self-concept such as problem-solving ability, may relate more to minimising and managing in resilience.

The relationship between resilience and well-being is somewhat ambiguous (Hascher et al., 2021), but some research suggests well-being is a successful outcome of the resilience process (Turner et al., 2017). Expeditions often provide meaningful experiences that could lead to a greater sense of long-term psychological well-being, particularly on reflection of these experiences (Curtin & Brown, 2018). These findings' reflective and reappraisal aspect could entail a stronger relationship between well-being and the more reactive elements of resilience (mend in particular). However, there is also little supporting quantitative evidence that expeditions improve well-being (Barton et al., 2016). An expedition study with our resilience model could clarify well-being as a potential positive outcome and offer further insight into how well-being relates to resilience.

It is expected that an expedition should be challenging across physical, social, cognitive, and emotional domains (e.g., Beames, 2005; Smith et al., 2016). As such, we expected that expeditions could act as a facilitative and challenging environment that will enhance resilience. Specifically, we investigated the extent to which these mechanisms change across time, along with psychological well-being and cognitive appraisals of challenge and threat (e.g., Frydenberg & Lewis, 1993; Moore et al., 2012; Smith et al., 2016; Tull, 2020) between the beginning and end of the expedition. In addition, resilience is

expected to relate to observer ratings of resilience, self-concept (as a collection of protective, personal qualities), well-being, and appraisals of challenge.

Method

Participants

Following institutional ethical approval, we recruited a convenience sample of 35 (M_{age} = 16.8, *SD* = 0.8; *n* = 13 Male, *n* = 22 Female) participants from Outlook Expeditions. These participants comprised of seven different teams, with participants stating their ethnicities as one Asian, three mixed, and 31 White, and their Nationalities as 34 of them British and one Chinese. Data was collected from participants on the day before leaving for expedition, mid-expedition, and post-expedition. Furthermore, to explore the reliability of self-reported resilience scores and to further examine resilience, we recruited 42 teachers (who also attended the expeditions) of the participating students for the purpose of observational ratings. The expeditions ranged from 2 to 4 weeks, and varied greatly in location (e.g., Borneo, Morocco, and Peru) and activity (e.g., jungle trekking, mountaineering, helping build schools in rural villages).

Measures

Resilience.

To examine changes in resilience across the expedition we used The Resilience Process Scale (RPS; see Appendix A and Chapter 2 of this thesis). Each of the 65 items (N.B., the RPS measures the four mechanisms of resilience across five domains) are measured on a.7-point Likert-type scale (1 = *strongly disagree*, 4 = *neither agree nor disagree*, 7 = *strongly agree*). We presented each domain in a random order to reduce order or fatigue effects. This measure was given at all three timepoints.

In addition, we created a brief version of the RPS from the full measure (see Appendix B), with one item used from each subscale across the five domains that were

chosen based on their factor loading and face validity. This includes items such as “They bounce-back easily after a challenge”. Observers used this measure at all three timepoints, and to compare with and add reliability to self-reported resilience (e.g., Hardy et al., 2013; McDonald, 2008).

Challenge and Threat.

We examined challenge mindsets using two items from the cognitive appraisal ratio (Tomaka et al., 1993) which are often used in the challenge and threat literature (e.g., Meijen et al., 2020). Participants were asked in relation to their upcoming expedition “How demanding do you expect the expedition to be?”[2] and “How able are you to cope with the demands of the expedition?” Items were measured on a 6-point Likert scale, with 1 = *not at all* and 6 = *extremely*. Scores were calculated by dividing demands by resources (such that a value greater than 1 indicated a threat state and a value less than 1 indicated a challenge state). This measure was used at Timepoint 1 and Timepoint 2, given that the challenge is effectively ‘complete’ at the end of the expedition at Timepoint 3.

Self-Concept.

We measured the different facets of self-concept using the Self-Description Questionnaire (SDQ; Marsh & O’Neill, 1984). Currently, there are three versions (SDQ I, SDQ II, & SDQ III) of the SDQ, each version has been validated via Confirmatory Factor Analyses (e.g., Gilman et al., 1999; Marsh & O’Neill, 1984), and considered some of the best in self-concept research for their psychometric properties (Hattie, 1992; 1996). However, a limiting factor of the SDQ is the length of the measure at 102 items across its 11 subfactors (e.g., Ellis et al., 2002). This would be a substantial increase in the load on participants in the current study. A short-form version of the SDQ-II (SDQII-S) was developed with 51 items in total (Marsh et al., 2005). Marsh et al. (2005) provided evidence in their study that responses

[2] At Timepoint 2, the wording of this item is changed to “How demanding do you find the expedition?”

were invariant within factor structures compared to the original 102 items. Reliabilities for the subfactors were almost the same as the full version, and consistently high (.80 to .89), and multitrait-multimethod analyses support internal validity responses over time.

Given the context of the current study investigating self-concept across expedition and adverse environments, 8 of the 11 subfactors were considered relevant and meaningful for the study's aims. These were chosen after the study's purpose was presented to three psychologists with expertise in resilience, sport, performance, and exercise psychology who were asked which subfactors would be deemed relevant. We used *General esteem, Physical abilities, Emotional stability, Same-sex relationships, Opposite-sex relationships, Parent relations,* and *General school abilities* from the SDQII-S. The SDQIII additionally contains a *Problem Solving* subfactor of self-concept (e.g., Ellis et al., 2002) that was also considered to be an important subfactor for the current study. However, this subfactor was in full – as opposed to a shortened version as in the SDQII-S. To account for this, the factor loadings of items were examined (Marsh, 1992), and based on the highest factor loadings and face validity of this subfactor, four items were chosen to be included following a similar procedure of item selection as Marsh et al. (2005). This measure was given pre-expedition at Timepoint 1 to examine with resilience scores.

Well-Being.

To examine the individual's overall sense of well-being in a concise manner, we used the WHO-5 (see Appendix C for WHO-5 and the following two measures). The WHO-5 is among the most widely used questionnaires assessing subjective psychological well-being and has been found to have adequate validity in screening for depression and in measuring outcomes in clinical trials (e.g., Topp et al., 2015). Five items are anchored on a 5-point Likert-type scale (5 = *All of the time* to 1 = *At no time*), with the statement "Over the past 2 weeks…" followed by items such as "I have felt cheerful and in good spirits". This measure

was given at all three timepoints. Previous studies report Cronbach's alpha scores from .83 to .92 (e.g., Krieger et al., 2014).

Procedure

Following participant recruitment, on the final day of preparation at Timepoint 1, we gave expedition team members the initial set of measures after ensuring their equipment was present, packed, and secured. This consisted of the RPS, cognitive appraisal ratio, SDQ, and WHO-5. Expedition leaders were given packs containing booklets of questionnaires for participants at Timepoint 2 (RPS, cognitive appraisal ratio, & WHO-5) to give to participants at a convenient time during the mid-point of their expedition. They were then also given a pack of questionnaire booklets for Timepoint 3 (RPS & WHO-5) and instructed to give these to participants at a convenient time during the journey back to the UK at the end of their expedition.

Analysis

We used repeated measures ANOVAs (4 x 3 by mechanism and timepoint) for each domain. This approach was used for both self-reported and observer ratings of resilience. Alongside these analyses we used Bonferroni corrections to follow-up significant effects. Single factor ANOVAs across the three timepoints were used for well-being, and across two timepoints for cognitive appraisals. In addition, for further insight into resilience and its mechanisms, we performed a series of correlational analysis to examine relationships with other outcome variables. These analyses included examining how self and observer reported resilience correlated, and how resilience correlated with cognitive challenge and threat appraisals, self-concept, and well-being (with cognitive appraisals and well-being taken from Timepoint 1 data, allowing an *n* of 82 from Timepoint 1, and 50 at Timepoint 2 that were retained).

Results

Psychological Changes across Expeditions

Resilience.

Table 3.1 shows mean resilience scores and standard deviations across mechanism and domain from Timepoint 1 to 3.[3] Analysis from repeated measures ANOVA showed that in the general domain of resilience (see Figure 3.1), there was a main effect for mechanism F (2.15, 71.07) = 4.50, p = .013, η_p^2 = .120 and timepoint F (2, 66) = 10.23, p < .001, η_p^2 = .227. Further, a timepoint x mechanism interaction was revealed F (4.05, 133.49) = 3.47, p = .010, η_p^2 = .104. Follow-up tests on the interaction demonstrated that manage and mend significantly increased from Timepoint 1 to Timepoint 3 (Manage: M_{diff} = 0.72, t = 5.61, d = 0.757; Mend: M_{diff} = 0.59, t = 4.57, d = 0.826). Manage and mend also increased from Timepoint 2 to Timepoint 3 (Manage: M_{diff} = 0.64, t = 4.98, d = 0.673; Mend: M_{diff} = 0.63, t = 4.88, d = 0.664). No other differences were significant (all p's > .05, all d's < 0.290).

[3] We also examined if expedition length had an impact on the findings (between 14 days, 24 days, 28 days, and 30 days). However, no meaningful differences between exped. length were found with the current data.

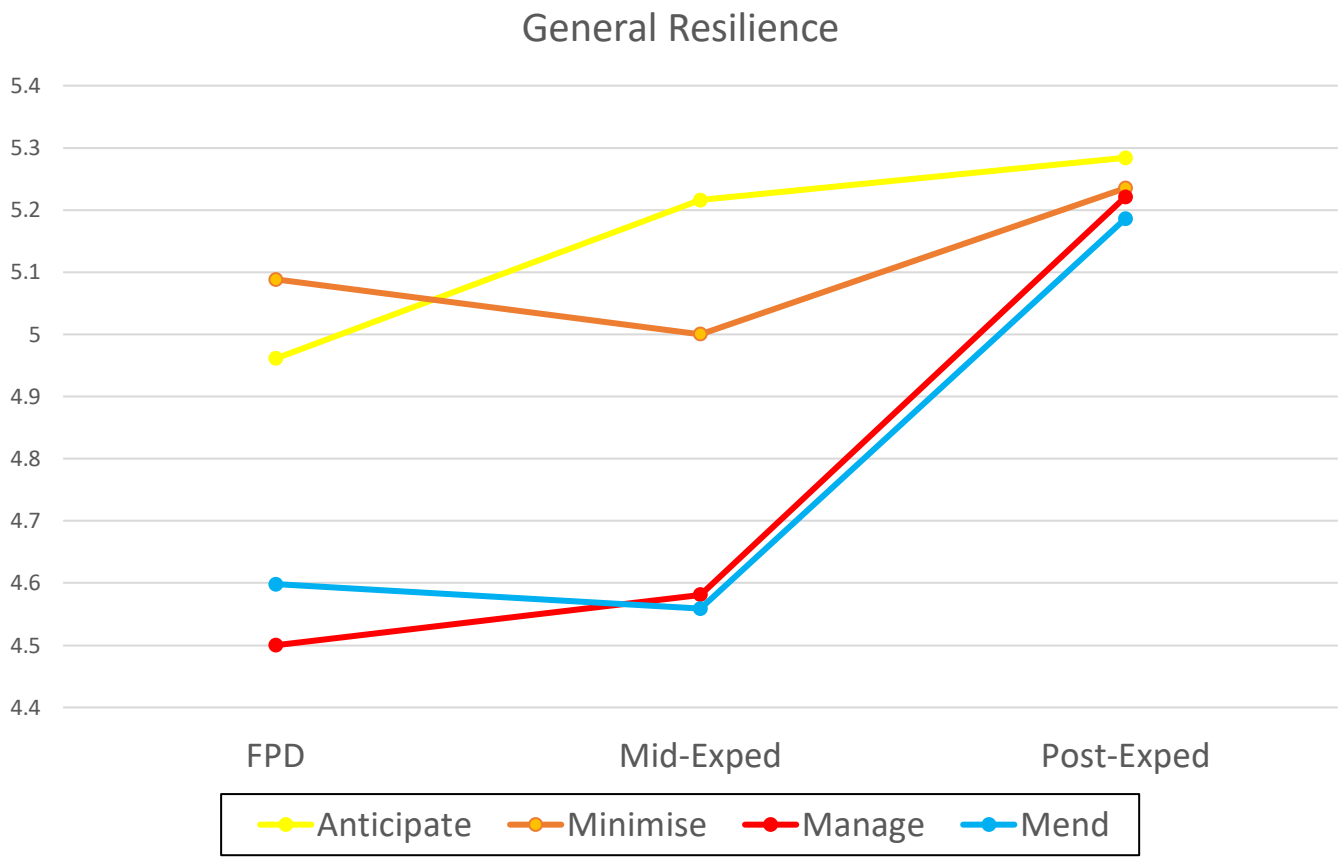
Table 3.1

Study 3 Means (M) and Standard Deviations (SD) of each mechanism within their domains, across the three timepoints

		Anticipate		Minimise		Manage		Mend		Mean	
		M	***(SD)***	***M***	***(SD)***	***M***	***(SD)***	***M***	***(SD)***	***M***	***(SD)***
Timepoint 1	**General**	4.96	(1.20)	5.09	(1.00)	4.50	(0.95)	4.60	(1.03)	4.79	(1.05)
	Physical	4.94	(1.07)	4.87	(0.92)	4.66	(0.96)	4.83	(0.84)	4.83	(0.95)
	Social	5.17	(1.06)	4.70	(1.44)	4.31	(1.12)	4.38	(1.21)	4.64	(1.21)
	Cognitive	5.04	(1.04)	4.88	(1.07)	4.32	(1.09)	4.48	(0.85)	4.68	(1.01)
	Emotional	4.91	(1.04)	4.54	(1.24)	4.13	(1.23)	4.18	(1.20)	4.44	(1.18)
	Mean	5.00	(1.08)	4.82	(1.13)	4.38	(1.07)	4.49	(1.03)	4.67	(1.08)
Timepoint 2	**General**	5.22	(0.98)	5.00	(0.92)	4.58	(0.95)	4.56	(1.04)	4.84	(0.97)
	Physical	5.14	(0.95)	4.78	(1.02)	4.69	(0.99)	4.67	(0.99)	4.82	(0.99)
	Social	5.17	(1.01)	4.55	(1.23)	4.36	(1.16)	4.45	(1.26)	4.63	(1.17)
	Cognitive	5.15	(0.88)	4.87	(1.06)	4.65	(1.12)	4.61	(1.12)	4.82	(1.05)
	Emotional	5.02	(1.05)	4.37	(1.11)	4.10	(1.28)	4.28	(1.44)	4.44	(1.22)
	Mean	5.14	(0.97)	4.71	(1.07)	4.48	(1.10)	4.51	(1.17)	4.71	(1.08)
Timepoint 3	**General**	5.28	(1.00)	5.24	(0.78)	5.22	(0.95)	5.19	(0.84)	5.23	(0.89)
	Physical	5.41	(0.86)	5.28	(0.88)	5.30	(0.82)	5.15	(0.75)	5.28	(0.83)
	Social	5.36	(0.86)	5.08	(0.96)	5.04	(0.94)	5.19	(0.84)	5.17	(0.90)
	Cognitive	5.34	(0.84)	5.24	(1.00)	5.23	(0.90)	5.12	(0.84)	5.23	(0.90)
	Emotional	5.58	(1.02)	5.03	(1.07)	4.90	(1.09)	4.94	(1.16)	5.11	(1.09)
	Mean	5.39	(0.92)	5.17	(0.94)	5.14	(0.94)	5.12	(0.89)	5.21	(0.92)

Figure 3.1

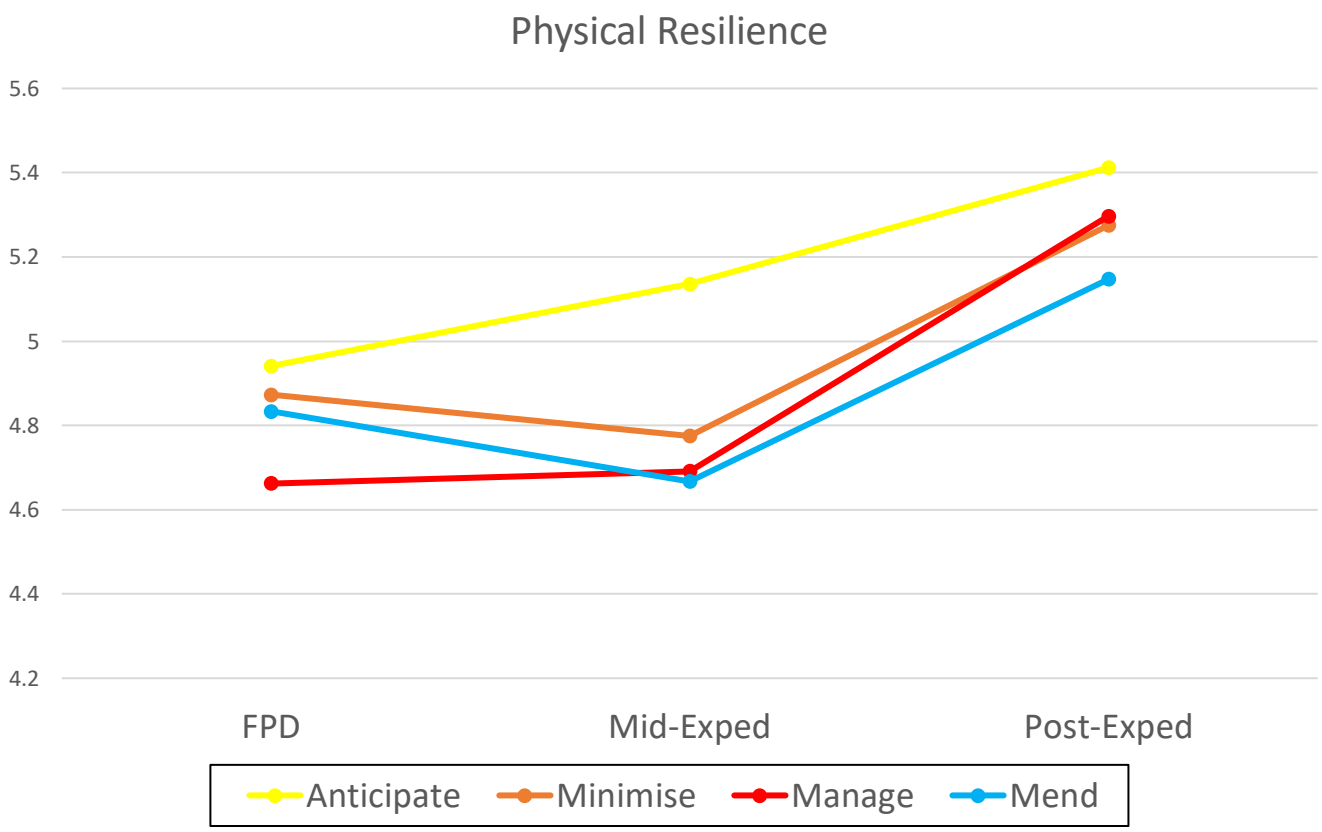
General resilience mean scores across the three timepoints (total n = 34)



For the physical domain (see Figure 3.2), the main effect for mechanism approached significance F (2.51, 82.70) = 2.68, p = .062, η_p^2 = .075 and there was a main effect for timepoint F (2, 66) = 10.62, p > .000, η_p^2 = .243. Interaction effects were non-significant F (4.28, 141.37) = 1.83, p = .122, η_p^2 = .053. Follow-up tests on the timepoint main effect demonstrated that mean physical resilience significantly increased from Timepoint 1 (M = 4.83) to Timepoint 3 (M = 5.28; p = .001; d = 0.518), and Timepoint 2 (M = 4.82) to Timepoint 3 (p < .001; d = 0.510). All other differences were non-significant (all p's > .05, all d's < 0.011).

Figure 3.2

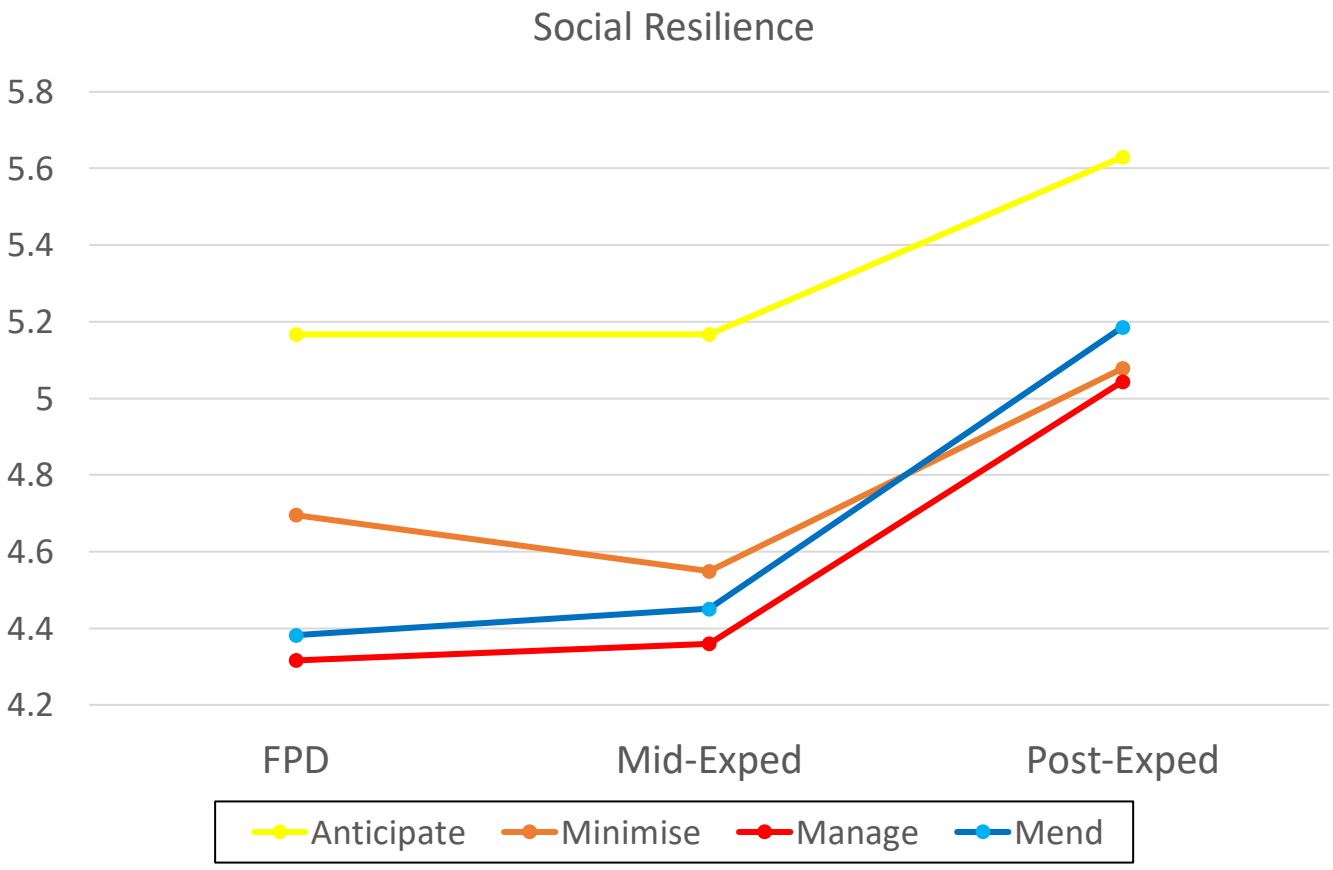
Physical resilience mean scores across the three timepoints (total n = 34)



For the social domain (see Figure 3.3), there were main effects for mechanism F (2.17, 71.62) = 10.73, $p < .001$, $\eta_p^2 = .245$ and timepoint F (2, 66) = 14.11, $p < .001$, $\eta_p^2 = .300$. Further, a timepoint x mechanism interaction was revealed F (4.52, 149.28) = 2.69, $p = .027$, $\eta_p^2 = .075$. Follow-up tests on the interaction demonstrated minimise, manage, and mend all significantly increased from Timepoint 1 to Timepoint 3 (Minimise: $M_{diff} = 0.38$, $t = 2.80$, $d = 0.312$; Manage: $M_{diff} = 0.73$, $t = 5.33$, $d = 0.704$; Mend: $M_{diff} = 0.80$, $t = 5.89$, $d = 0.768$). Minimise, manage, and mend also increased from Timepoint 2 to Timepoint 3 (Minimise: $M_{diff} = 0.53$, $t = 3.88$, $d = 0.480$; Manage: $M_{diff} = 0.68$, $t = 5.01$, $d = 0.648$; Mend: $M_{diff} = .74$, $t = 5.89$, $d = 0.687$). Anticipate did not significantly change across time (all p's > .05, all d's < 0.270).

Figure 3.3

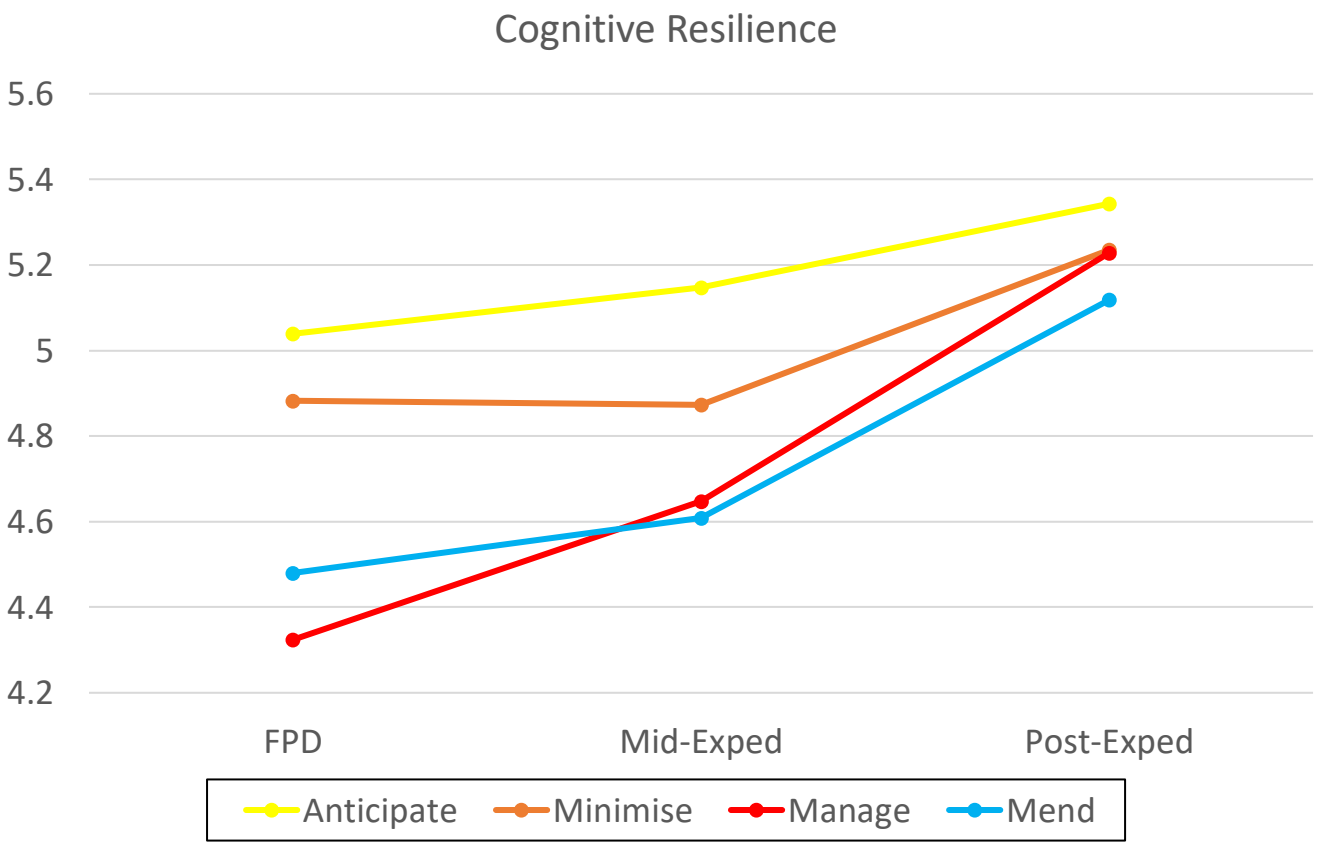
Social resilience mean scores across the three timepoints (total n = 34)



For the cognitive domain (see Figure 3.4), there were main effects for mechanism F (2.37, 78.14) = 6.14, p = .002, η_p^2 = .157 and timepoint F (2, 66) = 12.10, p < .001, η_p^2 = .268. Further, a timepoint x mechanism interaction was revealed F (6, 198) = 2.61, p = .019, η_p^2 = .073. Follow-up tests on the interaction demonstrated that minimise, manage, and mend all significantly increased from Timepoint 1 to Timepoint 3 (Minimise: M_{diff} = 0.35, t = 2.79, d = 0.340; Manage: M_{diff} = 0.90, t = 7.14, d = 0.905; Mend: M_{diff} = 0.64, t = 5.03, d = 0.754). minimise, manage, and mend also significantly increased from Timepoint 2 to Timepoint 3 (Minimise: M_{diff} = 0.36, t = 2.86, d = 0.35; Manage: M_{diff} = 0.58, t = 4.58, d = 0.572; Mend: M_{diff} = 0.51, t = 5.03, d = 0.515). As with the social domain, anticipate did not significantly differ (all p's > .05, all d's < 0.310).

Figure 3.4

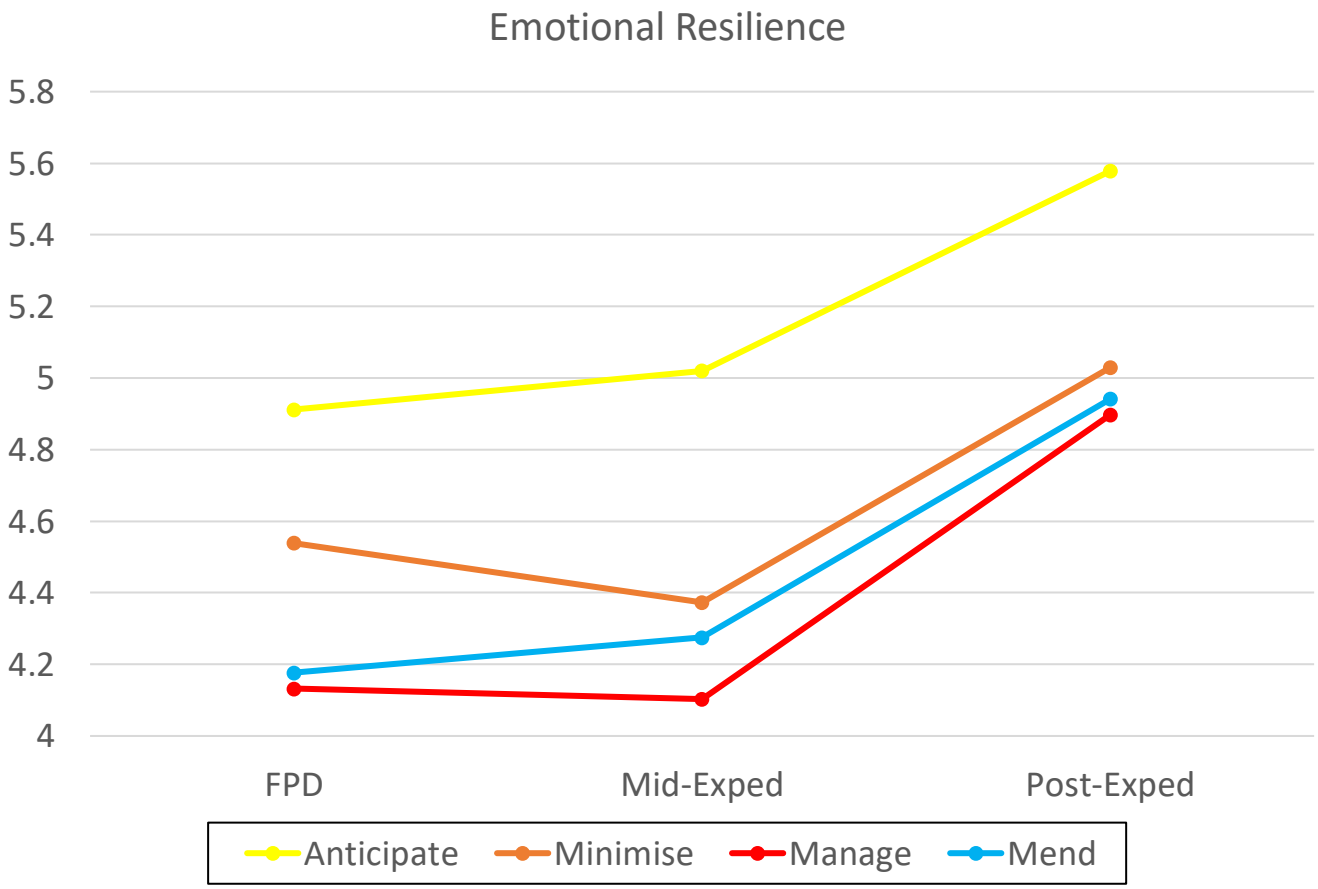
Cognitive resilience mean scores across the three timepoints (total n = 34)



Lastly for the emotional domain (see Figure 3.5), there were main effects for mechanism F (2, 52.16) = 20.16, $p < .001$, $\eta_p^2 = .292$ and timepoint F (2, 66) = 13.61, $p < .001$, $\eta_p^2 = .279$. Interaction effects were non-significant F (4.33, 142,71) = .73, $p = .581$, $\eta_p^2 = .022$. Follow-up tests on the timepoint main effect demonstrated that mean Emotional resilience significantly increased from Timepoint 1 ($M = 4.44$) to Timepoint 3 ($M = 5.11$; $p > .000$; $d = 0.593$), and Timepoint 2 ($M = 4.44$) to Timepoint 3 ($p < .001$; $d = 0.618$). All other differences were non-significant (all p's > .05, all d's < 0.001).

Figure 3.5

Emotional resilience mean scores across the three timepoints (total n = 34)



Overall, across the domains, it can be summarised that self-reported resilience increased over the course of expeditions. Most of these reported increases are from the beginning of expeditions to the end of them. The increases tended to be across most mechanisms, although anticipation tended not to significantly change.

Observer Ratings of Resilience.

There also tended to be some significant changes in observer ratings of resilience (see Table 3.2 for observer ratings). Analysis from repeated measures ANOVA showed that in the general domain of resilience, the main effect for mechanism was non-significant F (1.88, 26.29) = 1.01, p = .374, η_p^2 = .067 and there were main effects for timepoint F(2, 28) = 9.66, p = .001, η_p^2 = .408. Interaction effects were non-significant F (6, 84) = .77, p = .597, η_p^2 = .052. Follow-up tests on the timepoint main effect demonstrated that mean general resilience significantly increased from Timepoint 2 (M = 5.18) to Timepoint 3 (M = 5.74; p = .004; d = 0.692). All other differences were non-significant (all p's > .05, all d's < 0.379).

Table 3.2

Study 3 Means (M) and Standard Deviations (SD) of each observed mechanism within their domains, across the three timepoints

		Anticipate		**Minimise**		**Manage**		**Mend**		**Mean**	
		M	***(SD)***	***M***	***(SD)***	***M***	***(SD)***	***M***	***(SD)***	***M***	***(SD)***
Timepoint 1	**General**	5.53	(0.61)	5.56	(1.03)	5.33	(1.05)	5.53	(0.61)	5.49	(0.83)
	Physical	5.63	(0.61)	5.57	(0.98)	5.27	(1.05)	5.33	(0.82)	5.45	(0.87)
	Social	5.40	(0.60)	5.23	(0.56)	5.23	(0.62)	5.37	(0.48)	5.31	(0.57)
	Cognitive	5.43	(0.50)	5.43	(0.73)	5.40	(0.66)	5.37	(0.72)	5.41	(0.65)
	Emotional	5.53	(0.72)	5.63	(0.61)	5.30	(0.80)	5.57	(0.62)	5.51	(0.69)
	Mean	5.49	(0.64)	5.48	(0.76)	5.30	(0.83)	5.42	(0.70)	5.43	(0.73)
Timepoint 2	**General**	5.23	(0.62)	5.10	(0.95)	5.03	(0.99)	5.33	(0.67)	5.18	(0.81)
	Physical	5.33	(0.75)	5.33	(1.05)	5.23	(1.05)	5.43	(0.92)	5.33	(0.94)
	Social	5.63	(0.58)	5.63	(0.40)	5.57	(0.42)	5.67	(0.49)	5.63	(0.47)
	Cognitive	5.23	(0.62)	5.17	(0.82)	5.10	(0.93)	5.23	(0.73)	5.18	(0.78)
	Emotional	5.43	(0.75)	5.53	(0.72)	5.30	(0.84)	5.43	(0.70)	5.42	(0.75)
	Mean	5.36	(0.75)	5.32	(0.78)	5.14	(0.85)	5.26	(0.79)	5.27	(0.79)
Timepoint 3	**General**	5.80	(0.67)	5.90	(0.87)	5.63	(0.94)	5.63	(0.83)	5.74	(0.83)
	Physical	5.63	(0.77)	5.90	(0.91)	5.50	(0.93)	5.73	(0.80)	5.69	(0.85)
	Social	5.73	(0.68)	5.67	(0.72)	5.50	(0.96)	5.50	(0.96)	5.60	(0.83)
	Cognitive	5.70	(0.80)	5.97	(0.93)	5.60	(0.93)	5.77	(0.90)	5.76	(0.89)
	Emotional	5.83	(0.75)	5.87	(1.04)	5.73	(0.90)	5.83	(0.96)	5.82	(0.91)
	Mean	5.61	(0.82)	5.72	(0.88)	5.51	(0.91)	5.59	(0.91)	5.61	(0.88)

For the physical domain, the main effect for mechanism was non-significant F (3, 42) = 2.03, p = .124, η_p^2 = .127 and there was a main effect for timepoint F (2, 28) = 3.64, p = .039, η_p^2 = .206. Interaction effects were non-significant F (2.99, 41.89) = 1.23, p = .311, η_p^2 = .081. Follow-up tests on the timepoint main effect demonstrated that mean physical resilience significantly increased from Timepoint 2 (M = 5.33) to Timepoint 3 (M = 5.69; p = .028; d = 0.399). All other differences were non-significant (all p's > .05, all d's < 0.280).

For the social domain, the main effect for mechanism was non-significant F (3, 42) = 1.33, p = .279, η_p^2 = .087 and the main effect of timepoint approached significance F (2, 28) = 3.26, p = .054, η_p^2 = .189. Interaction effects were non-significant F (6, 84) = .966, p = .453, η_p^2 = .065. Follow-up tests on the timepoint main effect demonstrated that mean social resilience significantly increased from Timepoint 1 (M = 5.31) to Timepoint 2 (M = 5.63; p = .024; d = 0.609). All other differences were non-significant (all p's > .05, all d's < 0.408).

For the cognitive domain, there was a main effect for timepoint F (2, 28) = 6.18, p = .006, η_p^2 = .306 and the main effect for mechanism was non-significant F (3, 42) = 1.11, p = .357, η_p^2 = .073. Interaction effects were non-significant F (3.36, 47) = 1.52, p = .219, η_p^2 = .098. Follow-up tests on the timepoint main effect demonstrated that mean cognitive resilience significantly increased from Timepoint 2 (M = 5.18) to Timepoint 3 (M = 5.76; p = .027; d = .688). All other differences were non-significant (all p's > .05, all d's < 0.321).

For the emotional domain, there was a main effect for mechanism F (3, 42) = 2.94, p = .044, η_p^2 = .174 and timepoint F (2, 28) = 5.39, p = .010, η_p^2 = .278. Interaction effects were non-significant F (6, 84) = .331, p = .919, η_p^2 = .278. Follow-up tests on the mechanism main effect did not reveal any significant differences (all p's > .05, all d's < 0.286). Follow-up tests on the timepoint main effect demonstrated that emotional resilience significantly increased from Timepoint 2 (M = 5.43) to Timepoint 3 (M = 5.82; p = .023; d = 0.469). All other differences were non-significant (all p's > .05, all d's < 0.384).

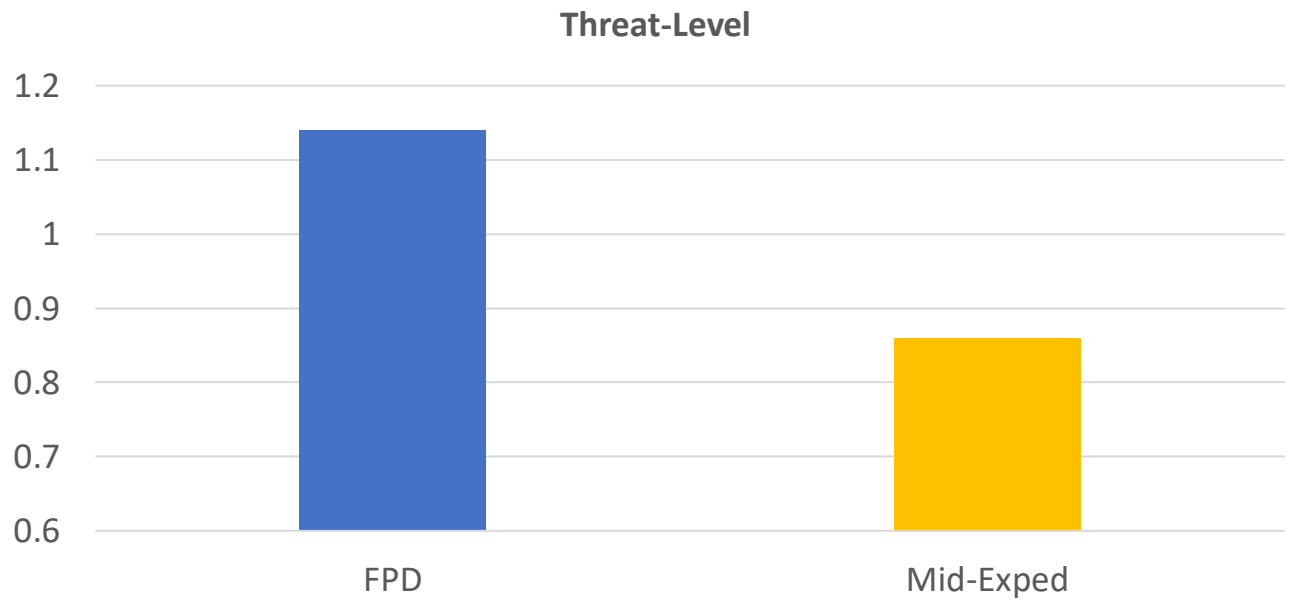
Overall, across the domains, it can be summarised that observer-reported resilience did not increase to the same extent as self-reported. However, there were increases from Timepoint 2 to 3 (perhaps from observers re-assessing their initial thoughts on their students' resilience at Timepoint 2), but there were a few resilience domains that increased across the domains from Timepoint 1 to 3.

Cognitive Appraisals.

For cognitive appraisals (see Figure 3.6) analysis from a repeated measures ANOVA revealed there was a main effect of timepoint F (1, 49) = 22.05, $p < .001$, $\eta_p^2 = .310$, demonstrating a decrease in viewing stressors as threats, and an increase in viewing them as a challenge from Timepoint 1 at the beginning of their expedition (M = 1.14; SD = 0.37) to Timepoint 2 to during the expedition (M = 0.86; SD = 0.29; $p < .001$; d = 0.825). This finding could reflect challenge states becoming more frequent as the expedition progressed, with participants perceiving their resources and coping abilities as better, and the stressors becoming less overwhelming over the course of the expedition.

Figure 3.6

Challenge/threat mean scores across the two timepoints (total n = 50)

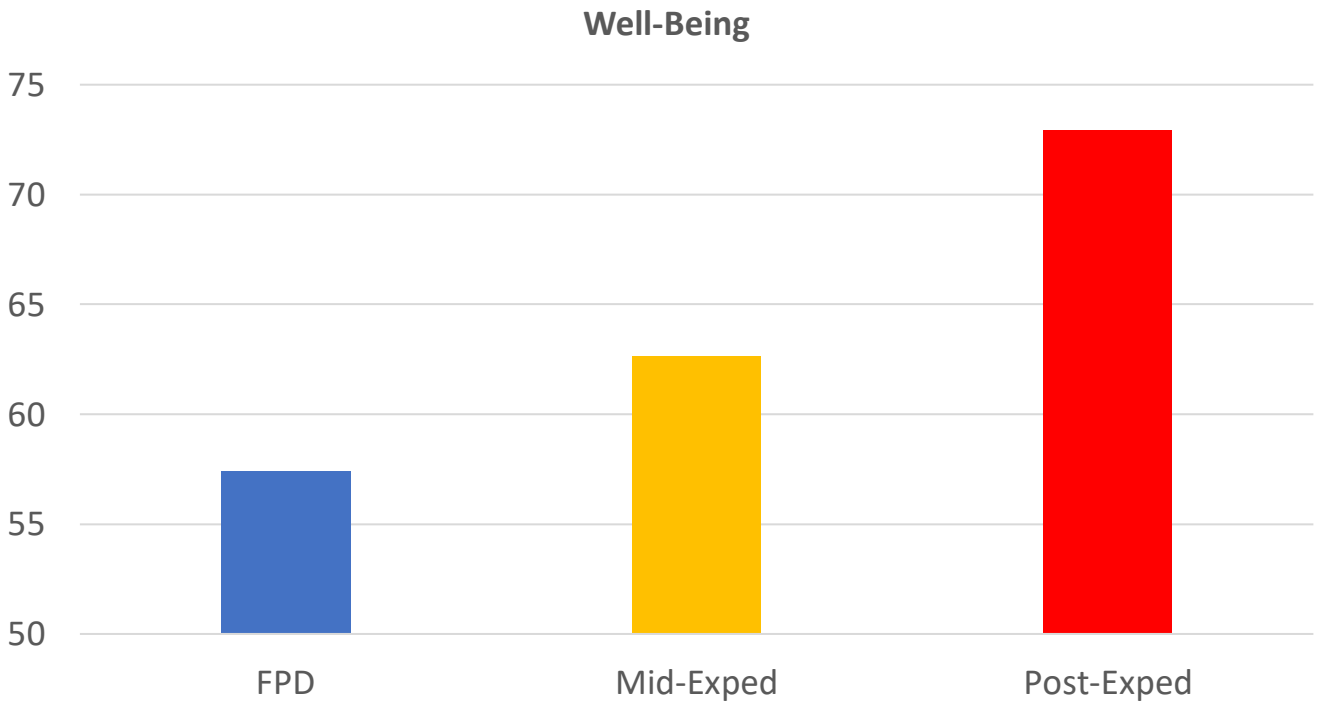


Well-Being.

Analysis also revealed a significant change in well-being across timepoints (see Figure 3.6) F (2, 68) = 25.05, $p < .001$, $\eta_p^2 = .424$. More specifically, well-being increased from Timepoint 1 (M = 57.37; SD = 3.65) to Timepoint 3 (M = 72.91; SD = 2.45; $p < .001$; d = 1.177), and Timepoint 2 (M = 62.63; SD = 2.92) to Timepoint 3 ($p < .001$; d = 0.881). All other differences were non-significant (all p's > .05, all d's < 0.398).

Figure 3.7

Well-being mean scores across the three timepoints (total n = 35)



Correlations with Resilience

Observed and Self-Reported Resilience.

Correlational analysis from Timepoint 1 demonstrated positive relationships between observer and self-reported mechanisms of resilience in the general domain for minimise (r = .29; p = .031) and manage (r = .36; p = .006), in the physical domain for manage (r = .40; p =

.002) and mend (r = .45; p = .001), and in the emotional domain for anticipate (r = .29; p = .037).

Relationships between Resilience, Self-Concept, Cognitive Appraisals, and Well-Being.

Table 3.3 shows the relationships between variables. Correlational analysis during Timepoint 1 demonstrated that resilience domains and mechanisms related to many self-concept subscales (see Appendix D for other domains and mechanisms). Within the general domain, minimise had a positive relationship with *self-esteem* (r = .25; p = .025) and *problem solving* (r = .36; p = .001). Manage similarly related to *self-esteem* (r = .32; p = .004), *parental relations* (r = .29; p = .009), *physical ability* (r = .25; p = .025), and *problem solving* (r = .34; p = .002). Mend positively related to *self-esteem* (r = .33; p = .003), *same-sex relations* (r = .23; p = .044), *parental relations* (r = .25; p = .023), and *problem solving* (r = .23; p = .037).

Table 3.3

Study 3 SDQ correlations with general resilience

	General			
	Anticipate	Minimise	Manage	Mend
Self-Esteem	0.07	0.25*	0.32**	0.33**
Emotional Stability	0.02	-0.12	0.03	0.12
Same-Sex Relations	0.06	-0.06	0.05	0.23*
Opp-Sex Relations	-0.06	-0.06	0.05	0.16
Parent Relations	0.01	0.03	0.29**	0.25*
Physical Ability	0.20	0.15	.25*	0.19
Gen School Ability	-0.03	0.16	0.21	0.21
Problem Solving	0.16	0.36**	0.34**	0.23*

Note. $p < .05$; $p < .01$***

Further correlation analysis demonstrated that for cognitive appraisals at Timepoint 1, a threat state was significantly negatively related only to general manage (r = -.26; p = .019), suggesting that a higher perception of the ability to manage general stressors was associated with challenge states.

Lastly, correlation analysis during Timepoint 1 demonstrated various relationships between resilience and well-being. Within the general domain, manage and mend related to well-being (r = .44; p < .001; r = .30; p = .006, respectively). The physical domain was the same with manage and mend to well-being (r = .40; p < .001; r = .26; p = .020, respectively), as did the social domain (r = .52; p < .001; r = .45; p < .001, respectively). Within the cognitive domain, minimise, manage, and mend all positively related to well-being (r = .29; p = .010; r = .48; p < .001; r = .45; p < .001, respectively). This finding was similar to the emotional domain, with minimise, manage, and mend positively relating to well-being (r = .25; p = .029; r = .52; p < .001 r = .45; p < .001, respectively).

Discussion

Psychological Changes across Expeditions

In the present study, we hypothesised that expeditions provide a facilitative environment to adequately enhance the domains and mechanisms of resilience. The findings support this hypothesis, with increases in resilience in the general domain and the four other respective domains across most mechanisms These findings suggest expedition environments provide contexts to successfully deal with these unique stressors (e.g., Beames, 2005; McElligott et al., 2012); but are generally not so overwhelming as to be detrimental to mental health and resilience (cf. Crane & Searle, 2016; Fletcher & Sarkar, 2016). One mechanism that tended not to improve as the others did was anticipation, which started considerably higher than the other mechanisms. This may have been more of a reflection of the preparations and information given on what to expect they would face on the expedition,

given that the stressors would likely be novel to them (e.g., Yoshino, 2008). Beyond simply dealing with these stressors, the positive influence on the resilience mechanisms suggests growth, further exemplified by improvements in cognitive appraisals and well-being, as was also expected (e.g., Ewert & Yoshino, 2011; Mutz & Müller, 2016; Neill & Dias, 2001; Stott et al., 2013).

Resilience and Related Variables

It was also hypothesised that self-reported resilience would positively relate to observer ratings, however, only some correlations were found. Although this may highlight issues of self-report accuracy, particularly with regards to socially desirable constructs (e.g., Barton et al., 2016), it may also be due to other factors. Respondents may be more motivated and identify with questions in ways that observers do not (Paulhus & Vazire, 2007). It could also be argued that observers, in this case, the participants' teachers, simply did not know their students intimately enough in each of the resilience domains. This latter point was confirmed in post-study informal discussions with the teachers, many of whom said they gave the best guess that they could but did not know *all* the students under study well enough to be fully confident in their ratings. In the absence of an observer who may know the participant more intimately, using more than one observer may present a more reliable solution if practical, as well as researchers considering that a more accurate measure of resilience may be somewhere between the self-reports and observer reports.

As predicted, many aspects of the Self-Description Questionnaire were positively related to resilience, such as self-esteem and problem-solving ability. Self-esteem tends to remain higher during stressful events in those with higher resilience (Balgiu, 2017) and thus may have been a positive influence on resilience throughout the expedition. In turn, aspects of self-concept such as those surrounding social relationships, can act as antecedents and resources that further promote resilience (e.g., Ozbay et al., 2007).

Appraisals of threat negatively related only to the manage mechanism within the general domain. Given that the instruction in the cognitive appraisal measure was on perceived ability to deal with the upcoming expedition, in which the adversities faced would likely be novel and unknown (e.g., Yoshino, 2008), this finding is not entirely unexpected. A more accurate examination of challenge and threat may be to look at specific tasks and issues faced during the expeditions. Additionally, more comprehensive measures than the 2-item cognitive appraisal ratio could be used alongside physiological measures of challenge and threat, which may also provide more valid and reliable results (e.g., Uphill et al., 2019) to examine alongside resilience.

Well-being was positively related to many aspects of resilience, including minimise, manage, and mend. This could be expected, as more active coping styles tend to be associated with positive well-being (McFadden et al., 2021). Generally, high resilience can act as a protective factor during adversity (e.g., Fisk & Dionisi, 2010; Masten & Tellegen, 2012; Sanders et al., 2015), leading to increased well-being and successful coping.

Limitations and Future Research

There were several limitations of the present study that should be considered (as also discussed in the preface). A matched control group would have enhanced the validity and applicability of the expedition findings. Although there do appear to be increases in the measured variables across expeditions, these changes could be influenced by factors such as maturation effects (e.g., Gooding et al., 2011; Oliver et al., 2006; Senior et al., 2020), which future researchers should aim to address. Further, it should be considered that appraisals from threat to challenge may also have been influenced by the reduction in the novelty and unknown elements of the challenges and stressors being faced (e.g., Yoshino, 2008) rather than an increase in resources and coping to deal with perceived threats. Therefore, the findings from this study should be viewed with caution.

Another limitation to acknowledge in the current study is the short span in which measurements were made at the end of the expedition. It was logistically challenging to extend the timepoints beyond the expedition and retain the participants due to the student age of participants, as many were finishing their final school year. In the contemporary literature, there is some debate about the extent to which the benefits of expeditions remain over time. Some researchers contend that expeditions still produce long-term benefits (Stott et al., 2013), Sayer (2011) suggests these benefits could slowly change into the future as a trigger and not entirely immediate at all. However, it is possible that immediately after such an experience, participants experience post-group euphoria, inflating scores on self-report scales (e.g., Daniel, 2007; Furman & Sibthorp, 2014; Hattie et al., 1997; Scrutton & Beames, 2015). Regardless, it would provide further insights for future researchers to examine the longer-term changes to factors such as resilience and self-concept after an expedition (or similar experience).

To conclude, the aim of this study was to examine and demonstrate the positive psychological changes to resilience and related factors across varying expedition experiences in young adults. Further, the many ways in which resilience domains and mechanisms could correlate with related factors of self-concept, challenge appraisals, and well-being. Along with addressing the previously mentioned and acknowledged limitations of the study, future researchers could also examine different or more heterogeneous samples or how to help train and prepare young, relative inexperienced adults' resilience for such a challenge. An intervention could not only help protect the individuals from psychological risk but potentially further enhance the benefits such as those demonstrated in this study.

Study 4: Resilience Training and Intervention

While Study 3 examined the potential psychological benefits of expeditions as a facilitative environment to resilience, the aim of the present study was to apply our resilience

model to an intervention pilot to try and aid the training process prior to participants' expeditions.

Resilience Interventions and Adversity Training

The facilitative environment itself should be considered when designing an intervention. This can then be followed by teaching an array of evidence-based coping techniques that could enhance resilience mechanisms by improving the personal qualities and challenge mindset and internal and external influences on resilience (e.g., Fletcher & Sarkar, 2016; De Terte et al., 2009). It is the basic premise that some forms of stress and adversity can enhance resilience, but too much can result in negative outcomes such as burnout (Barrett & Martin, 2014). An optimal amount of arousal and stress can lead us to perform better and lead to longer-term benefits such as resilience. The process of growing from smaller, controllable adversities is known as stress inoculation (Barrett & Martin, 2014; Meichenbaum & Novaco, 1985). With regards to interventions, an effective way to simulate adversity is through reward and punishment stimuli.

Despite their potential benefits, exposure to punishment stimuli is generally underused for fear of potential negative emotional and motivational consequences. (e.g., Ávila & Torrubia, 2008; Bell et al., 2013; Hardy et al., 1996; Seifried, 2008). But in contexts such as sport, it could be argued that without these stimuli, athletes are not prepared to deal with the threats they will face on a regular basis (Seifried, 2008). Further, sensitivity to punishment can more likely be related to good performance in a threatening environment (e.g., Corr, 2004) and promotes environmental mastery, which can have a reciprocal relationship with self-esteem and resilience (e.g., Monpetit & Tiberio, 2016). In addition, creating an intervention around the sensitivity and threat of punishment has been linked to detecting, processing, and learning from aversive and potentially dangerous cues in the environment (Ávila & Torrubia, 2008), with obvious utility to expedition environments and

links to the resilience mechanisms. Promoting earlier detection of threats and inhibitory control, would also allow more time and opportunity to implement effective coping strategies (e.g., Fenz & Jones, 1972).

One way this general premise can be understood is systematic desensitisation training (Wolpe, 1958), generally used for phobias and anxiety – the latter occurring with the repeated threat of punishment (e.g., Deffenbacher & Suinn, 1988). Similar to what was previously discussed with the supportive elements of resilience training frameworks, the individual is trained in coping and relaxation techniques and then gradually exposed to punishment stimuli. This principle is also in many ways, analogous to simulation training (cf. Hardy et al., 1996). Simulation training with athletes involves physical practice but with the presence of simulated competition stressors (Hardy et al., 1996). Research also suggests this approach can prevent adverse performance reactions in high anxiety situations (e.g., Oudejans & Pijpers, 2010).

With regards to the current context, there are a multitude of methods one could implement into training to simulate the physically, socially, cognitively, and emotionally threatening environment of an expedition to help train participants. One method of simulating a more punishing training climate would be limiting coping methods that would not be able to be used in the real performance environment. Within the current study, an example of this would be phone and social media usage, which can be used as a useful coping tool in extreme environments *when* able to be used (Smith et al., 2017); along with both too much use *and* too little usage causing social and emotional issues (Magner, 2018). Another method would be creating tasks that can simulate the pressured environment being faced (e.g., Ávila & Torrubia, 2008; Bell et al., 2013; Hardy et al., 1996). |This method could include tasks such as putting up a tent as a team while deprived of eyesight, under the guidance of a leader (who can only verbally instruct). This could also include using competition with others and

punishment for poor performance (Hardy et al., 2007), such as taking too long or not listening to the leader. Such a task would potentially tap into their physical (fatigue & sensory deprivation), social (teamwork & leadership), cognitive (problem-solving & attention control), and emotional (anxiety & embarrassment) resilience. This task also tests participants in a way relevant to the expedition – as for example, putting up a tent in the dark could become a very real risk and threat.

Coping Strategies

Improving resilience involves the use of various personal resources as well as a challenging but supportive environment (Fletcher & Sarkar, 2016; De Terte et al., 2009; Reivich et al., 2011; Griffith & West, 2013; Smith et al., 2016). Many of these personal qualities, skills, and coping techniques are teachable, and can potentially enhance the resilience mechanisms for an adverse environment. However, many resilience intervention studies do not have a strong theoretical foundation in resilience upon which to build (cf. Fletcher & Sarkar, 2016).

Contrastingly, some studies provide a theoretical foundation but without providing suggested strategies to implement a conceptual plan. For example, De Terte et al.'s (2009) framework for building resilience is developed from Cognitive Behavioural Therapy (CBT) and describes internal factors and influences on resilience, as well as external. Internal factors include cognitions such as cognitive distortions (Beck 1995), emotions, behaviours (helpful or unhelpful), and physical sensations. External factors include the environment, underpinned by support from a community and significant others. Although this model provides a guideline for understanding resilience, as the authors themselves suggest, it would need to be built upon to demonstrate usable strategies based on it.

One method to improve the personal qualities and internal factors influencing resilience is teaching and equipping participants with effective coping strategies (Gould et al.,

1993). These coping strategies can generally be conceived as problem-focused or emotion-focused (Lazarus & Folkman, 1984). Problem-focused coping is generally aimed at resolving a stressor directly if it's controllable. Emotion-focused coping is dealing with the effect it has on the person themselves (especially if the stressor is not controllable), such as a relaxation strategy (Carmody & Baer, 2008), seeking support (Blackadder-Weinstein et al., 2019), and attempting to reappraise and see silver-linings of the situation (Jackson & Watkin, 2004; Koster & Hoorelbeke, 2015; MacLeod & Mathews, 2012; Seligman et al., 2005). In environments such as expeditions and with individual differences in mind, the controllable nature of the stressors can vary, along with what type of coping might work best for certain individuals, therefore both types of coping techniques should be nurtured (Bonanno & Burton, 2013; Kjaergaard et al., 2015). While applied intervention studies using these techniques may work for their particular setting, such as sport (Fletcher & Sarkar, 2016), in dynamic environments such as expeditions, it is unlikely that any single coping technique works for every individual (e.g., Hardy et al., 1996). Therefore, it is important to have an evidence and theory-based intervention that can provide and develop a multitude of strategies within a psychological toolbox. Different individuals can use and apply to fit both the situation and their personal preferences or need to promote more salutogenic experiences from expeditions (e.g., Frydenberg & Lewis, 1993; Grant & Kinman, 2015; Palinkas & Suedfeld, 2008).

The aim of the current study was to examine the benefits of a training weekend for participants going on an expedition. However, the main focus was to develop and pilot test a resilience intervention training program. The aim of this training was to add adversity-based tasks to test the physical, social, cognitive, and emotional domains of resilience, along with teaching coping strategies to promote the ability to anticipate, minimise, manage, and mend. It was predicted that a training weekend should act as a facilitative environment that can

develop resilience, but it was also expected that adding the resilience intervention should enhance resilience even further. The specific strategies and tasks for this intervention are specified below in the Method section.

Method

Participants

Following institutional ethical approval, we recruited a convenience sample of 16 sixth-form students (M_{age} = 17.0, *SD* = 1.1; *n* = 16 Female) from Outlook Expeditions (*n* = 6 in an intervention group; *n* = 10 in a non-intervention group). Participants were from the same school but split into two different teams, and stated their ethnicity as one mixed, five White, and 10 preferred not to say, and stated their Nationalities as six of them British and 10 preferred not to say. The non-intervention group still took part in the normal camping and training weekend activities such as hiking, tent setup and cooking and still completed the measures at the same time as the intervention group, but without the adversity training and coping strategies discussed later in this method section. In addition, we recruited two teachers for the respective classes for observer ratings. All were already engaged in a camping weekend as part of normal preparations approximately four months prior to their expedition.

Measures

In line with Study 3, we used the five domains of the Resilience Process Scale (RPS), with each domain presented in random order. This measure was given at the beginning of the intervention and at the end. In addition, the brief version of the RPS was used for observers at the beginning and at the end of the intervention.

During one of the tasks (a progressive muscular relaxation technique, see Intervention section below), participants were asked to rate their worriedness of thoughts (cognitive anxiety) and tenseness of body (somatic anxiety) before and after practising the technique on

a Likert-type scale (1 = *calm/relaxed*, 11 = *worried/tense*) taken from the Mental Readiness Form (MRF; Krane, 1994; see PMR section of Appendix E).

Intervention

Adversity tasks.

A task called *witch hunt* was used to test social and emotional resilience, with a dietary consequence for failure (eating only plain rice for the evening). This task involves secretly nominating a "witch" in the team. The team is then asked to group/pair up, with the goal of avoiding having a witch in their group, with the witches' goal to successfully infiltrate a group using any means of deception they deemed fit within a time limit. At the end, it is revealed there were no witches, with the team debriefed on how they can miscommunicate under stress. The next task used was the *blindfold tent*. This this task focused on challenging participants in all domains of resilience. In groups of 3-4, a team leader verbally instructed blindfolded group members to put up their tent. They were given 10 minutes to complete the task and for every 1 minute taken after this timeframe, they lost £1 from a £10 prize as a punishment stimulus.

While not a specific task per se, a phone ban was planned to add an extra social and emotional pressure during the intervention (e.g., Magner, 2018). Phone usage would be heavily limited on an expedition, so the intention was to acclimatise participants to stressors such as social isolation and limiting their use of a phone as a coping tool.

Coping strategies.

The structure of the intervention plan can be separated into adversity-based tasks and coping-strategy tasks (see Appendix E for contents of the exercise booklet given to participants). Coping strategy tasks were focused on resilience mechanisms, and first was a thought regulation task. This task is based upon work by Beck (1963; 1995) and Burns (1980), who proposed that instances of depressive and anxious thinking can be linked

cognitive distortions. Used within cognitive behavioural therapy, these distortions include common unhelpful thinking styles such as overgeneralising and black and white thinking. Encouraging the challenging of these thinking styles has been a strategy employed in resilience interventions throughout the literature (Jackson & Watkin, 2004; Koster & Hoorelbeke, 2015; MacLeod & Mathews, 2012). By challenging these thoughts (e.g., via thought records), individuals can better anticipate, plan for (minimise), and manage how they may think during specific adverse situations after putting them into perspective – dependent on the individual to which distortion they may employ (Burns 1980; Jackson & Watkin, 2004).

Moving towards methods other than cognition management, participants were taught Progressive Muscular Relaxation (PMR). This approach focuses and redirects attention from external thoughts to the different areas of your body, for relaxation and relief from the physical symptoms of stress (e.g., Robb, 2000). Research indicates that these techniques are linked to greater well-being and increased resilience (Carmody & Baer, 2008), reducing stress, anxiety, and aiding sleep (e.g., Hernández-Ruiz, 2005; Robb, 2000). With this strategy in mind, participants can potentially plan to use this technique (minimise) to handle stress and anxiety during adversity (manage; Jackson & Watkin, 2004), and then to recover from tense thoughts and body to face new stressors (mend).

The last strategies used were a what-if scenario exercise followed by a debrief. In many ways, such a strategy brings together the above-mentioned methods and encourages the pro-active planning of their use (anticipate & minimise). It encourages the sustaining of learned techniques by preparing the application of them (e.g., Griffith & West, 2013; Reivich et al., 2011) for expected and unexpected events. Participants lay out a plan of what could affect them, and how they will address it. An example could be feeling homesick on expedition, resulting in certain unhelpful thinking styles and negative emotions, so they plan

to deal with it with a few control measures such as seeking out a nearby friend to speak to. This process also allows participants to actively experiment with their coping techniques to find what works for them.

Procedure

As the teams arrived at the campsite, students, teachers, and expedition leaders were re-introduced to the researcher and the intervention plan, which was also re-examined to ensure it would fit into camping weekend's regular schedule. Participants were given two booklets, one containing instructions and information pertaining to the tasks and exercises (without giving away some of the necessary details; this booklet was not given to the control group; see Appendix E), the other containing the questionnaires to complete. At this point, participants and teachers completed the first set of questionnaires after a brief discussion about what resilience is, before setting up their tents to sleep. Teachers were also reminded to implement a phone ban over the weekend for the experimental group.

The next morning, teams underwent a hike in the surrounding areas as part of their normal training weekend until the early evening. For the experimental group, one of the adversity tasks was then introduced (*witch hunt*), followed by the first of the coping strategy exercises (*thought regulation*). Teams were then given a short break before the next adversity task (*blindfold tent*) followed by their regular evening meal. Following this, they were taught the next coping strategy exercise (*Progressive Muscular Relaxation*) with the MRF measure given before and after PMR. The next morning after breakfast, the last two coping strategy exercises were introduced (*what-if* & *social support debrief*). Participants and leaders were then thanked for their time and asked for feedback, before heading home.

Analysis

We used mixed-model ANOVAs (4 x 2 x 2 by mechanism, timepoint, and group)[4] for each domain. This approach was used for both self-reported and observer ratings of resilience. Alongside these analyses we used Bonferroni corrections to follow-up significant effects. A 2 x 2 ANOVA (anxiety type x timepoint) was also used to examine changes in anxiety before and after the relaxation technique.

It is noteworthy that some students included comments regarding their perceptions of techniques/experiences of the weekend and intervention. We recognise that these comments have not been subjected to a rigorous qualitative analytical approach, however, due to the pilot nature of the study, when presented in combination with the quantitative findings we believe they add value as a supplement.

Results

Psychological Changes over the Training Weekend

Resilience.

Analysis from mixed-model ANOVA showed that in the general domain of resilience (see Table 4.1), the main effect for timepoint approached significance F (1, 14) = 4.42, p = .054, η_p^2 = .240. No other main effects or interactions were significant (all p's > .05, all η_p^2's < .081). Follow-up tests on the timepoint main effect demonstrated an increase in mean general resilience from Timepoint 1 (M = 5.05) to Timepoint 2 (M = 5.36, p = .054, η_p^2 = .240).

For the physical domain, there was a main effect for timepoint F (1, 14) = 13.32, p = .003, η_p^2 = .499. Further, a timepoint x group interaction was revealed F (1, 13) = 4.81, p .047, η_p^2 = .270. No other main effects or interactions were significant (all p's > .05, all η_p^2's

[4] While we are aware the sample size would make such an analysis under-powered we used this method for the sake of learning and the exploratory nature of pilot testing.

< .271). Follow-up tests on the interaction between timepoint and group demonstrated that the non-intervention group significantly increased from Timepoint 1 (M = 4.91, SE = 0.29) to Timepoint 2 (M = 5.58, SE = 0.31, d = 0.580) and the intervention group only marginally increased from Timepoint 1 (M = 5.02, SE = 0.35) to Timepoint 2 (M = 5.18, SE = 0.39, d = 0.178).

For the social domain, there was a main effect for mechanism F (2.11, 27.55) = 3.62, p = .021, η_p^2 = .218 and timepoint F (1, 13) = 9.08, p = .010, η_p^2 = .411 and mechanism F (2.11, 27.55) = 3.62, p = .021, η_p^2 = .218. No other main effects or interactions were significant (all p's > .05, all η_p^2's < .147). Follow-up tests on the mechanism main effect demonstrated that the difference between anticipate (M = 5.44, SE = 0.25) and minimise (M = 4.78, SE = 0.37) approached significance (p = .067, d = 0.583). Follow-up tests on the timepoint main effect demonstrated that mean social resilience significantly increased from Timepoint 1 (M = 4.64) to Timepoint 2 (M = 5.32, p = .010, η_p^2 = .411).

For the cognitive domain, there was a main effect of timepoint F (1, 14) = 12.01, p = .004, η_p^2 = .462. No other main effects or interactions were significant (all p's > .05, all η_p^2's < .151) Follow-up tests demonstrated that mean cognitive resilience significantly increased from Timepoint 1 (M = 4.94) to Timepoint 2 (M = 5.55, p = .004, η_p^2 = .462).

Lastly for the emotional domain, the main effect of mechanism approached significance F (2.08, 29.17) = 6.36, p = .051, η_p^2 = .189 and there was a main effect of timepoint F (1, 14) = 6.36, p = .024, η_p^2 = .312. No other main effects or interactions were significant (all p's > .05, all η_p^2's < .144). Follow-up tests on the mechanism main effect did not reveal any significant differences (all p's > .05, all d's < 0.630). Follow-up tests on the timepoint main effect demonstrated that mean emotional resilience significantly increased from Timepoint 1 (M = 4.62) to Timepoint 2 (M = 5.11, p = .024, η_p^2 = .312).

The findings demonstrate that overall, there were increases in resilience over the course of the training weekend, however, the addition of the resilience intervention did not yield any further benefits.

Table 3.4

Study 4 Mean (M) resilience scores over the two timepoints

			Time 1		Time 2	
			M	***(SD)***	***M***	***(SD)***
General	**Anticipate**	Int. Group	4.89	(1.59)	5.39	(1.18)
		Non-Int. Group	5.20	(1.07)	5.83	(0.76)
		Total	5.08	(1.24)	5.67	(0.93)
	Minimise	Int. Group	4.72	(1.06)	4.78	(0.58)
		Non-Int. Group	5.03	(1.27)	5.13	(1.06)
		Total	4.92	(1.17)	5.00	(0.90)
	Manage	Int. Group	5.17	(0.83)	5.13	(0.47)
		Non-Int. Group	4.93	(1.06)	5.53	(1.31)
		Total	5.02	(0.96)	5.38	(1.07)
	Mend	Int. Group	5.28	(0.77)	5.50	(0.55)
		Non-Int. Group	5.17	(1.26)	5.57	(1.43)
		Total	5.21	(1.07)	5.54	(1.15)
Physical	**Anticipate**	Int. Group	4.33	(1.40)	4.72	(1.51)
		Non-Int. Group	5.11	(0.67)	5.74	(0.68)
		Total	4.80	(1.05)	5.33	(1.16)
	Minimise	Int. Group	5.11	(1.31)	4.61	(1.16)
		Non-Int. Group	4.70	(1.03)	5.26	(1.26)
		Total	4.87	(1.13)	5.00	(1.22)
	Manage	Int. Group	5.25	(1.04)	5.63	(1.01)
		Non-Int. Group	4.86	(1.22)	5.67	(1.40)
		Total	5.02	(1.13)	5.65	(1.22)
	Mend	Int. Group	5.39	(1.25)	5.78	(0.86)
		Non-Int. Group	4.96	(1.21)	5.67	(1.42)
		Total	5.13	(1.20)	5.71	(1.19)
Social	**Anticipate**	Int. Group	4.50	(1.67)	5.17	(1.35)
		Non-Int. Group	6.00	(0.75)	6.07	(0.55)
		Total	5.40	(1.38)	5.71	(1.01)
	Minimise	Int. Group	3.83	(1.28)	4.56	(0.98)
		Non-Int. Group	4.94	(0.72)	5.48	(0.93)
		Total	4.50	(1.09)	5.11	(1.03)
	Manage	Int. Group	4.79	(0.71)	5.13	(0.68)
		Non-Int. Group	4.44	(1.46)	5.64	(1.57)
		Total	4.58	(1.19)	5.43	(1.28)
	Mend	Int. Group	4.11	(1.22)	5.00	(0.70)
		Non-Int. Group	4.48	(1.74)	5.52	(1.67)
		Total	4.33	(1.52)	5.31	(1.35)
Cognitive	**Anticipate**	Int. Group	5.11	(1.50)	5.50	(0.55)
		Non-Int. Group	5.77	(0.70)	6.00	(0.80)
		Total	5.52	(1.07)	5.81	(0.74)
	Minimise	Int. Group	4.67	(0.76)	5.17	(1.13)
		Non-Int. Group	4.80	(1.07)	5.13	(1.34)
		Total	4.75	(0.94)	5.15	(1.22)
	Manage	Int. Group	4.71	(0.94)	5.50	(0.55)
		Non-Int. Group	4.98	(1.33)	5.78	(1.62)
		Total	4.88	(1.17)	5.67	(1.30)
	Mend	Int. Group	4.39	(1.06)	5.33	(0.76)
		Non-Int. Group	5.10	(1.44)	6.00	(1.46)
		Total	4.83	(1.32)	5.75	(1.26)
Emotional	**Anticipate**	Int. Group	4.50	(1.89)	5.17	(0.62)
		Non-Int. Group	5.87	(0.80)	5.87	(1.16)
		Total	5.35	(1.43)	5.60	(1.03)
	Minimise	Int. Group	3.78	(1.09)	4.44	(1.28)
		Non-Int. Group	4.40	(1.78)	5.37	(1.38)
		Total	4.17	(1.54)	5.02	(1.38)
	Manage	Int. Group	4.71	(0.75)	4.57	(1.19)
		Non-Int. Group	4.65	(1.95)	5.55	(1.83)
		Total	4.67	(1.57)	5.18	(1.65)
	Mend	Int. Group	4.61	(0.98)	4.61	(0.57)
		Non-Int. Group	4.43	(2.27)	5.33	(1.99)
		Total	4.50	(1.85)	5.06	(1.62)

Observed Resilience.

For observer-ratings of resilience, analysis from mixed-model ANOVA showed that for the general domain, there were no significant main effects or interactions (all *p*'s > .05, all η_p^2's < .144). However, there was a main effect of group type F (1, 12) = 6.28, p = .028, η_p^2 = .344. Resilience was significantly lower in the intervention group (M = 4.27, SE = 0.35) compared to the non-intervention group (M = 5.45, SE = 0.31).

Within the Physical domain, there was a main effect for timepoint F (1, 12) = 7.62, p = .017, η_p^2 = .388, and a timepoint x group interaction was revealed F (1, 12) = 11.95, p = .005, η_p^2 = .499. No other main effects or interactions were significant (all *p*'s > .05, all η_p^2's < .223). Follow-up tests on the interaction demonstrated a significant decrease in mean physical resilience of the intervention group from Timepoint 1 (M = 5.42, SE = 0.35) to Timepoint 2 (M = 3.60, SE = 0.54, d = 1.553). The non-intervention group had a marginal increase from Timepoint 1 (M = 5.34, SE = 0.30) to Timepoint 2 (M = 5.58, SE = 0.47, d = 0.207).

Within the social domain, there was a main effect for timepoint F (1, 11) = 7.51, p = .019, η_p^2 = .406 and group type F (1, 11) = 11.27, p = .006, η_p^2 = .506. Further a timepoint x group interaction was revealed F (1, 11) = 7.51, p = .019, η_p^2 = .506. No other main effects or interactions were significant (all *p*'s > .05, all η_p^2's < .113). Follow-up tests on the interaction demonstrated that a significant decrease in mean social resilience of the intervention group from Timepoint 1 (M = 5.35, SE = 0.38) to Timepoint 2 (M = 3.92, SE = 0.24, d = 2.119). The non-intervention group remained unchanged from Timepoint 1 (M = 5.79, SE = 0.35) to Timepoint 2 (M = 5.79, SE = 0.22 d < 0.001).

Within the cognitive domain, there was a main effect for mechanism F (1.73, 19.06) = 4.11, p = .038, η_p^2 = .27,2 timepoint F (1, 11) = 10.30, p = .008, η_p^2 = .484, and group type F (1, 11) = 16.99, p = .002, η_p^2 = .607). Further, a timepoint x group interaction was revealed F

(1, 11) = 11.49, p = .006, η_p^2 = .511. No other main effects or interactions were significant (all p's > .05, all η_p^2's < .189). Follow-up tests on the mechanism main effect demonstrated that the difference between manage (M = 4.86, SE = 0.18) and Mend (M = 5.28, SE = 0.18) approached significance (p = .062, d = 0.340). Follow-up tests on the interaction demonstrated a significant decrease in mean cognitive resilience of the intervention group from Timepoint 1 (M = 5.29, SE = 0.33) to Timepoint 2 (M = 3.33, SE = 0.34, d = 2.151). The non-intervention group remained relatively unchanged from Timepoint 1 (M = 5.71, SE = .30) to Timepoint 2 (M = 5.77, SE = .32, d = 0.067).

Within the emotional domain, there was a main effect for timepoint F (1, 11) = 23.13, p = .001, η_p^2 = .678 and group type F (1, 11) = 6.02, p = .032, η_p^2 = .354. Further, a timepoint x mechanism interaction was revealed F (3, 33) = 3.66, p = .022, η_p^2 = .484, as well as a timepoint x group interaction F (1, 11) = 67.32, p < .001, η_p^2 = .860). No other main effects or interactions were significant (all p's > .05, all η_p^2's < .154). Follow-up tests on the timepoint x mechanism interaction demonstrated that anticipate, minimise, manage, and mend all significantly decreased from Timepoint 1 to Timepoint 2 (Anticipate: M_{diff} = 1.42, d = 1.132; Minimise: M_{diff} = 1.10, d = 0.742; Manage: M_{diff} = 0.85, d = 0.504; Mend: M_{diff} = 0.89, d = 0.517). Follow-up tests on the timepoint x group interaction revealed a significant decrease in mean emotional resilience of the intervention group from Timepoint 1 (M = 6.04, SE = 0.29) to Timepoint 2 (M = 3.17, SE = 0.31, d = 4.498), and the non-intervention group increased from Timepoint 1 (M = 5.07, SE = 0.27) to Timepoint 2 (M = 5.82, SE = 0.28, d = 0.798).

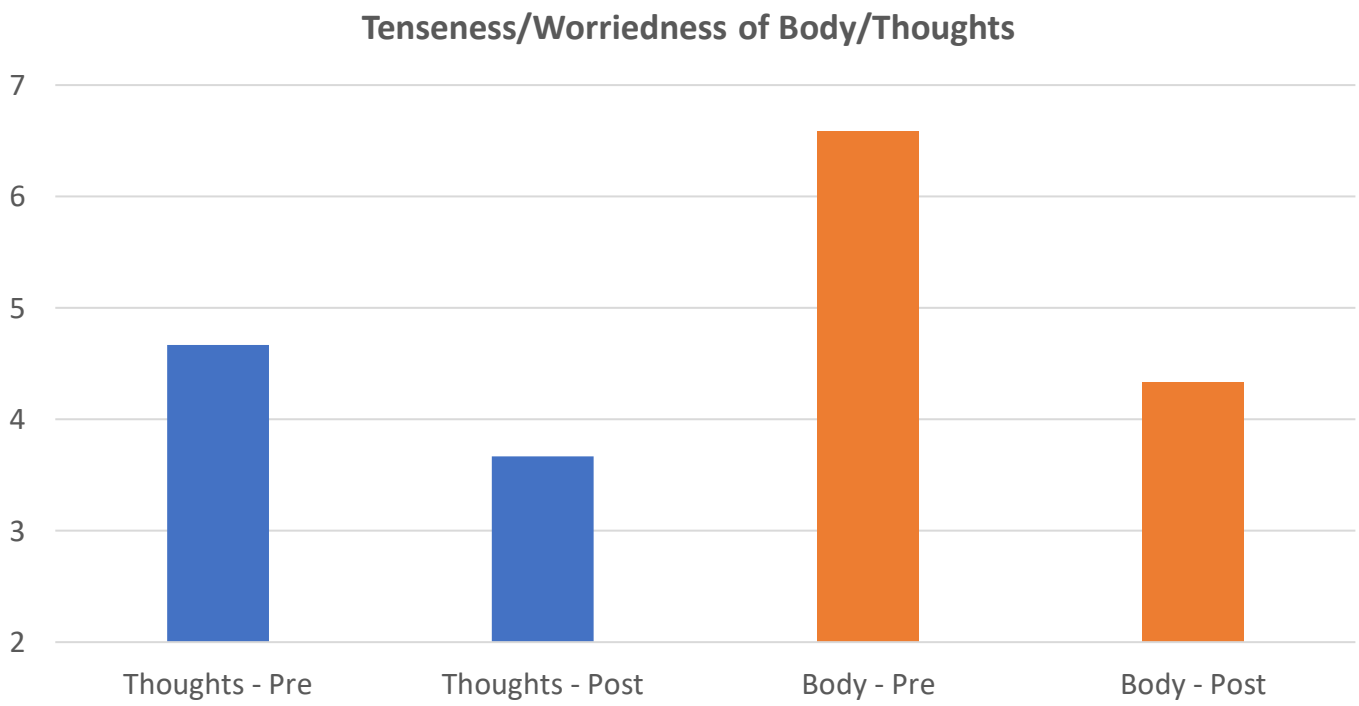
The findings indicate that for observed resilience, differences mostly resided in the intervention group, which decreased over the training weekend. Reasons for this are considered in the Discussion section.

Progressive Muscular Relaxation.

Analysis of the MRF scores demonstrated a main effect of timepoint F (1, 5) = 110.22, $p < .001$, $\eta_p^2 = .957$. No other main effects or interactions were significant (all p's > .05, all η_p^2's below .378). Follow-up tests revealed a significant decrease in mean anxiety (worriedness of thoughts and tenseness of body; see Figure 4.1) from Timepoint 1 (M_{pre} = 5.63; SE = 0.38) to Timepoint 2 (M_{post} = 4.00; SE = 0.37).

Figure 3.8

Study 4 PMR mean scores before and after (n = 6)



Additional Findings.

In addition, quotes from the workbook suggested that students found the relaxation technique helpful: "*I felt way less stressed and slept great after the meditation*". Along with quotes and discussions with participants after the intervention in general: "*The thinking styles and what-if planning really got me to reflect on myself, I'll use those again*" and "*The games were stressful and hard, but I can see why they were helpful and to see how we'd react with*

each other on expedition". It is also worth noting that the experimental group had an issue between the students, teachers, and expedition leader. Both the students and teachers confirmed that this likely impacted both their self- and observer-rated reports of resilience.

Discussion

The aim of Study 4 was to examine the benefits of a training weekend for an expedition team. However, the main focus was to develop and pilot test an evidence-based intervention to improve resilience based on the proposed resilience model. We predicted that the training weekend should enhance resilience across its domains and mechanisms, which was partially supported. However, the addition of the piloted resilience intervention did not enhance this effect further, although the taught relaxation technique did produce some benefits.

The findings demonstrate that the training weekend was facilitative to resilience, with increases in both the general domain and the four other respective domains, suggesting these training environments provide contexts that deal with these unique stressors. Although there were no apparent further increases in resilience as a result of the intervention, with such a small sample size in each group, it would not be tenable to draw strong conclusions regardless.

Limitations and Future Directions

There are several limitations to acknowledge in the present study. Despite its pilot nature, the lack of a non-training control group makes conclusions about the benefits of the training weekend more difficult to apply. In addition, the pilot highlighted some issues with both fitting in planned tasks around regular training and with the observer ratings. An incident over the weekend between the intervention group, their expedition leader, and their teachers had a clear influence on observer (teacher) ratings of their students' resilience as well as students' self-perceptions. This was confirmed in post-hoc discussions, along with

their overall concerns that they do not know their students well enough, or at least not how resilient they are across different contexts and situations beyond those found in schools. Future researchers may want to consider taking observer ratings from multiple sources for more reliability, or pre-testing observers for their knowledge of the participant. A larger sample size should also reduce the effect of individual events and group issues on the findings. Another limitation of the study is the snapshot nature of the data collected, limiting conclusions about whether these positive psychological effects could extend beyond the immediate post-adverse environment (e.g., McElligott et al., 2012; Mutz & Müller; Stott et al., 2013), which could be the result of post-group euphoria (Daniel, 2007; Furman & Sibthorp, 2014; Hattie et al., 1997; Scrutton & Beames, 2015). If practical, future researchers should consider examining participants from before the intervention and at a few timepoints several months beyond an intervention or experience in an adverse environment.

To conclude, training weekends for expeditions could have some potential benefits. Unsurprisingly, given the events of the testing weekend and the low sample size, there was no demonstration of additional benefits to the resilience intervention. However, refining the methodology, implementation, and examining a larger sample with a full study could enhance resilience above and beyond the benefits of the regular training.

General Discussion

The purpose of the current studies was to examine the potential psychological benefits of an adverse environment with a focus on resilience – either an overseas expedition, or a training weekend for an expedition. A second (and main aim for Study 4) purpose was to develop and pilot an intervention study based on the presented resilience model.

Benefits of an Adverse but Facilitative Environment

Overall, it was found that overseas expeditions and the training weekends leading up to them acted as facilitative environments that adequately challenged and developed resilience, leading to improvements across its domains and mechanisms. These benefits also extended to cognitive appraisals, indicating that the coping resources improved, or the demands were perceived to decrease (or both), and well-being also improved. The experiences likely have an inoculating effect (e.g., Barrett & Martin, 2014; Meichenbaum & Novaco, 1985), demonstrated by significant improvements from the beginning to the end of the expeditions. The findings demonstrate that expeditions themselves encourage adaptive psychological growth and improve resilience (e.g., Barton et al., 2016; Smith et al., 2016). The improvements to resilience go some way to help clear up the ambiguity in expedition studies regarding whether resilience tends to develop over the course of the expeditions (e.g., Neill & Dias, 2001; Skehill, 2001). This finding may be due to using a more comprehensive and adequate method of measuring resilience, for example, we could demonstrate that not all resilience mechanisms increased from the beginning of the expedition to the end, such as anticipation. It was also demonstrated that most changes occurred from the beginning to the end of expeditions, with no changes occurring during expeditions. Other ways in which we may have demonstrated more effects was because we examined multiple expedition environments and provided a more heterogeneous sample. The findings contrast the more traditional pathogenic view of extreme environments that focus on psychological and interpersonal dysfunction experienced in such contexts (Smith et al., 2016). More resilience-focused training prior to engaging in these environments could mitigate these potential dysfunctions and negative outcomes.

Resilience and Related Factors

It was expected that resilience would correlate with several other factors. Observer ratings of resilience correlated partially with self-reported resilience. Several reasons could suggest why these ratings didn't correlate to a greater extent, such as observers not knowing their students well enough in each of the resilience domains. In the case of the pilot intervention study, external influences also proved to negatively impact observer (and likely self) ratings of resilience. In the absence of an observer who may know the participant more intimately, using more than one observer may present one solution or triangulating a resilience score between the self-reports and observer reports.

Self-concepts and associated factors such as self-esteem positively correlated with resilience, which supported previous findings (e.g., Balgiu, 2017). In turn, other aspects of self-concept, such as maintaining social relationships, tend to be associated with higher resilience (Ozbay et al., 2007). Cognitive appraisals of threat over challenge only related to the manage mechanism within the general domain. This may have been due to the items used referring to stressors very likely to be novel, vague, and/or unknown to the participants (e.g., Yoshino, 2008). A more accurate examination of cognitive appraisals may be to look at specific challenges faced during the expedition. In addition, more comprehensive measures such as examining physiological indices of challenge and threat may also provide more valid and reliable results (e.g., Uphill et al., 2019). Well-being was correlated with many of the more action-oriented aspects within resilience of minimise, manage, and mend. This finding supports the previous literature with active coping being associated with higher well-being (McFadden et al., 2021) and high resilience potentially acting as a protective factor with regards to well-being during adversity (e.g., Fisk & Dionisi, 2010; Masten & Tellegen, 2012; Sanders et al., 2015). The findings highlight further insights into the relationships between

resilience, its proposed mechanisms, and related concomitant factors that could develop resilience.

Applied Implications

From an applied perspective, simulated adversity and punishment stimuli are generally underused, despite the potential benefits to coping and resilience during adversity (e.g., Ávila & Torrubia, 2008; Hardy et al., 1996; Seifried, 2008). Study 4 demonstrates such stimuli can be implemented ethically and practically, provided they remain relevant to the context (expeditions in this case) and not be overwhelming. In addition, the pro-active and reactive mechanisms could better inform practitioners to understand and improve resilience, including developing general and specific coping techniques that encompass or target specific mechanisms. The intervention pilot also demonstrates a preliminary attempt to bring together evidence-based strategies that can support resilience (e.g., Gould et al., 1993), and a theory-driven approach to why and how resilience might be improved (e.g., Fletcher & Sarkar, 2016; De Terte et al., 2009). The aim was to promote more salutogenic experiences from expeditions with these strategies (e.g., Palinkas & Suedfeld, 2008). However, for the potential reasons previously discussed, the findings did not demonstrate any additional benefits. Nevertheless, the findings can be applied not only in understanding and developing resilience in an expedition environment, but in other dynamic and challenging environments and training such as sport or the military (e.g., Griffith & West, 2013).

Limitations and Future Directions

There were several limitations of the two studies that should be considered for future researchers to address. In both instances, a larger sample, matched control groups, and an examination of longitudinal effects (beyond immediate post-expedition or intervention effects) would have greatly enhanced the validity and applicability of findings from the studies. It could be considered that the benefits demonstrated in the studies could have been

influenced by factors such as maturation effects increasing resilience (e.g., Gooding et al., 2011; Oliver et al., 2006; Senior et al., 2020), or post-group euphoria after completing such events that tends to inflate positive self-reports (e.g., Daniel, 2007; Furman & Sibthorp, 2014; Hattie et al., 1997; Scrutton & Beames, 2015). In addition, it may be worth investigating if the long-term benefits of such experiences may be triggered in the future, as opposed to immediately post-event (e.g., Sayer, 2011). Regarding observer ratings, using more than one observer may present a more reliable solution (and in the absence of an observer who feels they know the participant well enough), as well as researchers considering that a more accurate measurement may be somewhere between the self-reports and observer reports. With regards to the intervention study, future researchers could examine other methods of introducing adversity training and punishment stimuli (e.g., Seifried, 2008) to build upon the pilot test. In addition, given the benefits of coping strategies such as progressive muscular relaxation, other such techniques (e.g., Carmody & Baer, 2008) could be examined to target resilience mechanisms and in a larger sample to investigate these potential benefits.

Lastly, a future direction and approach practitioners could consider is profiling. Personality profiling has often been used to screen and predict coping and performance for different extreme and challenging environments such as the military (Sandal et al., 1998) and space missions (McFadden et al., 1994). Sought after traits include emotional stability and positive sociability (e.g., Smith et al., 2016) and tend to be associated with higher resilience (e.g., Fisk & Dionisi, 2010; Fleming & Ledogar, 2010; Masten & Tellegen, 2012; Olsson et al., 2003; Sanders et al., 2015). Thus, a next step could be to examine resilience profiles based on the four mechanisms, and how these may predict thoughts, feelings, and behaviours in adverse environments. This could act as a guide for more bespoke interventions and screening in these contexts.

Conclusions

To conclude, both expeditions and training weekends appear to potentially enhance resilience across its domains and mechanisms, as well as some concomitant factors such as well-being and cognitive appraisals. It was also found that many domains and mechanisms of resilience positively related with these other factors, such as many aspects of positive self-concept and well-being.

In addition, a resilience intervention could be further developed based on the resilience process and integrated into training and preparation for challenging environments such as expeditions. This direction could further enhance the resilience benefits and better protect from the ill effects of stress. Lastly, logical next steps would include examining the long-term psychological effects of an expedition experience, comparing these findings with a matched control group, examining resilience profiling and their potential predictive outcomes, and further expanding and further developing adversity and coping strategy-based interventions.

Chapter 4: Profiles of Resilience and the Psychological and Behavioural Effects of the COVID-19 Pandemic

Abstract[5]

The current studies explored profiles of resilience based on four constituent mechanisms, including pro-active (anticipation & minimising) and reactive (managing & mending) components, and subsequently examined the influence of resilience profiles on different psychological and behavioural outcomes in relation to the COVID-19 pandemic. We conducted two studies using Latent Profile Analysis (LPA) and Latent Transition Analysis (LTA) to examine the profiles emerging from a sample of 555 participants (M_{age} = 20.9, *SD* = 8.2) in Study 5, and 400 participants (M_{age} = 32.1, *SD* = 8.9) in Study 6. In Study 5 we established that four distinct profiles best fit the data including: a low resilience profile with high anticipation; a low resilience profile with high pro-active mechanisms; a moderate resilience profile with high reactive mechanisms; and a high resilience profile with high reactive mechanisms. In Study 6, we were able to largely confirm the replicability of these profiles. In addition, LTA provided evidence supporting the stability of profiles over a four-month period. In Study 6 we also examined how resilience profiles predicted anxiety, depression, well-being, risk-taking, impulsiveness, preventative behaviours, coping effectiveness, and avoiding unwanted behaviours. Analyses revealed that those with high resilience were lower in depression, anxiety, and impulsiveness, but higher in well-being, coping effectiveness, and engaged in more preventative behaviours. In contrast, those with profiles showing lower levels of resilience (particularly those with a high anticipation) tended to be higher in anxiety, depression, impulsiveness, and lower in coping effectiveness. Implications and directions for future research are then discussed, such as the use of profiling to create more bespoke interventions and understanding (mal)adaptive coping during adverse contexts such as the pandemic.

[5] This research was presented at the AASP 2021 Las Vegas conference in poster format. In addition, it was awarded the Professor Beatrice Edgell Prize for best postgraduate research 2021 by the BPS, along with a £400 grant.

Profiles of Resilience and the Psychological and Behavioural Effects of COVID-19

Resilience is a process of managing and adapting to adversity and life's challenges (e.g., Bryan et al., 2019; see Chapter 2 of this thesis). High resilience is associated with a range of benefits, such as enhanced well-being (e.g., Fisk & Dionisi, 2010; Grant & Kinman, 2012; Sanders et al., 2015), lower levels of depression and anxiety (e.g., Labrague et al., 2020), and the use of more active and adaptive coping behaviours to confront challenges (e.g., Balmer et al., 2013). Highly resilient individuals feel less emotional stress following adverse events (Masten & Tellegen, 2012), and have a faster recovery from the ill effects of these adversities (Zautra et al., 2010). Given the positives associated with resilience, it seems reasonable that these benefits would likely extend to adverse events such as the current COVID-19 pandemic (e.g., Yildirim et al., 2020).

The COVID-19 pandemic has caused significant psychological and physical adversity to many (e.g., Labrague et al., 2020; WHO, 2020a), with the UK particularly affected (cf. Howie, 2021; BBC, 2021). The pandemic has been characterised by social isolation, negative impacts on physical health, education, and finances, and has led to increasing levels of stress, depression, and anxiety, as well as reduced levels of well-being and even resilience in the population (Arslan et al., 2020; Cao et al., 2020; Hull et al., 2020; Killgore et al., 2020; Yildirim & Arslan, 2020).

The imposed isolation via restrictions, lockdowns, and quarantines is unfamiliar and unpleasant. The emotional distress attached to this isolation may be worsened by the limited availability of social support and routines that may have previously acted as coping strategies (Usher et al., 2020; Bavel et al., 2020). Furthermore, these multiple stressors relating to the pandemic may have a compounding effect with more typical daily stressors, compromising resilience throughout daily life (e.g., Petzold et al., 2020). However, individual differences impact how people have dealt with the new situation. Indeed, some individuals have reported

benefits such as increased creativity in lockdown (Michinov & Michinov, 2021) and improved social relationships (Bleil et al., 2021), which in turn could facilitate increases in resilience (e.g., Kılınç & Sis Çelik, 2021). During the pandemic, resilience and taking preventative behaviours (such as mask-wearing) have been associated with improved well-being (Arslan et al., 2020; Balkhi, 2020; Labrague et al., 2020; Wang & Zhao, 2020; Yildirim & Arslan, 2020). Given the benefits and protective effects of high resilience against negative psychological outcomes (e.g., Fisk & Dionisi, 2010; Masten & Tellegen, 2012; Sanders et al., 2015), well-being and successful coping should be better maintained during the pandemic. Recognising how resilient individuals deal with the unique adversities associated with the pandemic might allow researchers to better understand how resilience may be able to reduce the associated negative consequences of it.

Resilience is a pro-active and reactive process involving different components (e.g., Chen et al., 2015; Fletcher & Sarkar, 2016). These components may vary across individuals, and the differing within-person profiles of these components of resilience may be conducive to different outcomes. However, to our knowledge, research has yet to examine resilience in terms of profiles relating to its constituent parts. Thus, in Study 5, we explored profiles of resilience in a general population. We then sought to confirm and extend this work in Study 6 in a new sample, to explore the stability of these profiles over time, and to examine the predictive outcomes of different profiles in the context of the pandemic.

With these broad research aims in mind, the rest of the introduction takes the following format. We first discuss conceptualisations of resilience and the mechanisms that encapsulate it, and then we discuss these mechanisms in the context of the pandemic and how different combinations of them could lead to different positive and negative outcomes, underscoring the need to examine them as a profile. This is then followed by the introduction to Study 5, in

which we explain what profiles might be expected to emerge. We offer a rationale for how these profiles might predict COVID-related outcomes in the introduction to Study 6.

Definitions and Mechanisms of Resilience

Historically, resilience has been defined as an ability to adapt positively in the face of adversity (Joyce et al., 2018), or simply rebounding from adversity's negative impact (Doorn et al., 2018). Authors have offered various operational definitions for resilience with different core concepts involved (Bryan et al., 2019; Windle et al., 2011). For example, one definition of resilience focuses on remaining functionally stable despite pressure (Bonanno, 2004), and another as positive growth and adapting to stressful circumstances (Luthar et al., 2000). A more comprehensive and contemporary conceptualisation of resilience is that of a pro-active and reactive state-like process, that involves trait-like protective qualities as well as state-like influences such as the type of adversity faced and the environment one operates in (Bryan et al., 2019; Fletcher & Sarkar, 2016; Pangallo et al., 2015). According to this view of resilience, when approaching adversity, an individual would take actions to reduce the negative effects of it, followed by more appropriate reactions during and after the stressor (e.g., Alliger et al., 2015; Bryan et al., 2019; Fleming & Ledogar, 2008). Consistent with the pro-active and reactive position, Chen et al. (2015) suggest that resilience is best understood by its constituent mechanisms, which reflect an individual's ability to anticipate (pro-active), be flexible (pro-active/reactive), and bounce back and learn (reactive) when approaching, during, and after adversity. Similarly, Alliger et al. (2015) have defined the mechanisms of resilience as the ability to minimise (pro-active), manage (pro-active/reactive), and mend (reactive) from a threat. These mechanisms of resilience would likely relate to each other within their temporal proximities (for example, minimising would correlate more with managing over mending) given the proposed resilience process to adversity (see Chapter 2 of this thesis).

These mechanisms of minimising (awareness/anticipating and taking actions to reduce a stressor's impact), managing (adapting and dealing with a stressor as it occurs), and mending (recovering from the stressor and learning from it) represent the processes taken to deal with adversity. However, the three mechanisms proposed by Alliger et al. (2015) fail to separate the pro-active, early components of resilience, namely anticipation and minimising. Similarly, Chen et al. (2015) grouped the awareness and pro-action of anticipating and minimising together. Separating the components of anticipating and minimising is conceptually important in understanding the pro-active aspect of resilience. To elaborate, when anticipating upcoming stressful events, behavioural approaches to such events may partially be determined by threat appraisals (Scherer et al., 2001). Thus, one might anticipate a threat *and then* evaluate if minimising actions are needed to help manage it, or if the issue is even avoided altogether. To further illustrate this distinction, if one had high anticipation abilities and strategies but was low in minimise, manage, and mending, they may *over* anticipate adversity, leading to potentially maladaptive responses such as behavioural withdrawal (when this isn't helpful) or no response at all such as freezing up (Dickson et al., 2012; Thompson et al., 2014). During the pandemic for example, this particular pattern of resilience mechanisms may be a key influence towards increased levels of anxiety and stress (e.g., Arslan et al., 2020; Yildirim & Arslan, 2020). In contrast, if one had high levels of anticipation and also minimising, upon appraising the upcoming threat, they would likely begin seeking help, planning coping strategies, and/or start problem-solving (pro-active). This in turn would reduce the impact the stressor might have to manage and mend (react) from it, such as taking protective measures to avoid infection from COVID-19. These examples demonstrate how these mechanisms should be treated separately. However, in the dynamic context of the pandemic, these patterns of resilience mechanisms may present themselves in varying ways that would need to be examined.

Resilience Mechanisms and the Pandemic

One way of considering how resilience mechanisms present themselves in the pandemic would be to examine how different combinations might be associated with positive (or even negative) outcomes. Generally, high resilience may lead to more effective (or at least, the perception of, e.g., Trivate et al. 2019) coping behaviours throughout, along with an improved ability to deal with the effects of potential depression and anxiety around the pandemic (Balkhi et al., 2020; Wang & Zhao, 2020). A high ability to anticipate and minimise combined with managing and mending would likely present behaviours such as frequent information seeking and the taking of more preventative COVID-19 measures (e.g., mask-wearing), which may further reduce the negative psychological impact of the pandemic (e.g., Balkhi, 2020; Wang & Zhao, 2020). In addition, examples of effective mending, such as cognitive reappraisal, could generally lead to better mental health outcomes (Boyes et al., 2015). The combination of high managing and mending may also reflect a propensity to take more calculated risks, perceiving an ability to cope with any accompanying adversity for perceived rewards (e.g., Herman et al., 2018). A distinction would need to be made between calculated, more positive risk-taking and less controlled, impulsive behaviour (Herman et al., 2018; Isles et al., 2018); however, calculated risk-takers may perceive themselves as better able to handle adversity for varying rewards.

Contrastingly, there may be some negative outcomes of certain resilience mechanism combinations during the pandemic as alluded to in the previous subsection. High anticipation and minimise combined with lower manage and mend may be associated with mental health challenges such as anxiety. Such individuals may engage in threat detection and precautionary responses but without an ability to then deal with the threat beyond this point particularly well, potentially causing anxiety (e.g., Byrne & Eysenck, 1995; Stein & Nesse, 2011). Without the accompanying high level of manage and mend, high anticipation could

still lead to behaviours such as avoidance (adaptive or not; e.g., Weiner, 1980). In addition, managing ineffectively and/or negative rumination from low levels of mending can also lead to psychological distress and depression (e.g., O'Connor et al., 2007). These negative psychological outcomes can potentially follow through to undesirable and unwanted behaviours such as excessive smoking, alcohol consumption, aggression, avoidance, and overall social dysfunction (Cropley et al., 2011; Cribb et al., 2006; Morrison & O'Connor, 2004; Pederson et al., 2011) which can then be a potential risk to individuals who may not cope effectively during the heightened stress of the COVID-19 pandemic. Therefore, it is important that evidence-based profiles of the resilience mechanisms be examined so we can explore what mental health and behavioural outcomes they could predict so these outcomes (or low resilience mechanisms) can be potentially intervened upon.

The Present Studies

Given that resilience reflects a number of processes (i.e., the four proposed mechanisms), it is inevitable that individuals will differ in their relative level of each mechanism, leading to different resilience profiles. Understanding the different resilience profiles that may exist is important as distinctions between the four mechanisms may lead to different responses. These different responses could allow insight into how resilience can protect (or not protect) from mental health issues during the pandemic (e.g., Labrague et al., 2020) and lead to more adaptive behavioural responses such as better coping (e.g., Balmer et al., 2013) that could extend to adverse events during and beyond the pandemic.

In Study 5, we explored different resilience profiles in a sample of young adults. In Study 6, we completed a second examination of resilience profiles with a new sample to confirm the findings from Study 5 and explored the relationship between different resilience profiles and several psychological and behavioural outcomes relating to the COVID-19 pandemic.

Study 5: Preliminary Examination of Latent Profiles of Resilience

In considering the different resilience mechanisms, it is evident that many profiles could be construed. Given that our conceptualisation of resilience as a process of mechanisms is somewhat novel, it is difficult to make strong conclusions from the literature on what kinds of profiles might be hypothesised. However, there is enough evidence in the literature to make some predictions. Our resilience conceptualisation represents an interaction between the individual, the adversity faced, and the environment (e.g., Pangallo et al., 2015). These factors would influence and be influenced by the resilience process, resulting in a distinct profile of the four mechanisms. Based on theory, we believe the following four profiles are most likely. We present each of these expected profiles in turn below.

Low Resilience – Ant Dominant. It seems likely that some individuals may have low resilience across most mechanisms but with an elevated level of anticipation (in comparison to other mechanisms). Such a profile may be particularly prominent during the pandemic, in which resilience levels have been reportedly lower than average (Killgore et al., 2020), but the elevated level of anticipation may be expected given the worry and unknown associated (at the time) with COVID-19. This profile would be consistent with individuals who are sensitive to threats and stress and might over-anticipate adversity, yet do not have the resources to either minimise the impact of the stressor, or to deal with it in the moment (e.g., Dickson et al., 2012; Gross, 2002; Schneider et al., 2013; Thompson et al., 2014). This profile will also result in anticipation becoming a necessity if they know they struggle to deal with stressors (being particularly wary of intense stressors). Such individuals would likely experience intense negative emotions in anticipation of events (e.g., Van Boven & Ashworth, 2007).

Moderate Resilience – High Pro-active. A large portion of the population would likely fit somewhere within the ‘average’ level of resilience (e.g., Cigna, 2020; Kocalevent et

al., 2015). However, it would be generally expected that mechanisms with higher temporal proximity (e.g., anticipate & minimise) would correlate to a greater degree as they would involve more related abilities in comparison to more distal mechanisms. An individual with higher levels of anticipate and minimise (pro-active components) could reduce how much their more reactive abilities get utilised. This could result in the pro-active components becoming better 'practiced' in comparison to their reactive abilities, potentially leading to further higher pro-active abilities (or perception of) due to more experience using them (e.g., Barrett & Martin, 2014; Fletcher & Sarkar, 2016; Meichenbaum & Novaco, 1985).

Moderate Resilience – High Reactive. Following a similar logic to the previously predicted profile, it seems plausible that some individuals who fail to anticipate and minimise the impact of stressors would, by necessity, utilise managing and mending to a greater degree. Individuals would likely fit this profile due to either perceiving these pro-active components not to be necessary as they manage and mend so effectively, or that these become better practiced out of necessity due to a lack of ability to anticipate and minimise.

High Resilience. Lastly, it seems reasonable to suggest that some individuals would be high across all resilience mechanisms, as evidence does show individuals demonstrating high resilience across diverse situations (e.g., Barratt & Martin, 2014; Pangallo et al., 2015). In the resilience literature, these people are classically referred to as apparently 'invulnerable' individuals and tend to have high self-esteem, self-efficacy, planning and decision-making skills, and supportive social contacts (Fleming & Ledogar, 2010; Olsson et al., 2003). These consistent protective qualities help these individuals utilise a more challenge mindset when approaching adversity and stressful environments, therefore making such environments more facilitative to their resilience (e.g., Fletcher & Sarkar, 2016).

In this study, we tested the appropriateness of this theorising using Latent Profile Analysis to examine what patterns of the four resilience mechanisms tend to emerge.

Method

Participants

Following institutional ethical approval, we recruited a convenience sample of 555[6] participants (M_{age} = 20.9, *SD* = 8.2; *n* = 263 Male, *n* = 289 Female, *n* = 3 preferred not to say) via social media from the public, secondary schools, and Universities across the UK, and prior to the events of the pandemic.

Measures and Procedure

We used the general scale from the Resilience Process Scale (see Chapter 2 of this thesis) to examine the four mechanisms of anticipate, minimise, manage, and mend. Each of the 13 items are measured on a.7-point Likert-type scale (1 = *strongly disagree*, 4 = *neither agree nor disagree*, 7 = *strongly agree*).[7] Participants completed this measure in their own time.

Analysis

We conducted Latent Profile Analyses (LPA; e.g., Gillet et al., 2017) to identify subgroups of individuals based on their responses to the Resilience Process Scale's general domain. LPA is a latent variable approach to identifying subgroups within a population based on a set of variables (in our case, the four resilience mechanisms) and predicted number of profiles. Compared to similar methods such as cluster analysis, LPA allows more flexibility in model specification, and provides users with several fit indices to assess the quality of model fit, making it a superior approach to other person-centred analyses (such as cluster analysis). While there is no "gold standard" for determining the optimum number of profiles, it is generally worthwhile exploring a range of predicted profile solutions (e.g., Spurk et al.,

[6] All data used from previous studies within this thesis (Chapter 2 & 3).
[7] Although we did use the other four domains (physical, social, cognitive, and emotional), we chose to stick with the general domain for this research as the other domains were not a focus. This was after confirming that the other domains, and a composite mean of the domains gave similar findings and profiles (see Appendix F).

2020). We examined solutions from one to six latent profiles in which the means and variances of the resilience mechanisms were freely estimated in all profiles; we tested beyond our predicted four profiles to examine if a more complex model offered a better fit to our data than a more parsimonious one.

To determine the ideal number of profiles in the data, multiple factors should be considered, including the substantive meaningfulness (including a meaningful group membership size within a profile), theoretical conformity, and statistical adequacy (Gillet et al., 2017; Muthén. 2003). To support decision making, LPA offers several statistical indices including the Akaike's Information Criterion (AIC), Bayesian Information Criterion (BIC), and Adjusted BIC (aBIC) values. Comparing each proposed model (number of profiles), these statistics measure the trade-off between fit and complexity, with a lower relative score reflecting a better model fit. An entropy score is also given, where a higher relative score represents a clearer delineation of profiles. Further, the analysis also provides *p* values of the Lo-Mendell-Rubin likelihood ratio test (LMR LRT) and Bootstrap LRT (BLRT). These *p* values compare the currently examined model to the next most parsimonious one (the model with one fewer profiles), with a significant value indicating the current model is a better fit.

Results

The process of LPA resulted in a four-class solution (see Figure 4.1). Table 4.1 presents model fit indices, with the 4-class solution demonstrating lower AIC, BIC, and aBIC in comparison to other models, as well as a good entropy value (.82), and significant LMR LRT and BLRT scores ($p < .05$). Thus, the fit indices provided preliminary evidence that four profiles show a better fit than smaller class solutions (such as the three profiles), with a clearer delineation of profiles within the sample, and an acceptably high group membership within each profile of them. A five-profile solution also had a good fit. However, a combination of less meaningful group memberships (two of the five profiles only represented

7% & 4.9% of the total sample) and slightly lower entropy values in the five-profile solution, coupled with greater model complexity (because of a greater number of profiles), meant that, a four-profile model was used.

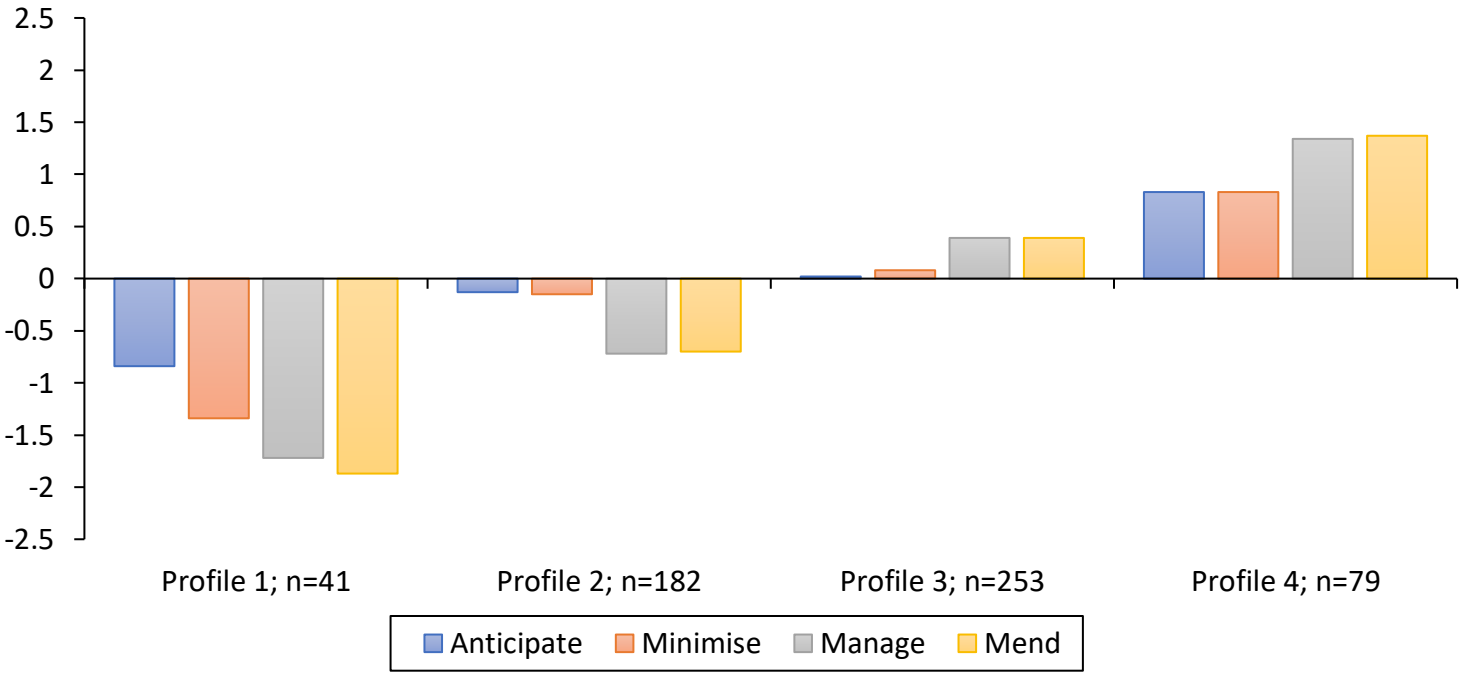
Table 4.1

Fit indices comparing different profile solutions

LPA Outputs	AIC	BIC	Adj BIC	Entropy	LMR LRT	BLRT
1 Class	6522.35	6556.9	6531.5	N/A	N/A	N/A
2 Class	6066.93	6123.07	6081.81	0.758	<.001	<.001
3 Class	5886.08	59.63.82	5906.68	0.763	0.7897	<.001
4 Class	5749.19	5848.52	5775.51	0.818	0.02	<.001
5 Class	5699.57	5820.5	5731.62	0.796	0.0191	<.001

Figure 4.1

Standardised profiles of resilience for Study 5 (total n = 555)



To facilitate interpretation, Figure 4.1 contains the standardised scores and patterns of anticipate, minimise, manage, and mend for each of the four profiles, along with the number of participants contained in each respective profile. We named Profile 1 (7.4% of the sample) as *Low Resilience – High Anticipate*. Individuals in this profile reported a low level of resilience, with anticipate being higher than the other mechanisms, confirming one of our hypothesised profiles. Minimise was second highest over manage and mend, which was expected given its temporal proximity to anticipate.

We named Profile 2 (32.8% of the sample) as *Lower Resilience – High Pro-Active.* Individuals in this profile reported moderate-low resilience, with manage and mend being particularly low in comparison to anticipate/minimise. Although this profile was not directly hypothesised, it is also not surprising, as we expected profiles with high pro-active and low reactive ability (and vice versa).

We named Profile 3 (45.6% of the sample) *Moderate Resilience – High Reactive.* Individuals in this profile reported a moderate level of a resilience, with similar levels of each mechanism across the board, but slightly elevated levels of manage and mend, confirming one of our hypothesised profiles.

Lastly, we named Profile 4 (14.2% of the sample) *High Resilience – High Reactive*. Individuals in this profile reported high resilience across all four mechanisms, but with a relatively higher level of manage and mend. In terms of pattern, it is similar to Profile 3, but a with greater magnitude.

Discussion

The current study provides initial evidence for the existence of four distinct resilience profiles based on the mechanisms of anticipate, minimise, manage, and mend, with our four predicted profiles being largely supported. The current results highlight that individuals can differ in their levels of each of the resilience mechanisms, and thus indicate the benefits of considering resilience from a profile perspective. Profile 1 was associated with low levels in each mechanism apart from anticipate, Profile 2 was also somewhat low in resilience levels, with higher pro-active mechanisms, Profile 3 was associated with moderate levels of resilience, with slightly higher reactive mechanisms, and Profile 4 was high in resilience, with relatively higher reactive mechanisms.

Despite the clarity of our effects, further research is needed to confirm the replicability of these profiles in more heterogeneous samples. Thus, in Study 6, we examined the replicability of these profiles in a different sample. Further, it is evident that our cross-sectional design in Study 5 does not allow for an investigation of the stability of resilience profiles and the extent to which they (do not) change over time. For example, some profiles may be relatively unstable (thus, members can easily transition from this to another profile). In contrast, some profiles may be relatively stable, and individuals may not transition.

Therefore, understanding the (lack of) stability in resilience profiles over time is important. In addition, we have yet to explore the predictive capacity of these different profiles and the extent to which different profiles predict psychological and behavioural outcomes. We also explored this issue in Study 6 in relation to the COVID-19 pandemic.

Based on the literature, there are several ways the different profiles could predict varying outcomes. Those with high anticipation but low levels of other mechanisms would be expected to have lower well-being and higher perception of risk to themselves (e.g., Anderson, 2003; Byrne & Eysenck, 1995). Individuals with such a profile may engage in more undesirable behaviours to cope with anxiety and worry, such as over-eating (e.g., Cropley et al., 2011), with a lower perception of how effective this coping actually *is* (e.g., Zimmer-Gembeck et al., 2018). A high minimise in combination with high anticipate may lead to higher well-being, but (if overall resilience is low) present as over-planning and safety-seeking due to feelings such as fear and anxiety over a potential stressor (Thwaites & Freeston, 2005). It is expected that individuals with a high resilience profile would have better mental health outcomes and well-being (Fisk & Dionisi, 2010; Sanders et al., 2015). Their higher manage and then mend may suggest a greater ability to deal with adversity as it occurs and bounce-back from it (e.g., Trivate et al., 2019; Zimmer-Gembeck et al., 2018). These individuals are better at appraising threats and their ability to deal with them, thus may feel less anxiety and negative affect in response to adversity (e.g., Bitsika et al., 2010; Lazarus, 1991; Scherer et al., 2001).

Study 5 demonstrated four distinct profiles of resilience that tend to emerge based on its mechanisms. However, these profiles need to be confirmed with a more heterogeneous sample, their stability and reliability examined across time, and to test the predictive outcomes such as those discussed above.

Study 6: Latent Resilience Profiles and the Psychological and Behavioural Effects of the COVID-19 Pandemic

Building upon the findings of Study 5, in Study 6, we investigated resilience profiles with a new sample during the COVID-19 pandemic in the UK (January-March 2021) and examined how these profiles predicted thoughts, feelings, and behaviours around the COVID-19 pandemic.

An initial aim of this study was to further explore the profiles of resilience we obtained in Study 5. We also examined psychological outcomes that might be predicted from these profiles, namely anxiety, depression, well-being, and behavioural-related outcomes (including risk-taking, impulsiveness, undesirable coping behaviours, perceptions of coping effectiveness, and preventative behaviours). We also examined these same outcomes four months later. In addition, we explored the stability and reliability of the emerging resilience profiles, in which these profiles are expected to be relatively stable (e.g., Pangallo et al., 2015). Lastly, we examined the influence of COVID infection and affect on resilience profile membership. Gaining insight into these variables could help inform on the psychological impact of the pandemic and the role of resilience, as well as guide future interventions in improving psychological and behavioural outcomes from it.

Resilience, COVID-19, and Predictive Outcomes

As previously discussed, more resilient individuals have better pro-active and reactive responses to adversity (e.g., Bryan et al., 2019; Fletcher & Sarkar, 2016). Thus, the benefits of how an individual can anticipate, minimise, manage, and mend from the negative effects of adversity should apply to the current pandemic. Considering the four profiles from Study 5, we offer the following predictions:

Profile 1 *Low Resilience – High Anticipate*: Given the correlations between severity of COVID-19 experience, well-being, and resilience, with resilience having a protective

effect on well-being (e.g., Arslan et al., 2020; Yildirim & Arslan, 2020), it seems likely that individuals in this profile may experience increased stress, anxiety, and depression during the pandemic. A high level of anticipation with lower levels in the other resilience mechanisms may be associated with over-active threat detection, causing anxiety (e.g., Byrne & Eysenck, 1995; Stein & Nesse, 2011). Anticipating a significant impact of coming adversities may also reflect a low opinion of the individuals' coping abilities. Managing and mending ineffectively however, can lead to psychological issues such as anxiety due to effects such as over-rumination (e.g., O'Connor et al., 2007), or might predict negative behavioural outcomes such as excessive vice consumption (undesirable coping behaviours) and impulsive behaviour (Cropley et al., 2011; Cribb et al., 2006; Isles et al., 2018; Morrison & O'Connor, 2004; Pederson et al., 2011) as a way of attempting to cope.

Profile 2 *Lower resilience – High Pro-Active*: These individuals would likely present similar outcomes to Profile 1, particularly regarding depression and well-being. Behaviourally, minimising actions such as taking precautionary/preventative measures (e.g., mask-wearing) would reduce negative affect and physical risk (Balkhi, 2020; Wang & Zhao, 2020). Individuals with this profile, with less ability to manage and mend, may present as taking fewer risks and have less effective coping methods (e.g., Herman et al., 2018; Weiner, 1980).

Profile 3 *Moderate Resilience – High Reactive*: Individuals in this profile would be expected to report less depression and anxiety than Profile 1. A higher manage and mend in comparison to the other mechanisms may suggest more effective coping methods and behaviours (e.g., Boyes et al., 2015; Trivate et al., 2019). The relatively lower levels of anticipate and minimise compared to manage may be associated with more frequent risk-taking behaviours. High risk-taking may be due to a high perceived ability to cope and handle

various threats (e.g., Herman et al., 2018) and reflect less perceived need to be aware of and plan for these threats.

Profile 4 *High Resilience – High Reactive*: Having a relatively high resilience, these individuals would be expected to be far less negatively affected by the pandemic, with a greater sense of well-being (e.g., Fisk & Dionisi, 2010; Sanders et al., 2015), less depression and anxiety, and using effective coping techniques, and presenting fewer undesirable behaviours around COVID-19 (e.g., Arslan et al., 2020; Yildirim & Arslan, 2020). With a greater anticipate, these individuals may be more inclined to perceive and consider threats to a greater degree (e.g., Allen & Honeycutt, 1998) but may also take more calculated risks with the perception of being able to manage and mend effectively from the potential threat (e.g., Herman et al., 2018; Isles et al., 2018; O'Connor et al., 2007).

To summarise, this study aimed to confirm the resilience profiles from Study 5 and how many group members they tend to have, along with examining predicted outcomes of these profiles in the context of the pandemic. In addition, we examined the stability of these profiles over a four-month period, and if the profiles predicted the aforementioned outcomes at this second timepoint.

Method

Participants

Following institutional ethical approval, we recruited a convenience sample of 400 participants (M_{age} = 32.1, *SD* = 8.9; *n* = 184 Male, *n* = 183 Female, *n* = 33 preferred not to say). Participants stated their Nationalities as 39 American, one Austrian, 248 British, one Croatian, eight French, one Georgian, one Greek, one Indian, one Iranian, one Irish, three Italian, one Malaysian, one Norwegian, one Polish, one Romanian, one Spanish, and one Sri Lankan.

To examine the stability of resilience profiles across the pandemic, approximately four months after the original data collection we invited participants to complete the measures for a second time. At this second data collection point, 175 of the original 400 participants responded (M_{age} = 31.3, *SD* = 7.6; *n* = 84 Male, *n* = 77 Female; *n* = 14 preferred not to say). These sample sizes for LPA and LTA are similar to other research that use LPA and LTA, and thus suggests they are appropriate (e.g., Gillet et al., 2017; Li et al., 2016; Wang et al., 2021). With regards to the attrition rate, other psychological research has found that even with timepoints spanning years, any potential bias is likely to be minimal (Wolke et al., 2009).

Measures and Procedures

We gave the following measures (see Appendix G) to participants to complete in their own time online, being presented in a random order to remove order effects.

Resilience.

In line with Study 5, we used the General domain of the Resilience Process Scale.

Depression and Anxiety

We measured depression and anxiety using the 4-item PHQ-4 (Kroenke et al., 2009). Items are anchored on a 3-point Likert-type scale following the statement "Over the last 2 weeks, how often have you been bothered by the following problems?" (1 = *not at all* to 3 = *nearly every day*). Factor analysis by Kroenke et al. (2009) showed good validity along with Cronbach's alpha scores all over .80. The participant instruction reads "Over the last 2 weeks, how often have you been bothered by the following problems?". Two items measure depression (e.g., "Feeling down, depressed, or hopeless"), and two measure anxiety. Although the four items are usually measured together, given the item's origins in the PHQ-2 and GAD-2, we examined them separately (Löwe et al., 2010). The depression items (PHQ-2) have shown good criterion and convergent validity and sensitivity to change, along with

good internal consistency (α = .83) in previous studies (Löwe et al., 2005). The anxiety items (GAD-2) showed similar good validity properties including discriminant validity, with good internal consistency (α = .86) found in previous studies (Ahn et al., 2019).

Well-Being and Affect.

We used the World Health Organisation's recommended COVID-19 survey tool (WHO, 2020b) to examine the psychological outcomes of well-being and affect. Affect was adapted for this survey tool from Bradley and Lang (1994) to use COVID-19 as the subject, with seven items such as "COVID-19 to me feels: 1 = *Fear-inducing* to 7 = *Not fear-inducing*" (this item being reverse scored). The WHO-5 examined well-being and is amongst the most widely used questionnaires assessing subjective psychological well-being and has been found to have adequate validity in screening for depression and in measuring outcomes in clinical trials (e.g., Topp et al., 2015). Five items are anchored on a 5-point Likert-type scale (5 = *All of the time* to 1 = *At no time*) with the statement "Over the past 2 weeks…" followed by items such as "I have felt cheerful and in good spirits". Previous studies report Cronbach's alpha scores from .83 to .92 (e.g., Krieger et al., 2014).

Coping Effectiveness.

We assessed perceptions of coping effectiveness using the 7-item Coping Effectiveness scale (Gottlieb & Rooney, 2004; Nicholls et al., 2011). The items are anchored on a 4-point Likert type scale (1 = *strongly disagree* to 4 = *strongly agree*). The instruction given to participants was reworded to ask how they felt they were coping with the pandemic, with example items such as "I'm dealing with this problem better now than I used to" followed by the aforementioned Likert-type scale. Convergent validity of the scale has been demonstrated in positive relationships with positive framing and affect, with Cronbach's alphas ranging from .66 to .74 in previous studies (Gottlieb & Rooney, 2004; Nicholls et al., 2011).

Impulsiveness.

We measured impulsiveness using the Barratt Impulsiveness Scale – Brief (Steinberg et al., 2013). This scale comprises eight items anchored on a 4-point Likert-type scale (1 = *rarely* to 4 = *almost always/always*) with items such as "I do things without thinking". Cronbach's alpha scores from previous studies ranged between .83 and .86 and provided evidence of reliability (Steinberg et al., 2013).

Risk-Taking.

We measured risk-taking using the General Risk Propensity Scale (Zhang et al., 2018), an 8-item measure anchored on a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*) that examines risk-taking as a general personality disposition with items such as "I am attracted, rather than scared, by risk". Discriminant and convergent validity were demonstrated, and with Cronbach alphas scores from previous studies between .58 to .93 and coefficients of .89 and .93 (Zhang et al., 2018).

Preventative Behaviours, Unwanted Behaviours, and Past COVID Infection.

The World Health Organisation's recommended COVID-19 survey tool (WHO, 2020b) also has measures we used to examine the outcomes of preventative behaviours, unwanted behaviours/coping, and past COVID infection (see Appendix G). Preventative behaviours are a 9-item measure anchored on a 7-point Likert type scale (1 = *Not at all* to 7 = *Very much so*; followed by *Not applicable*), with items adapted from Steel-Fisher et al. (2012) and including "Wore a mask in public" and "I frequently washed my hands with soap and water for at least 20 seconds". Unwanted behaviours are an 8-item measure anchored by *Yes*, *No,* and *Not applicable*, with these items created purely for this survey with items such as "Exercised less than I did before the pandemic" following a vignette on what they had done within the last 2 weeks. Past COVID infection was simply asking if participants had been previously infected (measured by *Yes* or *No*), followed by if it was *mild* or *severe*, and if

it was confirmed by a test or not. This was then followed up with if anyone in their immediate social environment *were* or *had been* infected, and if anyone they know had died from it (both being *Yes* or *No* items).

Confirmatory Factor Analysis and Validation.

Measures examining affect, preventative behaviours, and unwanted behaviours were either created or adapted for this survey tool without providing evidence of any validation studies, and so we checked them for validity using a Bayesian Structural Equation Modelling approach to factor analysis (BSEM; e.g., Niven & Markland, 2016, see also Chapter 2 for more detail on this approach) and composite reliability. For unwanted behaviours, due to the data being ordinal (*Yes* or *No* answers) we used diagonally weighted least squares (WLSMV); as the method of factor analysis, as this is the appropriate method for this type of data (e.g., Zhang et al., 2021).

Affect.

Confirmatory Factor Analysis for the affect scale demonstrated a good model fit (PP*p* of .49; CI of -20.65 and 20.57) and Factor Loadings (FL) between .49 to .64, with a composite reliability score of .72 for all items (see Appendix H for final used items from these analyses).

Preventative Behaviours.

The initial model fit for the preventative behaviours scale was acceptable (PP*p* of .52; CI of -29.29 and 28.25). However, three items had particularly low FLs (<.4), and we deemed less appropriate (e.g., “Used antibiotics to prevent or treat COVID-19” was not deemed a useful preventative behaviour). We subsequently removed these items and re-analysed the scale, which resulted in a good model fit (PP*p* of .50; CI of -20.50 and 21.21). All remaining FLs were between .41 to .60, and composite reliability was appropriate at .71.

Unwanted Behaviours.

We removed three items initially as they were deemed irrelevant (e.g., "Bought drugs I heard were good for treating COVID-19"). The model fit following this for the unwanted behaviours scale was acceptable ($\chi2 = 13.48$; $df = 5$; $p = .019$; RMSEA = .094; CFI = .893; SRMR = .060), but item 2 had a very low FL (.15). We subsequently removed this item, leaving four that were deemed still relevant, although two of these items still had relatively low FL (.3 and .31), they still significantly loaded onto their factor. Re-analysis of the scale resulted in an acceptable model fit ($\chi2 = 9.09$; $df = 2$; $p = .011$), and a composite reliability at .58, only a little below acceptable standards (.60; Hamid et al., 2017), however caution is advised when interpreting this variable.

Main Analyses

Latent Profile Analysis.

We used Latent Profile Analysis following the same approach as Study 5. To examine the impact of profiles on outcomes, we used an extension of this method in which auxiliary variables can be added using the DU3STEP command in Mplus (Asparouhov & Muthén, 2014), which allows for examining the influence of the resilience profiles on the psychological and behavioural outcomes. We initially ran these analyses on the data from Timepoint 1. Following this first set of analyses we then explored the influence of resilience profiles at Timepoint 1 on outcomes at Timepoint 2 using the data from those who had completed measures at both timepoints.

Latent Transition Analysis.

Lastly, to examine the stability of resilience profiles across time, we conducted two separate LPAs, followed by Latent Transition Analysis (LTA; e.g., Gillet et al., 2017). LTA is an extension of LPA in which one can estimate the probabilities of transitions among profiles over time based on the likelihood-ratio G^2 statistic, in addition to AIC and BIC. The

two LPAs help establish that profiles remain the same at each timepoint. If this is found, LTA (assuming the profile structures themselves are identical or very similar at each timepoint) is used to examine if members of a resilience profile tend to stay in their profile over time, or if their profile membership changes, and if so, to which profile they transition to.

Screening for Extraneous Influences.

To examine if experiences of the pandemic itself had a more immediate influence on the resilience profiles, we explored the extent to which affect and whether the participant had been infected with COVID-19 influenced profile membership using the R3STEP command (Asparouhov & Muthén, 2014) as an addition to LPA. We also conducted correlational analysis between each of these measures and the separate resilience mechanisms, to examine if these variables could have influenced resilience levels and profile membership.

Results

Resilience Profiles

The process of LPA resulted in a four-profile solution that was consistent with Study 5. Table 4.2 shows model fit indices, with the 4-class solution demonstrating lower AIC, BIC, and aBIC, a good entropy value (.78), significant LMR LRT and BLRT scores ($p < .05$), and meaningful group sizes. The fit indices demonstrated a more optimal fit with four profiles in comparison to other solutions. The entropy score also showed a clearer delineation of profiles, along with an acceptably high group membership within each profile (without for example, a profile with only >10 participants). A 5-class solution was also a good fit based on fit indices. However, three of the profiles in the 5-class solution had a low group membership (11, 19, and 24, from a sample of 400), making this solution impractical to use going forward. For these reasons, we used a four-profile model.

Table 4.2

Fit indices comparing different profile solutions

LPA Outputs	AIC	BIC	Adj BIC	Entropy	LMR LRT	BLRT
1 Class	4552.60	4584.53	4559.15	N/A	N/A	N/A
2 Class	4275.79	4327.68	4286.43	0.750	<.001	<.001
3 Class	4232.51	4304.36	4247.24	0.762	<.001	<.001
4 Class	4191.89	4283.70	4210.71	0.778	0.003	<.001
5 Class	4175.78	4287.54	4198.70	0.825	0.213	<.001

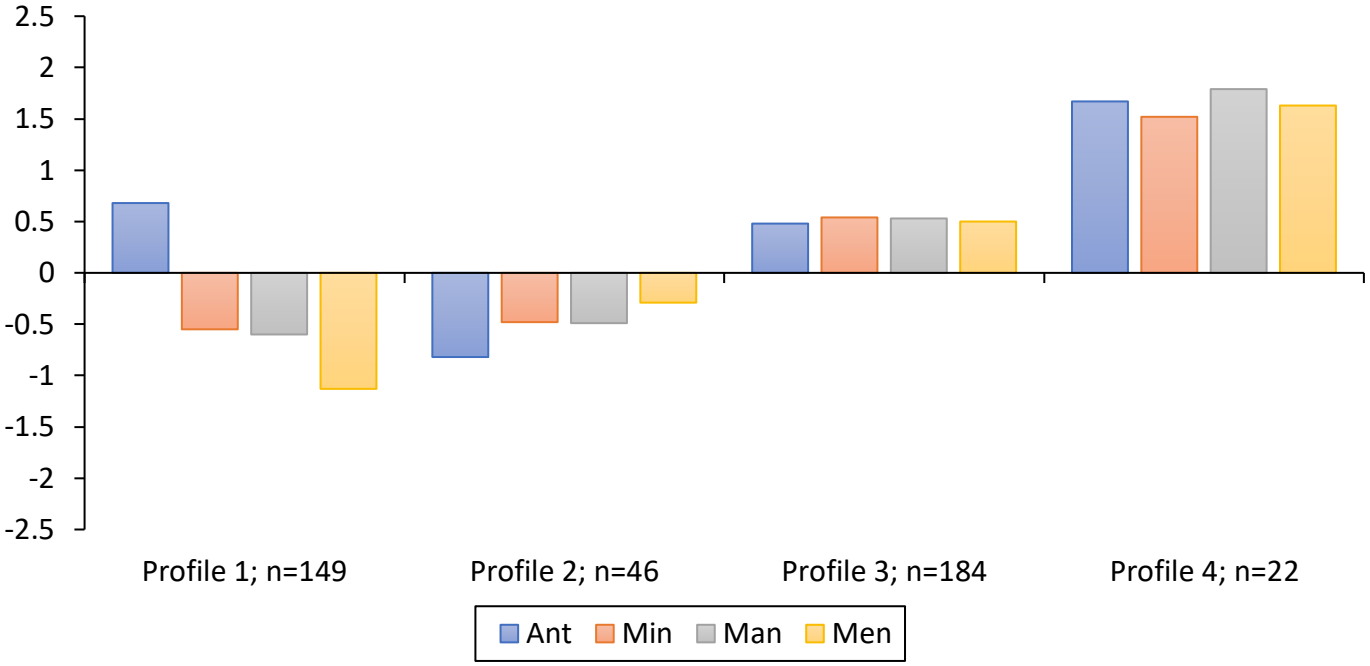
Figure 4.2 contains the standardised pattern of anticipate, minimise, manage, and mend for each of the four profiles, along with the number of participants contained in each respective profile. We named Profile 1 (12.3% of the sample) *Low Resilience – High Anticipate*. Individuals in this profile reported a low level of resilience, with anticipate being higher and mend being relatively lower. This pattern is similar to Profile 1 in Study 1.

We named Profile 2 (36.5% of the sample) *Low Resilience – Low Anticipate.* Individuals in this profile reported a low level of resilience, with anticipate being particularly low. Though not directly predicted, this profile is similar to profile 1 within this same study, but with an inversion of the anticipate mechanism.

We named Profile 3 (45.8% of the sample) *Moderate Resilience.* Individuals in this profile reported a moderate level of a resilience, with similar levels of each mechanism across the board. This profile is also similar to Profile 3 in the Study 5, but without an elevated relative level of manage and mend.

Figure 4.2

Standardised profiles of resilience for Study 6 (total n = 400)



Lastly, we named Profile 4 (5.5% of the sample) *High Resilience*, which a small amount of the sample fell into. Individuals in this profile reported a high level of resilience across the board, analogous to Profile 4 within Study 5. However, there are some differences evident. In Study 5, anticipate/minimise are both lower than manage/mend, as opposed to being more evenly balanced in this study.

Impact of Resilience Profiles

Below are the reported outcomes from our measures for each of these four resilience profiles (see Table 4.3 for all outcome means across profiles).

Anxiety.

The profiles demonstrated significant differences in anxiety ($\chi 2 = 13.51$, $p = .004$). Specifically, Profile 1 ($M = 4.47$) displayed the highest score, and Profile 4 the lowest ($M = 2.73$). Members of Profile 1 (*Low Resilience – High Anticipate*) and 3 were significantly higher than Profile 2 (*Low Resilience – Low Anticipate;* $M_{diff} = 0.77$, $p = .005$), those in

Profile 3 (*Moderate Resilience*) were also significantly higher than those in Profile 2 (M_{diff} = 0.61, p = .002). However, although members of Profile 4 (*High Resilience*) had the lowest mean for anxiety, this profile was not significantly different to any other profile.[8]

Depression.

The profiles showed significant differences in depression ($\chi 2$ = 29.75, p < .001), with Profile 1 (M = 4.50) displaying the highest score. Depression scores were greater for those in Profile 1 than Profile 3 (M = 3.98, M_{diff} = 0.53, p = .063), and significantly higher than Profile 2 (M = 3.74, M_{diff} = 0.76, p = .006), and Profile 4 (M = 2.70, M_{diff} = 1.80, p < .001). Depression scores were also significantly lower for those in Profile 4 than Profile 3 (M_{diff} = 1.27, p < .001) and Profile 2 (M_{diff} = 1.03, p < .001), as well as Profile 1.

Well-Being.

The profiles showed significant differences in well-being ($\chi 2$ = 11.85, p = .008), with Profile 4 (M = 68.76) displaying the highest score, and Profile 1 (M = 45.06) the lowest. Profile 4 was associated with significantly higher well-being than each other profile. No other differences were significant.

Risk-Taking.

We observed differences in risk-taking across the profiles ($\chi 2$ = 36.66, p < .001). Specifically, Profile 3 (M = 3.59) had the highest levels of risk-taking and Profile 1 (M = 2.79) the lowest. Risk-taking scores for those in Profile 3 were significantly higher than Profile 1 (M_{diff} = 0.80, p < .001), and Profile 2 (M = 3.19, M_{diff} = 0.41, p < .001). Those in Profile 1 were also significantly lower in risk-taking than Profile 2 (M_{diff} = 0.40, p = .006), and lower in risk-taking (with the difference approaching significance) than Profile 4 (M = 3.42, M_{diff} = 0.63, p = .067).

[8] This was most likely due to a relatively very high standard error (SE = 1.03) in anxiety scores for Profile 4

Impulsiveness.

The profiles showed significant differences in impulsiveness ($\chi 2 = 71.45$, $p < .001$), with Profile 2 ($M = 19.60$) displaying the highest score and Profile 4 ($M = 12.46$) the lowest. Profile 2 had significantly higher levels of impulsiveness than Profile 1 ($M_{diff} = 1.68$, $p = .048$), Profile 3 ($M_{diff} = 2.42$, $p < .0001$), and Profile 4 ($M_{diff} = 7.14$, $p < .001$). Those in Profile 4 were also significantly lower than Profile 1 ($M_{diff} = 5.47$, $p < .001$), and Profile 3 ($M_{diff} = 4.72$, $p < .001$).

Coping Effectiveness.

The profiles showed significant differences in coping effectiveness ($\chi 2 = 23.69$, $p < .001$), with those in Profile 4 ($M = 3.04$) having the highest score and Profile 1 ($M = 2.46$) the lowest. Members of Profile 4 were significantly higher than those in Profile 1 ($M_{diff} = 0.59$, $p < .001$), Profile 3 ($M_{diff} = 0.59$, $p < .001$), and Profile 4 ($M_{diff} = 0.55$, $p < .001$). No other profiles significantly differed.

Preventative Behaviour.

The profiles showed significant differences in preventative behaviour ($\chi 2 = 70.12$, $p < .001$), with Profile 4 ($M = 6.14$) displaying the highest score, and Profile 2 ($M = 4.85$) the lowest. Those in Profile 1 engaged in significantly fewer preventative behaviours than Profile 3 ($M_{diff} = 0.71$, $p = .001$) and Profile 4 ($M_{diff} = 1.20$, $p < .001$). Those in Profile 2 engaged in significantly less than Profile 3 ($M_{diff} = 0.71$, $p < .001$) and Profile 4 ($M_{diff} = 1.29$, $p < .001$). The difference in engaging in more preventative behaviours between those in Profile 4 and Profile 2 approached significance ($M_{diff} = 0.49$, $p = .051$).

Avoiding Unwanted Behaviour.

The profiles predicted significant differences in avoiding unwanted behaviour ($\chi 2 = 12.77$, $p = .005$). Profile 4 ($M = 1.71$) displayed the highest score, and Profile 1 ($M = 1.36$) the lowest. Those in Profile 4 were significantly higher than Profile 1 ($M_{diff} = 0.35$, $p = .001$),

Profile 2 (M_{diff} = 0.25, p = .011) and approached significance in avoiding more unwanted behaviours than Profile 3 (M_{diff} = 0.20, p = .053). Those in Profile 3 (M = 1.51) were also higher than Profile 1 (M_{diff} = 0.15, p = .032).

Table 4.3

Mean (M) outcome scores across each profile

	Profile 1		**Profile 2**		**Profile 3**		**Profile 4**	
	M	***SE***	***M***	***SE***	***M***	***SE***	***M***	***SE***
Anxiety	4.47	0.23	3.69	0.10	4.30	0.16	2.73	1.03
Depression	4.50	0.25	3.74	0.08	3.98	0.11	2.70	0.25
Well-Being	45.06	2.61	47.12	0.83	45.58	1.80	68.76	6.54
Risk-Taking	2.79	0.14	3.19	0.03	3.59	0.07	3.42	0.30
Impulsiveness	17.92	0.76	17.18	0.35	19.60	0.26	12.46	1.05
Coping Effectiveness	2.46	0.09	2.49	0.03	2.46	0.05	3.04	0.11
Preventative Behaviour	4.94	0.20	4.85	0.07	5.65	0.09	6.14	0.23
Unwanted Behaviour	1.36	0.06	1.47	0.03	1.51	0.03	1.71	0.09

Causal Outcomes of Resilience Profiles

We examined the influence of resilience profiles at Timepoint 1 on outcome variables at Timepoint 2, to investigate longitudinal effects of resilience, as a supplement to cross-sectional analysis as demonstrated above[9], using the data from participants who had completed all measures at both time points. In these analyses there were no differences across the profiles for anxiety, coping effectiveness, preventative behaviours and avoiding unwanted behaviours. However, we found differences between profiles for the other outcome variables

[9] We also examined resilience profiles at Timepoint 2 with Timepoint 2 outcomes, producing similar findings to those presented here with Timepoint 1 profiles.

and summarise these below. It is noteworthy that, in most cases, the nature of the differences between profiles were similar to the cross-sectional analyses.

Depression.

The profiles still demonstrated significant differences in depression (see Table 4.4 for all outcome means across profiles; $\chi 2 = 11.73$, $p = .008$). Profile 4 ($M = 3.05$) displayed the lowest score, and Profile 1 ($M = 4.42$) the highest once again. Those in Profile 1 were significantly higher in depression than those in Profile 2 ($M_{diff} = 0.90$, $p = .031$) and 4 ($M_{diff} = 1.38$, $p = .001$), and those in Profile 3 were significantly higher than those in Profile 4 ($M_{diff} = 0.85$, $p = .010$).

Well-Being.

The profiles showed significant differences in well-being ($\chi 2 = 36.30$, $p < .001$). Profile 4 ($M = 94.57$) displayed the highest score, and Profile 3 ($M = 65.25$) the lowest. Those in Profile 4 were significantly higher than those in all other profiles (vs. Profile 1: $M_{diff} = 26.49$, $p = .011$; Profile 2: $M_{diff} = 22.49$, $p = .011$; Profile 3: $M_{diff} = 29.32$, $p = .011$), those in Profile 2 were also significantly higher than those in Profile 3 ($M_{diff} = 6.84$, $p = .011$).

Risk-Taking.

The profiles again showed significant differences in risk-taking, with a similar pattern across the four profiles ($\chi 2 = 12.98$, $p = .005$). Profile 4 ($M = 3.44$) displayed the highest score, and Profile 1 ($M = 2.69$) the lowest. Members of Profile 4 were significantly higher in risk taking than those in Profile 1 ($M_{diff} = 0.75$, $p = .007$), those in Profile 2 were significantly lower than those in Profile 3 ($M_{diff} = 0.15$, $p = .047$) and higher than those in Profile 1 ($M_{diff} = 0.53$, $p = .010$), and those in Profile 3 were significantly higher than those in Profile 1 ($M_{diff} = 0.68$, $p = .001$).

Impulsiveness.

The profiles still showed significant differences in impulsiveness, with a similar pattern across the four profiles ($\chi 2 = 10.18$, $p = .017$). Profile 2 ($M = 19.57$) displayed the highest score, and Profile 4 ($M = 15.77$) the lowest. Those in Profile 2 were significantly higher than those in Profile 3 ($M_{diff} = 0.95$, $p = .030$) and Profile 4 ($M_{diff} = 3.80$, $p = .014$).

Table 4.4

Mean (M) outcome scores at Timepoint 2 across each profile

	Profile 1		**Profile 2**		**Profile 3**		**Profile 4**	
	M	***SE***	***M***	***SE***	***M***	***SE***	***M***	***SE***
Anxiety	3.83	0.29	3.61	0.15	3.76	0.12	3.67	0.28
Depression	4.42	0.33	3.52	0.17	3.89	0.15	3.05	0.28
Well-Being	68.09	3.11	72.09	2.32	65.25	1.25	94.57	5.06
Risk-Taking	2.69	0.20	3.22	0.05	3.37	0.05	3.44	0.34
Impulsiveness	18.92	0.99	19.57	0.41	17.97	0.58	15.77	1.50
Coping Effectiveness	2.68	0.17	2.48	0.09	2.67	0.09	2.97	0.16
Preventative Behaviour	4.87	0.23	4.90	0.09	5.18	0.09	4.88	0.20
Unwanted Behaviour	1.41	0.09	1.64	0.05	1.63	0.04	1.56	0.08

Stability of the Resilience Profiles

Profile Stability and Transitions.

LPAs at each timepoint using a four-profile solution (see Figures 4.3 & 4.4; Table 4.5 for fit indices), showed a good model fit in both instances. Profiles remained relatively similar in pattern and magnitude; however, profile membership did change somewhat (see Figures 4.3 & 4.4), highlighting the need for transition analysis to examine this further.

Table 4.5

Fit indices comparing LPA model fit at each timepoint

LPA Outputs	AIC	BIC	Adj BIC	Entropy	LMR LRT	BLRT
Time 1: 4 Class	1817.94	1890.72	1817.89	0.775	0.223	<.000
Time 2: 4 Class	1708.26	1781.05	1708.22	0.727	0.726	0.03

Figure 4.3

Standardised profiles of resilience for Timepoint 1 (LPA; 175 total n = 400)

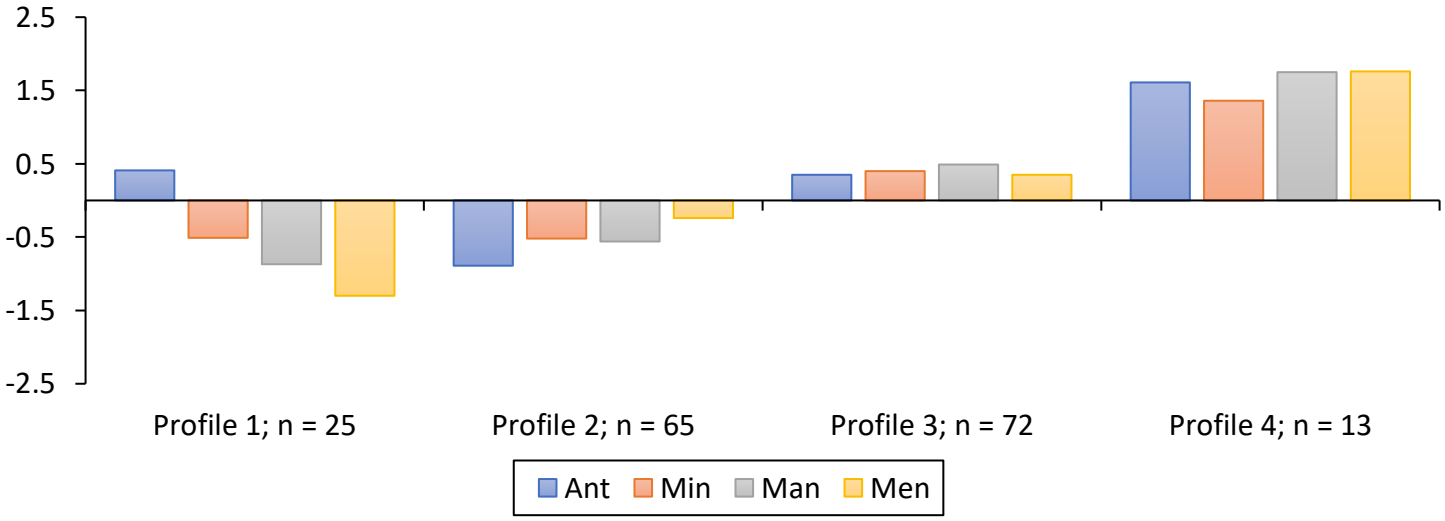
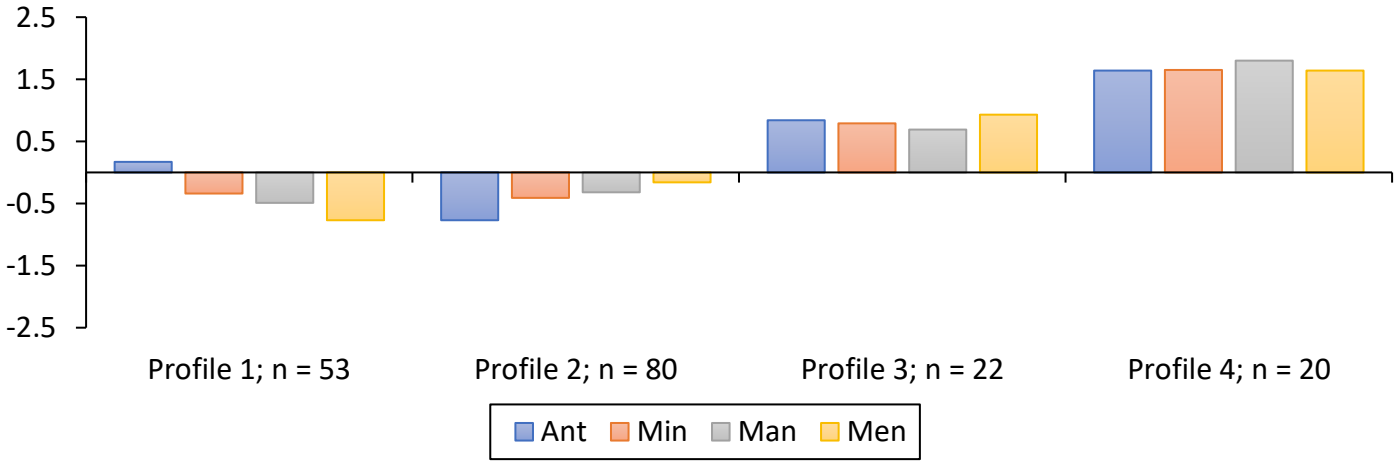


Figure 4.4

Standardised profiles of resilience for Timepoint 2 (LPA; n = 175)



Transition analysis demonstrated similar findings of good model fit and demonstrated stable profiles and some relative instabilities (cf. Gillet et al., 2017; see Table 4.6 & Figure 4.5).

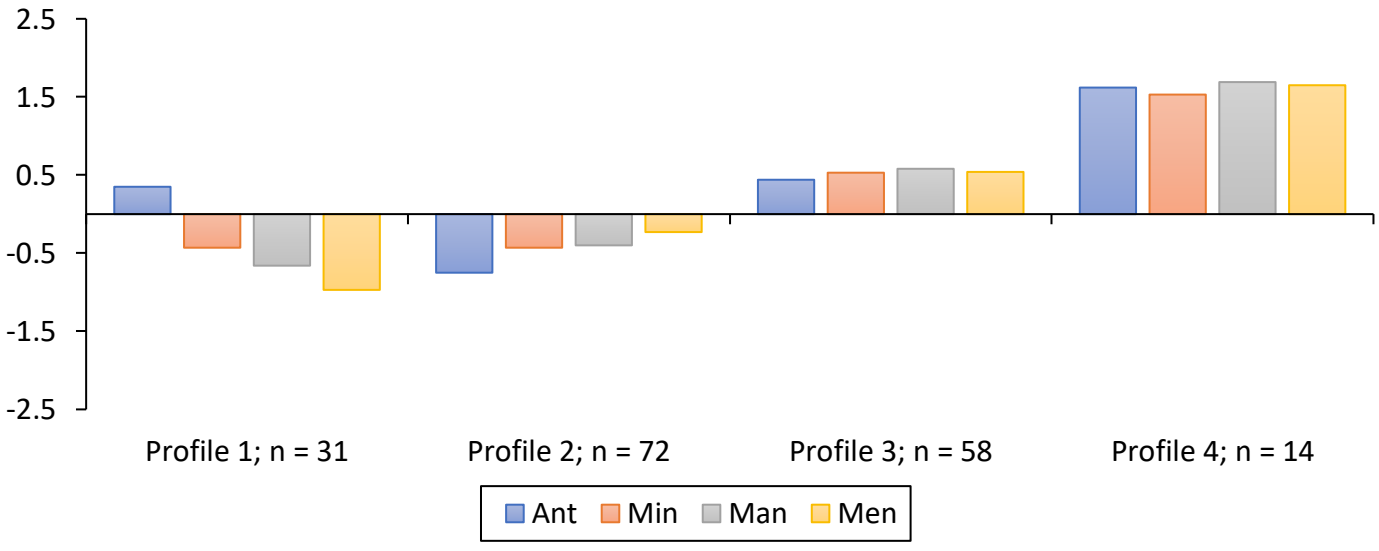
Table 4.6

*Fit indices for LTA model fit, followed by profile transitions by each column (in **bold** represents their stability)*

LTA Outputs	AIC	BIC	Adj BIC	Entropy
4 Class	1817.94	1890.72	1817.89	0.804
	Profile 1	**Profile 2**	**Profile 3**	**Profile 4**
Profile 1	**0.803**	0.132	0.020	0.115
Profile 2	0.001	**0.744**	0.497	0.312
Profile 3	0.090	0.058	**0.351**	0.001
Profile 4	0.106	0.066	0.132	**0.573**

Figure 4.5

Standardised profiles of resilience for LTA for the two timepoints (n = 175). Group membership is at Timepoint 1



Profile 1 was stable (80.3% of participants remained in this profile across time) with small transitions into Profile 3 (9%) and Profile 4 (10.6%), with transition probabilities (see Table 4.6) demonstrating a shift from lower resilience to higher resilience over the timepoints.

Profile 2 was also stable (74.4%) with small transitions into Profile 3 (5.8%), Profile 4 (6.6%), and Profile 1 (13.2%), showing some participants shifting from lower resilience to higher, and some moving to a similar profile with higher anticipation but lower mending.

Profile 3 had relative instability (35.1%) with transition probabilities demonstrating a shift into Profile 2 (49.7%) and Profile 4 (13.2%), showing those with moderate resilience tended to shift to lower resilience or higher resilience over the timepoints.

Profile 4 was somewhat stable (57.3%) with transitions into Profile 1 (11.5%) and Profile 2 (31.2%), showing those with high resilience shifting to lower resilience profiles.

Screening for Extraneous Influences

Affect was negatively correlated with previous COVID-19 infection (r = -.26; p < .001), and positively correlated with anticipate (r = .16; p = .002) and minimise (r = .20; p <.001). Further, infection and minimise were negatively correlated (r = -.15; p = .004).

R3step LPA gave odds ratio tests demonstrating that a high negative affect would make an individual more likely to be in Profile 2 than Profile 3 (OR = .71; p = .006), suggesting that individuals reporting more negative affect tended to have a lower resilience profile. People who had had COVID-19 before were more likely be in Profile 1 than Profile 2 (OR = .26; p < .001), Profile 3 (OR = .35; p = .017), or Profile 4 (OR = .12; p < .001. In addition, they were more likely to be in Profile 2 than Profile 4 (OR = .33; p = .002). Thus, individuals reporting previous infections were more likely to be in a lower resilience profile than high resilience.

Discussion

In Study 6 we re-examined resilience profiles in a general population during the COVID-19 pandemic. The purpose was threefold: (a) to confirm the replicability of the profiles, (b) to examine what psychological and behavioural outcome variables the profiles might predict, and (c) to examine the stability of these profiles over time during the course of the pandemic.

Resilience Profiles

We were able to provide a partial replication of the profiles obtained in Study 5. We again obtained profiles that reflected low, moderate, and high levels of resilience (specifically 1, 3, and 4). However, two profiles were somewhat different as Profiles 3 and 4 were more level across mechanisms in this study compared to Study 5. In addition, Profile 2 had lower pro-active mechanisms, whereas its Study 5 counterpart had lower levels of reactive mechanisms. Such differences might be expected given the differences in the sample demographic. In Study 5, we sampled a generally much younger sample, with a mean age of 21 compared with 32 in Study 6. Research shows that adults typically have a greater emotional regulation and problem-solving ability, but younger adults are better at utilising social support (Gooding et al., 2011). Thus, different levels of mechanisms might emerge because of age differences. Another factor to consider is that the data in Study 6 were collected during the COVID-19 pandemic, in which many people were undergoing or were dealing with many potentially novel and intense stressors (Cao et al., 2020; Hull et al., 2020). Therefore, as a state-like process, their resilience would likely present differently compared to pre-pandemic individuals. The implications of this are that the sample being investigated and the context in which they are being studied should be considered when examining resilience profiles, particularly if comparing them to different groups or at different times.

Influence of Resilience Profiles on Outcome Variables

Each resilience profile is summarised in this section in relation to its association with the predictive outcome variables.

Profile 1: *Low Resilience – High Anticipate, low Mend* contained individuals with higher levels of depression and anxiety as expected (e.g., Ran et al., 2020), with high anticipate and low mend likely contributing to anxiety and depressive symptoms (e.g., Alderman et al., 2015; Anderson, 2003; Byrne & Eyesenck, 1995). These individuals were low in risk-taking and moderate/high in impulsiveness. Low risk-taking could be expected with a high level of threat detection (anticipate) and lower resilience to deal with the consequences. Impulsiveness (though somewhat moderate) may have been due to a lack of more effective long-term coping methods as these individuals struggled not to engage in undesirable coping behaviours such as smoking (Kale et al., 2018) and eating unhealthy foods (e.g., Cropley et al., 2011), with a focus on avoidance (e.g., Cribb et al., 2006; Morrison & O'Connor, 2004). However, these coping methods were only perceived as less effective compared to those with much higher resilience, suggesting these coping methods had some short-term utility at the very least.

Profile 2: *Low Resilience – Low Anticipate* contained individuals with similar levels of depression but lower anxiety than those in Profile 3. The particularly low levels of anticipate may reflect a lack of threat awareness/detection, which would potentially lower anxiety (e.g., Byrne & Eysenck, 1995; Stein & Nesse, 2011). This lack of anticipate (paired with low minimise) also likely explains the moderate levels of risk-taking, but also the high levels of impulsiveness that leads to engaging in unwanted behaviours and a lack of preventative/precautionary behaviour. High impulsiveness in these individuals would be expected; combined with their lower risk perception, these individuals could engage in more harmful and self-destructive behaviours (e.g., Ryb et al., 2005). Impulsive behaviours have

been demonstrated to be a response to negative emotions and low resilience to adversity (Choi et al., 2015; Herman et al., 2018) and, therefore, may explain why these individuals score so highly in them.

Profile 3: *Moderate Resilience* contained individuals with moderate/high levels of anxiety and depression. Anxiety levels did not differ significantly from Profile 1, with similar anticipation levels likely contributing to this. In this profile, anxiety levels may represent a higher engagement, motivation, and attentiveness to the pandemic (e.g., Wirtz et al., 2019) as depression levels were lower. High risk-taking coupled with only moderate impulsiveness suggests that any risk-taking by individuals in Profile 2 was somewhat 'calculated' risk-taking, being tempered by a perceived ability to mitigate for and deal with the threats and consequences of a risk for a perceived reward (e.g., Herman et al., 2018). This conclusion is somewhat supported by the much greater use of preventative measures by individuals in this profile. However, preventative measures may reflect anxiety and more compulsive use of them as a coping method. Nevertheless, individuals in Profile 3 appeared generally better at avoiding undesirable behaviours than those in Profile 1.

Lastly, Profile 4: *High Resilience,* as expected, had individuals with the lowest levels of depression and anxiety with higher well-being (e.g., Fisk & Dionisi, 2010; Sanders et al., 2015). Though anticipate is higher, the greater capacity to deal with these adversities from their other high mechanisms could be what leads to calculated risk-taking, with low compulsion to act on impulses (e.g., Herman et al., 2018; Isles et al., 2018) that leads to greater reward and experience – thus nurturing further resilience (e.g., Fletcher & Sarkar, 2016; Trivate et al., 2019; Zimmer-Gembeck et al., 2018). These positive effects could be associated with the individuals' ability to avoid unwanted behaviours, high coping effectiveness, and engagement in mitigating preventative behaviours.

Causal Outcomes over Time.

Generally, resilience profiles predicted outcomes in similar ways across time. High resilience was still associated with the lowest depression and impulsiveness, along with the highest well-being and high risk-taking. Anxiety was an exception to this rule, as resilience profiles failed to predict differences in anxiety at Timepoint 2. Resilience profiles also failed to predict differences in some of the behavioural outcomes, notably coping effectiveness, preventative behaviours, and avoiding unwanted behaviours. These changes may have been due to novelty and fear of the unknown in relation to the pandemic experiences having reduced over the four months (e.g., Fu et al., 2021), and the availability of vaccinations easing fears and uncertainty (Ingram et al., 2021), or simply that individuals with lower levels of resilience having learned to deal with the anxieties and coping (or lack of) better over this timespan. Lastly, the non-significant effects may have resulted from the reduced sample size at Timepoint 2.

Most resilience profiles were relatively stable over time. However, a future study could examine these potential antecedents of resilience profiles to help practitioners plan for and better take circumstances into account when investigating resilience and giving interventions. Such a study may also provide a further understanding of resilience and, for example, give insight into why some profiles were less stable and why some profiles may have failed to predict similar differences at Timepoint 2.

Profile Stability and Transitions

The Transition analyses revealed that profiles were somewhat stable across time, as most participants remained in their profiles from Timepoint 1 to Timepoint 2 over the four-month period. The least stable profiles were Profile 3, with moderate resilience, and (although more stable) Profile 4, with high resilience. Those in Profile 3 tended to transition to Profile 2 (low resilience with lower Anticipate) and Profile 4 (associated with higher levels

of resilience). Those in Profile 4 tended to transition to profiles with lower levels of resilience (the only direction they can transition to). Profile 1 and 2 were more stable, with only small transitions into other profiles. The findings highlight that resilience profiles, while somewhat stable, are subject to change depending on the individual and the context (especially during the pandemic), highlighting the state-like nature of resilience.

Extraneous Influences

Negative affect and infection appeared to have some influence on resilience profiles when examined. Negative affect seemed more apparent in those who hadn't been infected with COVID-19. This finding may have been due to the novelty and unknown creating fear around becoming infected, as opposed to those that had and dealt with it. In addition, the perception of more immunity to future infection could reduce fear, leading to less worry and affect (e.g., Mertens et al., 2020). Expectedly, the negative affect around the pandemic thus did correlate with anticipation and minimising of potential threats. It was also demonstrated that higher negative affect from the pandemic was more associated with a lower resilience profile (compared, e.g., to a moderate resilience profile). Infection with COVID-19 was more associated with membership to any other profile than Profile 1 – characterised by low resilience with a high anticipate and low mend. This finding could suggest a more complex relationship between the psychological effects of COVID-19 infection and the negative thoughts and emotions associated with being infected.

To summarise, profiles tend to be stable over time and still predicted many of the measured outcomes over time. In addition, some influences such as negative affect and previous COVID-19 infection may influence which of the four emerging profiles individuals are members of.

General Discussion

Resilience Profiles

The aim of the present research was to explore profiles of resilience based on the resilience mechanisms presented herein. The second study aimed to confirm these profiles with a more heterogeneous sample collected during the COVID-19 pandemic. We examined behavioural and psychological outcomes that could emerge from these profiles, and lastly, we analysed these profiles for stability and reliability over a four-month period. The findings from the current study extend resilience research which, due to issues such as ambiguities of conceptualisation, has yet to consider resilience in terms of a within-person profile whereby the different facets of resilience are examined concurrently. This approach allows for a more nuanced and practical way of measuring and understanding the associated outcomes of an individual's resilience profile.

Overall, the resilience profiles demonstrated some similarities in patterns of the four mechanisms across different ages and times. The distinctions between profiles in both studies likely reflect individual differences, demographic circumstances such as age (e.g., Gooding et al., 2011) and the state-like nature of resilience (e.g., Bryan et al., 2019), and thus, the general demographic and context being examined should be considered when investigating resilience and its profiles. Generally, the more extreme profiles, such as very high and very low resilience had fewer members, with the majority of our participants fitting into a profile that was somewhat low to moderate in resilience. Some similarities in mechanism patterns remained across samples; for example, both studies contained profiles with higher levels of anticipation and lower levels of pro-active mechanisms. Thus, it can be concluded that most people fit into more moderate resilience profiles, but some may be higher in more anticipatory and pro-active aspects of resilience, and others more reactionary.

In addition to applications to the COVID pandemic discussed below, the studies demonstrate that profiling could provide a useful tool for practitioners. Personality screening, for example, has been used in various contexts such as space missions (McFadden et al., 1994). Practitioners could gain a quick and insightful look at how an individual may anticipate, minimise, manage, and mend from stressors in their area of interest and offer support for these mechanisms. Study 6 provides an example of how these profiles could lead to thoughts, feelings, and behaviours in the context of the pandemic.

Profiles and the COVID-19 Pandemic

Generally, a higher level of resilience was associated with better psychological outcomes, such as lower depression, and more appropriate behaviours, such as taking more preventative measures, findings consistent with previous research (e.g., Balkhi, 2020; Wang & Zhao, 2020). In addition, higher resilience was associated with more risk-taking, with low impulsiveness – along with more positive outcomes and coping – likely explained by the ability to minimise, manage and mend effectively. The influence of lower levels of resilience on the psychological and behavioural outcomes appeared to be somewhat dependent on the precise nature of the profiles. For example, profiles with lower levels of resilience, particularly when involving a higher anticipate, demonstrated fewer positive outcomes, with high awareness of threats presenting higher anxiety and taking fewer calculated risks. Lower resilience, when comprised of lower anticipation (and thus a possible lack of appreciation and mitigation for risks), also predicted a lack of impulse control and lack of preventative behaviours in the pandemic. Given that the majority of the sample fitted into a low/moderate resilience profile with lower anticipate or a moderate resilience profile, practitioners could use this insight when planning interventions, especially with the adversities associated with the pandemic (e.g., mitigating for and teaching strategies to deal with the physical and psychological risks of impulsive behaviours and lack of preventative measures).

Strengths, Limitations, and Future Directions

The current studies demonstrate a comprehensive approach to extend our understanding of resilience as a process. By using profiling with the mechanisms, we can gain more insight into resilience and its influences beyond examining simply 'low' or 'high' resilience. The use of two studies allowed for the examination of a more heterogeneous sample. In addition, we were able to provide some assessment of causality in terms of the influence of profiles on outcomes to supplement the cross-sectional analyses.

With regards to outcome variables, it is worth noting that throughout the data collection in Study 6 (approximately four months, beginning mostly throughout February 2021), lockdowns were eased as vaccination became more widely available. These changes may have introduced fears about the vaccine itself, reuptake of COVID-19 cases, or alleviated some of the ill psychological effects and stressors associated with the lockdown (Ingram et al., 2021). Nevertheless, these influences would have likely affected reported resilience when participants were re-examined. Still, this examination of downstream causal outcomes with resilience represents a useful tool over using only snapshot, cross-sectional analysis that future researchers should consider. Navigating the psychologically taxing effects of a context such as the pandemic successfully could lead to better mental health outcomes and resilience (e.g., Brooks et al., 2020; Barrett & Martin, 2014; Fletcher & Sarkar, 2016); this could be examined with more long-term data. In addition, while not necessarily a limitation, it could be useful to investigate more antecedents of the resilience profiles themselves (e.g., personality traits and/or stressful events) rather than focusing on outcomes. Given the state-like nature of resilience, it may provide more insight to know why (given the potential for transitioning of profile membership displayed in Study 6, or why some of the causal outcomes were not significantly different after four months) some participants go from one profile to another over a given time and situation. Not only would examining antecedents

of resilience help enhance our understanding of resilience, but it would further allow researchers and practitioners to plan and better take circumstances into account when examining an individual's resilience in settings such as sport, expeditions, or more general mental health.

Examining these insights in a very different direction, it could also be beneficial to examine if psychological resilience influences immunity and physiological responses to vaccination, given the adverse effects stress can have on these factors (Madison et al., 2021). If a higher resilience can reduce the impact of stress, it may lower cortisol and allow better physiological responses to disease (e.g., Dantzer et al., 2018). In addition, intervening on resilience (specifically, enhancing anticipation and minimising) could help with vaccine uptake and reduce hesitancy, given how fear and uncertainty have negatively impacted vaccinations (Nazli et al., 2021). More generally, intervention studies can build upon the resilience profiles to examine general coping and behaviours surrounding the pandemic to help target specific areas. Beyond the pandemic, this more nuanced view of an individual's resilience could prove useful in understanding and intervening in other contexts such as sport, the military, young offenders, or challenging environments such as overseas expeditions (see Chapter 3 of this thesis).

Lastly, the context and types of stressors being dealt with could be considered for future study (see e.g., Chapter 2 of this thesis). The abilities and resources involved in dealing with stressors of one type could be different to dealing with another (e.g., physical and cognitive stressors). To elaborate, an athlete may have the skills and resources to deal with physical pain and fatigue, but not necessarily have the emotional skills to deal with long-term injuries (e.g., Caine et al., 2016). With the pandemic, there may be stressors such as the lack of social interaction and loneliness that individuals may be more resilient to, but less resilient to adapting to working from home or ruminating about the pandemic's long-term impacts.

Future researchers could examine more specific stressors associated with COVID-19 and how individuals can be resilient (or not resilient) to them. Further, investigating resilience profiles in different primary domains (e.g., cognitive – air traffic control; e.g., Ćosić et al., 2019) and their influence on different outcomes could provide useful insights.

Conclusions

The findings of these studies demonstrate evidence of different profiles of resilience that can emerge, with differences in both overall resilience and each of the four mechanisms of anticipate, minimise, manage, and mend that encompass this process. There has also been evidence that these profiles can potentially predict mental health and behaviours within contexts such as the pandemic. Higher resilience tended to lead to more positive outcomes, with lower resilience leading to more negative outcomes. There are also specific impacts of particular patterns of resilience mechanisms. Further investigation of resilience profiles and the impact that these different profiles have on health and behavioural outcomes could lead to more bespoke interventions to reduce negative mental health and physical risks and consequences.

Chapter 5: General Discussion

General Discussion

The final chapter aims to briefly summarise the research questions and results presented and discuss the general findings from the empirical chapters of this thesis. To that end, the findings are summarised in a broad manner and set in the context of theoretical and applied perspectives, which leads to an examination of the strengths and limitations of the thesis, followed by possible future directions for research.

Summary of Results

Chapter 1 critically reviewed the resilience literature, highlighting several theoretical and empirical limitations that we thought needed to be addressed. Limitations included ambiguous conceptualisation and operationalisation of resilience that have persisted in the literature and the need for more comprehensive and complete measures of resilience to consider the pro-active *and* reactive components of the construct. In addition, we suggest that the contextual domains in which resilience can occur are often overlooked and required further research. The chapter concluded by proposing the conceptualisation of resilience as a state-like ability that allows a person to anticipate, minimise, manage, and mend from adversity in the contexts of general, physical, social, cognitive, and emotional domains.

Chapter 2, Study 1 and 2 aimed to address some of the limitations in resilience research by developing a theory-based measure that examined a more complete model of resilience incorporating the mechanisms of anticipation, minimising, managing, and mending. In addition, in Chapter 2, we examined the factorial validity of the measure in five domains (general, physical, social, cognitive, and emotional). Bayesian Structural Equation Modelling (BSEM) was used in two studies to validate the new measure. The results of the studies found good support for the final 13-item model across the five domains. Of interest, although all the resilience mechanisms tended to correlate with each other, the two pro-active elements of resilience (i.e., anticipate & minimise) tended to be strongly correlated with each

other, as were the two reactive elements. Finally, the mechanism of anticipation tended to score highest amongst the mechanisms, whereas levels of mending tended to be scored lower than the other mechanisms.

Chapter 3 reported on two applied resilience studies in the context of overseas expeditions. Study 3 involved examining how resilience might change and improve across the challenging and adverse context of expeditions (e.g., Neill & Dias, 2001; Stott et al., 2013). Measures of resilience and related factors such as well-being were taken on the day before participants' expedition, midway through it, and on their return home. Results generally supported our hypotheses in that resilience across its mechanisms and domains increased (primarily towards the end of the expedition). Study 4 focused on piloting an intervention. The aim was to develop an evidence-based resilience intervention based on the resilience model developed in this thesis. We intervened with an expedition team during a camping training weekend approximately four months prior to their expedition. The intervention focused not only on teaching coping strategies to improve the resilience mechanisms but included the addition of aspects of adversity (e.g., team games with consequences for losing and banning of phones) that targeted the domains of resilience (i.e., emotional, physical, cognitive, and social). The training weekend demonstrated some benefits to resilience, however, there were no significant group differences between the intervention and non-intervention groups. Potential reasons for this included an incident that developed over the weekend in the experimental group, which likely influenced scores on the measures used.

Chapter 4 reported two studies examining latent profiles of resilience based on the four proposed mechanisms (i.e., anticipate, minimise, manage, and mend) and how profiles of these mechanisms could potentially predict specific psychological and behavioural outcomes. Study 5 examined previously collected resilience data (from studies undertaken in Chapters 2

and 3) with Latent Profile Analysis (LPA; Gillet et al., 2017). The profiles that emerged tended to fall into four categories consisting of low resilience (but with high anticipation), two moderate resilience profiles (one with higher pro-active mechanisms, the other with higher reactive), and a very high resilience profile. Study 6 examined profiles with a new, more heterogeneous sample during the COVID-19 pandemic. Results generally supported the findings of Study 5. Specifically, the profiles fell into four categories: a low resilience profile with high anticipation, low resilience with low anticipation, moderate resilience, and high resilience profile. These profiles were relatively stable over a four-month period, with the moderate resilience profile showing the most instability, as indicated by Latent Transition Analysis (LTA). The majority of participants across these studies tended to fit into a profile of moderate levels of resilience, with fewer in the more extremely high- and low-level resilience profiles. Further, those with high resilience profiles tended to report lower levels of depression, anxiety, and impulsiveness, but higher levels of well-being, coping effectiveness, and preventative behaviours. In contrast, those with lower resilience profiles (particularly those with high anticipation) tended to report higher anxiety, depression, impulsiveness, and lower coping effectiveness.

Theoretical Implications and Contributions

The theoretical implications (and applications) derived from the empirical data in this thesis are addressed in greater detail in the discussions of each empirical chapter and will only be summarised here.

Resilience Process Model

Some of the most prominent implications from the thesis concern our conceptualisation of resilience as a multidimensional process of anticipating, minimising, managing, and mending within five domains of general, physical, social, cognitive, and emotional contexts. The findings in this thesis support previous, more contemporary research

on resilience as a pro-active and reactive process containing four mechanisms (e.g., Alliger et al., 2015; Chen et al., 2016; Fletcher & Sarkar, 2016). This conceptualisation includes resilience not only as simply a constellation of traits (e.g., Connor & Davidson, 2003; Wagnild & Young, 1993) but as an interactive, dynamic process influenced by the context, time, and adversity itself, providing a more comprehensive view of resilience (see e.g., Pangallo et a., 2015).

Further, this research extended these studies by adding the anticipation mechanism and the cognitive domain of functioning. With this model, we then developed a measure in line with the model across two studies presenting the scale, along with evidence for its psychometric properties for use in different populations. By following a clearly defined model and conceptualisation of resilience, this Resilience Process Scale was developed to address some of the issues reported with previous measurements of resilience (cf. Estrada, 2016; Windle et al., 2011). We provide a clearer concept on which our measure is based and examine resilience as a more comprehensive pro-active and reactive process that allows us to measure resilience itself and not the underlying influences of it. We also provide evidence for good psychometric properties of the scale following a rigorous validation process, helping to address these previous issues in the literature. Lastly, this model allows us to examine resilience profiles based on these processes (see Chapter 4 of this thesis). Profiling allows us to really explore resilience as a set of distinct subfactors in which people can differ, further work using profiling will further help to increase what we know about resilience itself, what it predicts and what it could be predicted by.

Pro-Active Resilience

In particular, the study provides preliminary evidence for a need to separate anticipation strategies from minimisation strategies. The *anticipation* mechanism refers to the awareness/self-awareness of an upcoming event that could lead to some form of adversity

through sanctions or consequences. Although most of us have an attentional bias toward threats when we become anxious (e.g., MacLeod et al., 1986), we do not always act upon it or even need to do so (Anderson, 2003). The separation of anticipate and minimise strategies supports research in the domain of mental toughness through punishment sensitivity research, in which awareness of threats then leads to separate minimising actions to deal with them (e.g., Hardy et al., 2014). In addition, anticipation and minimising tended to differ in scores, further supporting that they should be assessed separately.

An interesting finding throughout this thesis was that the process of anticipating was consistently rated higher than minimising, managing, and mending. In relation to appraisal theory (Lazarus, 1991), individuals may more frequently need to evaluate threats (i.e., primary appraisal) and then make subsequent decisions on whether they need to minimise the potential threat or not. This process may happen on two fronts. If the anticipated threat bears minimum consequences, then the individual may do nothing to prepare for that situation. If the individual perceives their resources are sufficient to deal with the threat, they may also do nothing to reduce any possible disruptions. But on both accounts, the individual has considered if they need a minimising strategy or not, so they have used minimising in one sense. However, if the individual anticipates that the threat may have serious repercussions if not dealt with soon, or the person does not feel they have the resources to deal with it, then the individual may employ minimising strategies (e.g., Scherer et al., 2001). Minimise was often the second highest-rated mechanism within the domains. This is also expected due to the potential actions of minimising, often reducing the need for managing and mending strategies. Indeed, with anticipation as the first employed skill followed by minimising, these would likely become the more dominant and ‘practiced’ mechanisms, given how using these mechanisms and dealing with adverse experiences can develop resilience (e.g., Barrett & Martin, 2014; Ewert & Yoshino, 2011; Fletcher & Sarkar, 2016; Meichenbaum & Novaco,

1985). Implicit within this line of reasoning is that this process is linear, from anticipating through to mending. However, this possible linearity would need to be tested. For example, one could argue that the use and 'practice' of managing could feed directly to anticipate rather than directly to/or in addition to mend.

Chapter 4, Study 6, demonstrated with Latent Profile Analysis that a large proportion of people may fit into two distinct profiles that largely differ based on the anticipate mechanism. This mechanism seemed to largely contribute to determining anxiety, depression and risk-taking in ways one would expect. That is, a greater detection and awareness of threats but without a perceived ability to deal with them would likely result in greater anxiety and depression symptoms (e.g., Alderman et al., 2015; Anderson, 2003; Byrne & Eysenck, 1995; Ran et al., 2020). In addition, these individuals would perceive greater risk and danger to themselves and thus would engage in fewer risk-taking behaviours. Contrarily, one with particularly low anticipation would likely not perceive or feel negative arousal to such threats, therefore using more manage and mend strategies. Nevertheless, the distinctiveness of the anticipation mechanism in these profiles highlights the importance of separating it from minimising processes in the resilience literature.

Reactive Resilience

Reactive resilience is more commonly associated with adapting and bouncing back from adversity and stress. Previous measures have often overlooked these aspects by focusing either on the more pro-active aspects, only on one part of it, such as bouncing back, or on factors that support resilience (Smith et al., 2008; Windle et al., 2011). As noted, the pro-active resilience mechanisms were rated higher (with anticipation the highest) than the reactive in the present studies. However, if one cannot get back to equilibrium after a stressful event, this would likely compromise their ability to anticipate, minimise, and manage future stressors. They may be, for example, still dealing with the negative impact of

previous stressors and have depleted resources to be able to adequately cope with a new one (e.g., Alliger et al., 2015). This finding also highlights both the distinctiveness and salience of the reactive aspects of resilience, which can be more uniquely associated with positive relationships with others, current levels of psychological distress, and physical fitness activity (Burnett et al., 2019). However, future research could extend this understanding of the reactive aspects of resilience by examining the relationship between managing and mending. For example, if managing strategies leave less adversity to recover from, then does mending become less used or practiced, and if this then feeds back into anticipation towards similar stressors. In addition, future research could examine further antecedents of pro-active and reactive resilience, along with potentially different outcomes of reactive resilience levels compared to pro-active components.

Domains of Functioning

Although some resilience resources and behaviours may be effective in various contexts, a one size fits all resilience measure may not be as effective at assessing adversity in specific domains of functioning. Resilience more likely exists on a continuum across such domains (Hayman et al., 2017; Pietrzak & Southwick, 2011). Therefore, one of the purposes of the resilience model presented in this thesis (and the Resilience Process Scale developed from it) is to better tailor resilience assessments around diverse sources of adversity. An aim of the proposed measure is also to allow modularity towards these different types of adversities, with each domain able to be examined individually if desired. Specifically, the thesis presents five domains of resilience with a general domain followed by physical, social, cognitive, and emotional. Further, these studies extend the current literature by presenting cognitive resilience. Research demonstrates that cognitive stress is perceived and dealt with differently to other sources of stress (e.g., physical) at both a psychological and physical level (e.g., Dong et al., 2018; Palamarchuk & Vaillancourt, 2021). Recognising and understanding

how one can be resilient to cognitive stressors could be vital when performance relies upon complex cognitive task performances in which there can be serious consequences (e.g., air traffic control; Ćosić et al., 2019). Neglecting to deal with cognitive stressors could lead to mental health issues (e.g., Putwain et al., 2015; Ringeisen & Raufelder, 2015) and performance consequences. Studies based on attentional control theory demonstrate that anxiety for example, impairs performance (Eysenck et al., 2007), and the resilience mechanisms (specifically anticipate, minimise, and manage) should protect against this (e.g., Derakhshan, 2020; Putman et al., 2014).

Overall, similar significant differences were found in both studies, where the emotional domain was scored lowest, and physical was scored the highest. This finding may reflect how these types of adversity are generally experienced and dealt with. For example, physical forms of stress such as illness and fatigue can be more recognisable issues than emotional forms of stress. But, more importantly, they tend to have more obvious solutions such as resting or using over-the-counter medication. On the other hand, emotional distress is not always so clear in its symptoms or solutions (e.g., McManus et al., 2009). Emotions can be complex and difficult to untangle and dealing with emotional issues may be more dependent upon emotional awareness and regulation (e.g., Cejudo et al., 2018; Salovey et al., 1999). Mental illness can also still be stigmatised and poorly understood compared to physical illnesses across society (e.g., Malla et al., 2015; Maunder & White, 2019). This stigma may lead to further issues such as poor coping with emotional stressors, encouraging withdrawal, and lowered self-efficacy (Holmes & River, 1998). Social resilience tended to be only marginally different to emotional resilience. Again, this finding could highlight that social adversity (e.g., relationship issues) may be more challenging to recognise and deal with (e.g., Wood & Bhatnagar, 2015) compared to physical issues (especially in a younger population). Future research could examine different antecedents of the different resilience

domains, which may provide better insights into why they may be higher or lower and help guide educational and/or intervention programs.

Resilience and Related Factors

Observer Ratings of Resilience.

Observer ratings of resilience tended to only correlate partially with self-reported resilience (5 out of 20 relationships between resilience mechanisms and domains were significant). Several reasons could suggest why they did not correlate to a greater extent. For example, respondents could identify with questions in ways observers do not (Paulhus & Vazire, 2007), or observers do not know the participants intimately enough in each of the resilience domains. Previous research on mental toughness also reports weak positive relationships between self-report data and reliable observer data (e.g., Beattie et al., 2019). Nevertheless, the observer measure was somewhat rudimentary in its development, and future researchers could aim to create a more validated observer measure through Bayesian Structural Equation Modelling.

Self-Concept.

Self-concept refers to an individual's beliefs about themselves, such as their attributes and competencies (Baumeister, 1999). Resilience and positive self-concept tend to correlate with each other (e.g., Hicks & Conner, 2013; Martins & Neto, 2016), with aspects of self-concept and associated factors such as self-esteem (e.g., Marsh, 1986) also acting as personal, protective qualities of resilience (e.g., Fletcher & Sarkar, 2016; Hicks & Conner, 2013). We found that aspects of self-concept and self-esteem positively correlated with resilience, which supports previous research, such as high self-esteem being associated with high resilience during stressful events (e.g., Balgiu, 2017). In addition, it was also supported that aspects of self-concept such as maintaining social relationships are also associated with resilience (Ozbay et al., 2007). Further studies could examine the different aspects of self-concept as

antecedents or outcomes of different resilience profiles to explore this relationship further, to see if they act as protective personal qualities to resilience (e.g., Fletcher & Sarkar, 2016).

Challenge and Threat.

It was hypothesised that challenge states would be associated with resilience (as an increase in resources to deal with demands) and reflect a challenge mindset (e.g., Fletcher & Sarkar). However, appraisals of threat negatively related only to the manage mechanism within the general domain of resilience in Chapter 3, Study 3. While this relationship was in the expected direction, we expected more significant correlations across the resilience mechanisms and domains. Given that the instruction in the cognitive appraisal measure was their perceived ability to deal with the upcoming expedition, in which the adversities faced would likely be novel and unknown (e.g., Yoshino, 2008), this is not entirely unexpected. Participants may not have felt able to accurately judge the situation and a more accurate examination of challenge and threat may be to look at specific tasks and issues faced during the expeditions. This could include fatigue, feelings of isolation, relationships with their team and leader, or specific upcoming tasks such as a difficult hike.

Well-Being.

Previous research has demonstrated the relationship between resilience and well-being to be ambiguous (Hascher et al., 2021). Nevertheless, well-being was positively related to many aspects of resilience in our model, especially around the components of minimise, manage, and mend. This finding could be expected, as more active coping strategies (rather than anticipatory ones) tend to be associated with positive well-being (McFadden et al., 2021). It may also present a good reason why some research on the association between resilience and well-being is ambiguous, as not all aspects of resilience were correlated, so previous measures that do not separate these mechanisms are likely to produce confounded results. The relationship between resilience and well-being was also further exemplified in

Chapter 4, Study 6, where high levels of resilience across all its mechanisms was consistently associated with higher levels of well-being during the pandemic. This finding of resilience acting as an antecedent and protective factor during adversity leading to successful coping and higher well-being is in line with previous research (e.g., Sanders et al., 2015; Turner et al., 2017).

Psychometric Contributions

The psychometric methods, properties and strengths have been briefly mentioned in previous subsections (and in the later Strengths subsection), but it is worth discussing some of the specific contributions this thesis demonstrates to measurement development both in general, but also with relevance to resilience measures. First, all studies proposing and developing measures should state clearly and concisely the conceptualisation of the construct they are measuring in addition to providing psychometric evidence, which has been lacking in the resilience literature (see e.g., Windle at al., 2011). In addition to clarity and supporting studies that build upon the conceptualisation and measurement, it also allows other researchers to easier differentiate between the particular resilience measure and similar construct measures such as mental toughness scales. The studies in Chapter 2 provide a good example and approach to fulfil this criterion and demonstrating a tight link between conceptualisation and measurement (the specific contributions and benefits of this conceptualisation are examined in more detail earlier in this discussion chapter).

With regards to item development, we feel the approach used in Chapter 2, Study 1 followed a clear and robust process. This process should logically follow the conceptualisation, with a clear consideration of the literature with which it's based and informed from (i.e., using a multi-method approach, such as both reviewing the literature, and discussion with relevant experts, see e.g., Hagger & Chatzisarantis, 2011). In our case, along with examining the literature, items were also informed by discussions with psychologists

with expertise in resilience, as well as expedition leaders from our partner company with a range of experience of different forms of adversity. This foundation for our scale is in contrast with some other measures of resilience that often have a disputable evidence base for item selection and development (cf. Windle et al., 2011). For example, the CD-RISC (Connor & Davidson, 2003) does draw from different sources, but based its items on a questionable theoretical basis – on the memoirs of Sir Edward Shackleton's 1912 expedition. Other scales do state a clear basis, but are narrow in focus, such as the Brief Resilience Scale (Smith et al., 2008) which has items solely derived from a conceptualisation of resilience as an ability to bounce back.

Chapter 2, Studies 1 and 2 also utilised Bayesian Structural Equation Modelling (BSEM) as a method of Confirmatory Factor Analysis. This method has only begun to see more use in recent years across the psychological literature (see e.g., Niven & Markland, 2016) and represents a more contemporary, comprehensive, and reliable analysis than conventional approaches (these advantages are also elaborated upon in the Strengths subsection of this chapter). Compared to Maximum Likelihood (ML) approaches more commonly used, evidence suggests BSEM is less sensitive to minor model misspecifications and exhibits better performance and reliability at small sample sizes and even skewed data distributions (e.g., Muthén & Asparouhov, 2012). A subtle but important advantage however, is the difference between absolute zero (as with ML) and approximate zero priors (as with BSEM). The Bayesian approach views parameters as variables with a mean and distribution, this allows the specification of informative priors on cross-loadings and residual correlations with *approximate* zero means and small variances within a specified model. Setting a small variance implies estimates are close to zero and can be informed by empirical findings, substantive theory, or with non-informative priors with no restrictions. This arguably produces a much more realistic fit of the specified model, as no model is going to fit perfectly

and would usually require extensive post-hoc testing to investigate the fit further in ML approaches (cf. Arthur et al., 2019; Niven & Markland, 2016).

In addition, we also undertook other underused methods in our psychometric testing, such as utilising multiple studies to validate the measure and across different samples. this presents a method of using an observer-rating of a resilience measure to further validate findings, corroborate subscales of resilience with other constructs (such as self-concept and well-being) to support construct validity. Furthermore, we demonstrate the potential benefits of an instructional vignette (see e.g., Cassidy, 2016; Leighton, 2010) as a method of guiding participants on how they consider adversity (given that this is largely influenced by individual differences and appraisal; see e.g., Fletcher & Sarkar, 2012; Pangallo et al., 2015; Robertson et al., 2015). Not only can the use of vignettes provide an aspect of consistency (for example, with the contextual interpretation of the items) but it allows the distinction between the domains of resilience in our measurement scale. As such, the measure can be used both to give a general overview of one's resilience and be used in specific contexts of interest. Currently, resilience measures do not tend to capture the importance of context, and how protective factors and characteristics will vary in these domains (e.g., Gucciardi et al., 2011). We hope at the very least, that the approach we have taken to developing our resilience measure could be utilised or built upon in future studies to help move the literature in this area forward.

Applications of Resilience

Expeditions Research

Supporting previous literature (e.g., Barton et al., 2016; Neill & Dias, 2001; Smith et al., 2016), it was found that overseas expeditions and the training weekend leading up to them can act as facilitative environments that adequately challenge and enhance resilience. Improvements were demonstrated across the resilience domains, mechanisms, cognitive

appraisals, and well-being, suggesting these environments provide contexts to facilitate dealing with stressors across different domains (e.g., Beames, 2005; McElligott et al., 2012; Stott et al., 2012). Along with the experiences likely having an inoculating effect (e.g., Barrett & Martin, 2014; Ewert & Yoshino, 2011; Meichenbaum & Novaco, 1985), the psychological growth of participants is likely facilitated by improvements in their personal qualities (such as self-esteem; Mutz & Müller, 2016), challenge mindset (as demonstrated with challenge/threat appraisals), and from the challenging (facilitative) environment that required a diverse range of coping strategies (Fletcher & Sarkar, 2016; Smith et al., 2017; Smith et al., 2018). These findings contrast a more traditional pathogenic view of extreme environments that focuses on psychological and interpersonal dysfunction experienced in such contexts, due to high demanding and pressured environments generally being seen as detrimental to our physical and psychological health (Smith et al., 2016). In addition, examining changes to resilience over the course of expeditions allowed the demonstration of resilience as a dynamic, malleable state-like process prone to change rather than a static collection of traits, which practitioners could aim to improve. Future research could further examine psychological growth in expedition environments and other personal qualities or antecedents of resilience such as emotional intelligence or self-efficacy. Furthermore, practitioners could consider carefully planned out expeditions or other challenging environments as a method to enhance the mechanisms and domains of resilience.

Interventions

Chapter 3, Study 4 tested a pilot study (n = 16) combining evidence-based strategies that can enhance resilience (e.g., Gould et al., 1993) with underlying theory as to why and how resilience might be improved (e.g., Fletcher & Sarkar, 2016; De Terte et al., 2009), to promote more salutogenic experiences from expeditions (Palinkas & Suedfeld, 2008). This was relatively easy to implement and fit around regular training schedules, with techniques

chosen for their reflection of different mechanisms. For example, progressive muscular relaxation strategies provided a tool to manage and mend from a physical stressor, and What-If thinking exercises provided a tool to better anticipate and minimise any potential stressor.

In addition, to replicate the challenges that participants may face on an expedition, the interventions introduced simulated adversity and situations that contained mild punishments. These methods are generally underused despite the potential benefits of developing resilience from adversity (e.g., Ávila & Torrubia, 2008; Bell et al., 2013; Hardy et al., 1996; Howells & Fletcher, 2015; Seifried, 2008). We were able to present such stimuli ethically and practically, provided they remained relevant to the context of expeditions and were not overwhelming for participants, and thus not compromising their resilience (e.g., Robertson et al., 2015). An example of this was a phone ban, as phones are often relied on as a coping tool that would not be available on expedition. Taking their phone away added an extra layer of social and emotional stress (e.g., Magner, 2018) relevant to what students could expect on the expedition. Future researchers and practitioners could continue to implement a combination of adversity and punishment training that target the resilience domains, with coping strategies to support the resilience mechanisms when studying or applying a resilience intervention.

Profiling

Rather than simply examining differences in mechanisms in isolation, profile analysis allowed us to investigate patterns of mechanisms that emerged in each population and what percentage of that population fit into each pattern. So far, this type of analysis has only been used to examine types of adversity along with resources and traits thought to influence resilience, such as self-efficacy and optimism (Lines et al., 2020). However, resilience itself has yet to be examined. This technique allows researchers and practitioners insight into resilience beyond it being simply *high* or *low* for a more fine-grained approach to which resilience mechanisms are high or low. Across different population samples, Chapter 4

explored resilience profiles based on four of the mechanisms presented in this thesis. Overall, the resilience profiles demonstrated some similarities in patterns and memberships of the four mechanisms across different ages and over time (four months). Distinctions likely reflect individual differences, demographic circumstances, and the state-like nature of resilience (e.g., Bryan et al., 2019). For example, due to the impact of the COVID-19 pandemic, and that younger adults tend to make better use of social support but have less emotional regulation and problem-solving ability compared to older adults (e.g., Gooding et al., 2011). Some similarities in mechanism patterns remained across samples, such as higher anticipate strategies leading down to lower mend strategies (and/or higher in the more pro-active or reactive elements of resilience). Thus, it can be concluded that most people fit into more moderate resilience profiles, but some may be higher in more anticipatory and pro-active aspects of resilience, and others more reactionary.

To summarise, profiling could represent a useful tool for practitioners who need a detailed and insightful approach to examine resilience and understand how participants may think, feel, and behave in certain environments. For example, to better predict performance outcomes, personality screening is already used in contexts such as the military (Sandal et al., 1998). Given that resilience mechanisms can be supported and intervened upon, resilience profiles could provide additional practical insight.

Resilience Profiles and COVID-19

Chapter 4, Study 6 applied resilience profiling to the COVID-19 pandemic. The main findings included demonstrating that higher levels of resilience were associated with better psychological and behavioural outcomes such as lower levels of anxiety, and taking more preventative measures (e.g., Balkhi, 2020; Wang & Zhao, 2020). Of these outcomes, higher resilience was also generally associated with more risk-taking but low impulsiveness (suggesting calculated risk-taking), well-being, and more effective coping – which again

were as predicted based on previous literature (e.g., Arslan et al., 2020; Fisk & Dionisi, 2010; Grant & Kinman, 2012; Sanders et al., 2015; Yildirim & Arslan, 2020).

Contrarily, the psychological and behavioural outcomes of the lower resilience profiles appeared to be somewhat dependent on the precise nature of the profiles. For example, higher levels of anticipation demonstrated fewer positive outcomes, with high awareness of threats presenting higher anxiety. Lower levels of anticipation demonstrated a lack of impulse control and lack of preventative behaviours in the pandemic. Since much of the sample tended to fit into a low/moderate resilience profile with either low or high levels of anticipation during the pandemic, practitioners could use this insight when considering reactions to the pandemic and its associated outcomes. Most profiles were somewhat stable across time, as most participants tended to remain in their profiles from Timepoint 1 to Timepoint 2 over the four-month period. Transitions to another profile may have been due to the nature of the pandemic when the data was collected, or due to the state-like nature of resilience. Nevertheless, practitioners could make use of resilience profiles in contexts such as the pandemic to help predict how participants may think, feel, and behave and offer insight into why this might be. However, they should keep in mind these profiles can be subject to change based on demographics and across a time when situations might change. Many of these outcomes also remained over a four-month period, such as high resilience still being associated with low depression and high well-being. Researchers could, for example, investigate why some profiles do or do not continue to be associated with certain outcomes, to give insight when planning interventions.

Strengths and Limitations of the Thesis

Strengths

From a theoretical perspective and the potential applications, there are several strengths to this thesis and the studies contained therein. In this section, I will discuss the

strengths of the thesis, followed by limitations in a broad manner to avoid repetition, as more specific discussions of the study's strengths and limitations can be found within each chapter.

The thesis puts forward the Resilience Process Model to conceptualise resilience. This model aims to address some of the limitations and ambiguities in resilience research (cf. Bryan et al., 2019; Fletcher & Sarkar, 2016; Joyce et al., 2018; Windle et a., 2011). For example, it takes a contemporary and comprehensive approach to resilience as a state-like pro-active and reactive process involving four mechanisms of anticipate, minimise, manage, and mend. In addition, resilience can distinctly differ across five domains, namely, general, physical, social, cognitive, and emotional settings. This model extends more recent resilience research (Alliger et al., 2015; Chen et al., 2016) with the addition of the anticipate mechanism (distinct from minimise) and putting forward a cognitive domain of resilience.

This thesis presents cutting-edge analytic techniques to validate a measure based on this model and examine profiles based on it. The Bayesian Structural Equation Modelling approach has several advantages over more conventional confirmatory factor analysis methods such as Maximum Likelihood approaches. For example, this approach views parameters as variables with a mean and replaces parameter specifications of exact zeros with approximate zeros based on informative, small-variance priors. This approach arguably produces a better, more reliable analysis that better reflects reality (Muthén & Asparouhov, 2012).

Latent Profile Analysis (LPA) is a categorical latent variable modelling approach to identify subpopulations within a population, allowing a parsimonious representation of structures in the form of groupings. Given that groupings are more natural features of cognition, these forms of models are conceptually more meaningful and methodologically useful for developing typologies (Spurk et al., 2020). We have yet to find LPA being used for resilience research (although Lines et al., 2020 examined *resources* of resilience), and it has

allowed us to classify distinct profiles of resilience based on its mechanisms, along with profile membership proportions in each of these subgroups. Importantly, this then allows us to predict associated outcomes from these profiles. This offers further insight than resilience simply being *high* or *low* and enables the researcher to draw conclusions about associated behavioural and psychological outcomes. In addition, Latent Transition Analysis (LTA) and collecting downstream outcome variables are both underused approaches. This method allowed us to examine the stability of resilience and its profiles and examine more causal outcomes (as opposed to cross-sectional, which most resilience studies focus on). The Chapters using both these methods use multiple studies to replicate and examine the reliability of the findings, presenting a further strength of this thesis. Not only does such an approach help extend the findings' to (for example) different demographic groups but helps address the general limitation in psychological research of the replication crisis (e.g., Staddon, 2017).

Another strength of the thesis is that it helps address some of the limitations of expeditions research. It was demonstrated that resilience can be enhanced over the course of different overseas expeditions adding clarity to previously ambiguous findings (e.g., Neill & Dias, 2001; Stott et al., 2013). This stands in contrast to the more pathogenic view of extreme environments (Smith et al., 2016). In addition, we examined multiple expedition environments to add more reliability to the findings, and used more comprehensive measures (McElligott et al., 2012; Mutz & Müller, 2016; Stott et al., 2013), as well as utilising observer ratings as a supplement to self-reports that most of these studies tend to rely on. Furthermore, the findings in Chapter 3, Study 3 examined resilience 'live', both during the expedition, and immediately at the end. Despite how collecting self-reported results after an expedition may be skewed by recall bias, few studies on resilience and expeditions have done so (e.g., Harrison et al., 2021).

Lastly, the thesis also demonstrates an approach in which evidence-based coping strategies can be used based on the presented resilience model. Along with how adversity-based tasks relevant to the context (expeditions in this case) can be implemented practically and ethically to potentially enhance a training process, despite being a generally underused method in interventions (e.g., Seifried, 2008).

Limitations

Along with the strengths of this thesis and its studies, there are several limitations to discuss. Most of the studies in this thesis rely on self-reports to examine resilience and other variables. It would help to further validate these self-report findings with observer-rated (and more rigorously tested than the one presented in this thesis) and other outcomes such as physiological and performance. For example, linking higher resilience from this measure with specific domains of functioning such as lower cognitive stress, pain tolerance in sport, or social cohesion, would provide more insight into the role of different mechanisms and domains of resilience in more real-world settings. It could be considered, for example, that the benefits of expeditions demonstrated in Chapter 3, Study 3 could be the result of post-group euphoria after completing such events, in which positive feelings are inflated in the short-term and reflected in self-report measures (e.g., Daniel, 2007; Furman & Sibthorp, 2014; Hattie et al., 1997; Scrutton & Beames, 2015). This also highlights a further issue with Study 3, in which there is no control group to compare the findings to and control for influences such as maturation effects increasing resilience (e.g., Gooding et al., 2011; Oliver et al., 2006; Senior et al., 2020).

Another general limitation of the thesis is a lack of examining more downstream and longitudinal variables. Similar to the control groups and low sample size issues in Chapter 3, much of this can be attributed to study and recruitment issues due to the COVID-19 pandemic restrictions. Examining longitudinal (and longer than four months as with Chapter

4, Study 6) outcomes with resilience would help establish longer-term benefits of expeditions, or if there are any (e.g., Sayer, 2011), profile stability of resilience over more extended periods and during different events, and if these profiles still predict the psychological and behavioural outcomes demonstrated in Chapter 4, Study 6.

Future Directions

Below is a discussion of the main future research directions worthy of consideration. Like the above sections, these are arranged into sub-sections based on the content and purpose of each chapter and its associated studies.

Resilience Process Model and Scale

The measurement tool we developed demonstrated good psychometric properties over two samples and studies. However, to better validate and connect the resilience self-report to the construct it intends to measure, future research could better test our resilience assessment to the domains of functioning. For example, examining the relationship between cognitive resilience and cognitive-based tasks where the participant is under pressure may allow us to understand how it might protect against cognitive overload, distraction to threat, and other working memory functions (e.g., Bong et al., 2016; Ćosić et al., 2019). A further example is physical resilience, which may go some way in protecting an ultra-marathon runner against the gruelling pain of a 72-hour race.

A further implication that could be investigated is the extent to which the pro-active and reactive mechanisms feedback into each other from anticipate to mend. The conclusions drawn so far suggest that more frequently used resilience mechanisms may become more practiced and higher in ability level than other mechanisms. However, this relationship may be over-simplistic and not always be the case. For example, a sudden situation such as a fire may immediately require managing. Although this may make one better at managing similar events, it may also increase the ability to anticipate and minimise the threat of a fire occurring

again – despite these mechanisms not being used. Future researchers could examine how certain stressors and the mechanisms employed to deal with them then improve resilience (i.e., improving *all* resilience mechanisms or only the ones employed). This would give further insights into how the resilience process can work and how resilience mechanisms can develop through adversity.

An additional way of validating our self-reported resilience scale could be to examine physiological responses to stress. Resilience can generally be linked for example, to lower cortisol responses (e.g., Zapater-Fajari et a., 2021) and less stressful cardiovascular responses (Winslow et al., 2015). Research of this sort would go some way to surmount the problems that exist with an over-reliance on self-report measures (e.g., Zeidner et al., 2012), social desirability bias (Edwards, 1991), and provide further insights by linking physiological responses to certain resilience mechanisms and domains. Using psychophysiological assessments of stress may also provide a better and more objective insight into the understudied relationship between resilience and challenge and threat states (e.g., Seery, 2011).

An additional future direction for the model would be to develop a more comprehensive measure of observer-rated behaviours. Although an observer version of the RPS was created and used in this thesis, it was very rudimentary. Future studies could modify items with a more rigorous analytical approach, such as Bayesian Structural Equation Modelling to allow for a comparison between observer ratings of resilience with self-reports.

Resilience, Expeditions, and Interventions

There are several limitations to Studies 5 and 6 in Chapter 3 that could be addressed in a future study, such as the addition of a control group (already discussed in the above section). It may also be worth investigating if the psychological benefits (for example, on resilience) of such challenging experiences on expeditions may be triggered in the future, as

opposed to immediately post-event (e.g., Sayer, 2011). Similarly, many studies on expeditions are only snapshot in nature (McElligott et al., 2012; Mutz & Müller, 2016), and future research should examine what the long-term benefits of high levels of resilience and well-being are (e.g., Curtin & Brown, 2018; Stott et al., 2013). Extended longitudinal approaches would also help dispel concerns that any increases in resilience and well-being were the result of influences such as post-group euphoria, in which self-reports could be inflated in the short-term after a group activity such as an expedition (e.g., Daniel, 2007; Furman & Sibthorp, 2014; Hattie et al., 1997; Scrutton & Beames, 2015).

Regarding resilience interventions and the above suggestions, future researchers could utilise the resilience model presented in this thesis (along with the principles of evidence-based strategies) to enhance its mechanisms and provide adversity to target the domains. Study 4 is a pilot study but demonstrates that these types of interventions can be easily implemented. However, there needs to be a more substantial sample to investigate the potential added benefits of the resilience intervention. Thus, future researchers could use a similar approach and expand on it, to examine if they can enhance resilience in environments such as expeditions, sport, or the military (e.g., Griffith & West, 2013), or even adversity that occurs naturally, such as recovery from surgery.

Resilience Profiling

With regards to resilience and profiling, there are several future directions it could take. Demographic influences could be investigated to better understand how resilience differs across groups in response to certain types of adversity. For example, research demonstrates that adults generally have a greater emotional regulation and problem-solving ability, but younger adults are better at utilising social support (Gooding et al., 2011). Further, older adults may be better at using emotion-focused coping (Hayman et al., 2017)

due to their experiences. Examining these differences could guide researchers and practitioners when planning interventions for these demographic groups.

Additionally, it may be beneficial to examine general antecedents of resilience profiles. For example, Study 6 demonstrated that COVID infection and negative affect can influence profile membership. Examining other trait or state factors such as emotional intelligence and regulation may provide further insight into how these factors interact with resilience mechanisms (e.g., Resnick et al., 2011; Schneider et al., 2013). Additionally, such insight may also help guide interventions and training that could provide more options for developing resilience (e.g., building emotional regulation skills if needed). On the other hand, examining antecedents could help provide insights into what kind of factors (e.g., negative affect) may be detrimental to resilience. One particular use of this line of enquiry is to examine what levels of adversity and stress may be beneficial to certain resilience profiles, and how much would be detrimental and overwhelming (e.g., Barrett & Martin, 2014). Such work could also be useful in helping us understand why some profiles in Study 6 demonstrated relative (in)stability over time and during adversity caused by the pandemic.

Finally, future research could corroborate our current profiling findings in other challenging performance environments. For example, personality profiling has often been used to predict coping and performance in the military (Sandal et al., 1998) and space missions (McFadden et al., 1994). There are consistent beneficial traits and factors looked for in these environments, including low susceptibility to anxiety, high emotional stability, and well-being, all of which are associated with higher resilience (e.g., Fisk & Dionisi, 2010; Fleming & Ledogar, 2010; Masten & Tellegen, 2012; Olsson et al., 2003; Sander et al., 2015). Thus, a next step could be to examine resilience profiles in predicting thoughts, feelings, and behaviours in such adverse environments (e.g., Smith et al., 2016). Based on the findings of Study 6, it may be that low levels of resilience (specifically minimise, manage,

and mend) coupled with high anticipation tend to be associated with higher anxiety, which could be detrimental to coping in such difficult environments. Such a position is worthy of future investigation.

Conclusion

In summary, this thesis set out to investigate the conceptualisation of resilience, develop a multifactor assessment and test its predictive validity in various populations. This aim was based on several issues in the resilience literature we intended to address. As such, we proposed a model of resilience as a process of mechanisms of anticipating, minimising, managing, and mending from adversity. In addition, resilience can distinctly function within general, physical, social, cognitive, and emotional domains. This thesis presents a measure based on this model (Resilience Process Scale) demonstrating good psychometric properties. We then applied this model and measure in several ways. Firstly, we demonstrated the benefits of overseas expeditions as a challenging but facilitative environment to resilience and related concepts such as well-being. We then applied this model as a way of approaching interventions using training weekends for these expeditions. We used evidence-based strategies to support resilience mechanisms and added adverse and punishment stimuli to challenge the resilience domains. Finally, we examined profiles of resilience, demonstrating what patterns of the four mechanisms tend to emerge in each population. We also demonstrated what psychological and behavioural outcomes could be associated with each of these profiles in the adverse context of a pandemic. Taken together, these findings offer a comprehensive examination of resilience to take this knowledge base forward to better understand, measure, and improve resilience.

References

Ahn, J. K., Kim, Y., & Choi, K. H. (2019). The psychometric properties and clinical utility of the Korean version of GAD-2 and GAD-2. *Frontiers in Psychiatry, 10.* 127. doi:10.3389/fpsyt.2019.00127

Alderman, B. L., Olson, R. L., Bates, M. E., Selby, E. A., Buckman, J. F., Brush, C. J., Panza, E. A., Kranzler, A., Eddie, D., & Shors, T. J. (2015). Rumination in major depressive disorder is associated with impaired neural activation during conflict monitoring. *Frontiers in Human Neuroscience, 9*, 269. doi:10.3389/fnhum.2015.00269

Allen, T. H., & Honeycutt, J. M. (1997). Planning, Imagined Interaction, and the Nonverbal Display of Anxiety. *Communication Research*, *24*, 64–82.

Alliger, G. M., Cerasoli, C. P., Tannenbaum, S. I., & Vessey, W. B. (2015). Team resilience: How teams flourish under pressure. *Organizational Dynamics, 44*, 176–184. doi:10.1016/j.orgdyn.2015.05.003

Anderson, C. J. (2003). The psychology of doing nothing: Forms of decision avoidance result from reason and emotion. *Psychological Bulletin, 129,* 139–167.

Arslan, G., Yıldırım, M., Karataş, Z., Kabasakal, Z., & Kılınç, M. (2020). Meaningful living to promote complete mental health among university students in the context of the COVID-19 pandemic. *International Journal of Mental Health and Addiction*, 1–13. https://doi.org/10.1007/s11469-020-00416-8

Arthur, R. A., Callow, N., Roberts, R., & Glendinning, F. (2019). Coaches coaching psychological skills—Why not? A framework and questionnaire development. *Journal of Sport and Exercise Psychology*, *41*, 10–23. https://doi.org/10.1123/jsep.2017-0198

Asparouhov, T., & Muthén, B. (2014). Auxiliary Variables in Mixture Modeling: Using the BCH method in Mplus to estimate a distal outcome model and an arbitrary secondary model. *Structural Equation Modelling: A Multidisciplinary Journal, 21*, 329–341.

Ávila, C., & Torrubia, R. (2008). Performance and conditioning studies. In P. J. Corr (Ed.), *The reinforcement sensitivity theory of personality* (pp. 228–260). Cambridge University Press. https://doi.org/10.1017/CBO9780511819384.008

Aydin, N., Fischer, P., & Frey, D. (2010). Turning to God in the Face of Ostracism: Effects of Social Exclusion on Religiousness. *Personality and Social Psychology Bulletin, 36(*6), 742–753. https://doi.org/10.1177/0146167210367491

Balgiu, B. A. (2017). Self-esteem, Personality and Resilience. Study of a student's emerging adults' group. *Journal of Educational Sciences & Psychology, 7,* 93–99.

Balkhi, F., Nasir, A., Zehra, A., & Riaz, R. (2020). Psychological and behavioral response to the coronavirus (COVID-19) pandemic. *Cureus, 12*(5). doi:10.7759/cureus.7923

Balmer, G. M., Pooley, J. A., & Cohen, L. (2014). Psychological resilience of Western Australian police officers: relationship between resilience, coping style, psychological functioning and demographics. *Police Practice and Research, 15*, 270–282.

Barrett, E. C., & Martin, P. (2014). *Extreme: Why some people thrive at the limits*. Oxford University Press.

Barton, J., Bragg, R., Pretty, J., Roberts, J., & Wood, C. (2016). The wilderness expedition: An effective life course intervention to improve young people's well-being and connectedness to nature. *Journal of Experiential Education, 39,* 59–72. https://doi.org/10.1177/1053825915626933

Baumeister, R. F. (1999). *The self in social psychology*. Psychology Press.

Bavel, J. J. V., Baicker, K., Boggio, P. S., Capraro, V., Cichocka, A., Cikara, M., ... & Willer, R. (2020). Using social and behavioural science to support COVID-19 pandemic response. *Nature Human Behaviour*, *4*(5), 460-471. https://doi.org/10.1038/s41562-020-0884-z

BBC News. (2021). *Covid map: Coronavirus cases, deaths, vaccinations by country.* https://www.bbc.co.uk/news/world-51235105

Beames, S. (2005). Expeditions and the social construction of the self. *Australian Journal of Outdoor Education, 9*, 14–22.

Beattie, S., Alqallaf, A., Hardy, L., & Ntoumanis, N. (2019). The mediating role of training behaviors on self-reported mental toughness and mentally tough behavior in swimming. *Sport, Exercise, and Performance Psychology*, *8*(2), 179–191. http://dx.doi.org.ezproxy.bangor.ac.uk/10.1037/spy0000146

Beck, A. T. (1963). Thinking and depression: I. Idiosyncratic content and cognitive distortions. *Archives of General Psychiatry*, *9*(4), 324–333. doi:10.1001/archpsyc.1963.01720160014002

Beck. J. (1995). *Cognitive therapy: Basics and beyond*. Guilford Press.

Bell, J. J., Hardy, L., & Beattie, S. (2013). Enhancing mental toughness and performance under pressure in elite young cricketers: A 2-year longitudinal intervention. *Sport, Exercise, and Performance Psychology*, *2*(4), 281–297. https://doi.org/10.1037/a0033129

Bitsika, V., Sharpley, C. F., & Peters, K. (2010). How is resilience associated with anxiety and depression? Analysis of factor score interactions within a homogeneous sample. *German Journal of Psychiatry*, *13*(1), 9–16.

Blackadder-Weinstein, J., Leon, G. R., Norris, R. C., Venables, N. C., & Smith, M. (2019). Individual attributes, values, and goals of an All-Military women Antarctic Expedition. *Aerospace Medicine and Human Performance, 90,* 18–25. https://doi.org/10.3357/AMHP.5248.2019

Blascovich, J., & Mendes, W. B. (2000). Challenge and threat appraisals: The role of affective cues. In J. P. Forgas (Ed.), *Feeling and thinking: The role of affect in social cognition* (pp. 59–82). Cambridge University Press.

Bleil, M. E., Appelhans, B. M., Thomas, A. S., Gregorich, S. E., Marquez, N., Roisman, G. I., Booth-LaForce, C., & Crowder, K. (2021). Early life predictors of positive change during the coronavirus disease pandemic. *BMC Psychology, 9,* 83. https://doi.org/10.1186/s40359-021-00586-7

Block, J., & Kremen, A. M. (1996). IQ and ego-resiliency: Conceptual and empirical connections and separateness. *Journal of Personality and Social Psychology, 70,* 349–361. https://doi.org/10.1037/0022-3514.70.2.349

Bong C., Fraser K., & Oriot D. (2016). Cognitive load and stress in simulation. *Comprehensive Healthcare Simulation: Paediatrics,* 3–17. https://doi.org/10.1007/978-3-319-24187-6_1

Bonanno, G. A. (2004). Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist, 59,* 20–28.

Bonanno, G. A., & Burton, C. L. (2013). Regulatory flexibility: An individual differences perspective on coping and emotion regulation. *Perspectives on Psychological Science, 8*(6), 591–612. https://doi.org/10.1177%2F1745691613504116

Boyes, M. E., Hasking, P. A., & Martin, G. (2015) Adverse Life Experience and Psychological Distress in Adolescence: Moderating and Mediating Effects of Emotion Regulation and Rumination. *Stress & Health, 32,* 402–410. https://doi.org/10.1002/smi.2635

Bradley, M. M., & Lang, P. J. (1994). Measuring emotion: The self-assessment manikin and the semantic differential. *Journal of Behavior Therapy and Experimental Psychiatry, 25*(1), 49–59. https://doi.org/10.1016/0005-7916(94)90063-9

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The Lancet, 395(*10227), 912–920. https://doi.org/10.1016/S0140-6736(20)30460-8

Bryan, C., O'Shea, D., & MacIntyre, T. (2019). Stressing the relevance of resilience: a systematic review of resilience across the domains of sport and work. *International Review of Sport and Exercise Psychology, 12,* 70–111. doi:10.1080/1750984X.2017.1381140

Burnett, H. J., Pichot, R. E., & Bailey, K. G. D. (2019) An exploratory study on psychological body armor: Factors supporting reactive and proactive pathways to resilience. *Crisis, Stress, and Human Resilience: An International Journal, 1,* 86–101.

Burns, D. D. (1980). *Feeling good: The new mood therapy*. William Morrow and Company.

Byrne, A., & Eysenck, M. W. (1995). Trait anxiety, anxious mood, and threat detection. *Cognition & Emotion, 9*(6), 549–562.

Caine, D., Walch, T., & Sabato, T. (2016) The elite young athlete: strategies to ensure physical and emotional health. *Open Access Journal of Sports Medicine, 7,* 99–113. https://doi.org/10.2147/oajsm.s96821C

Campbell-Sills, L., Cohan, S. L., & Stein, M. B. (2006). Relationship of resilience to personality, coping, and psychiatric symptoms in young adults. *Behavior Research and Therapy, 44*, 585–599. doi:10.1016/j.brat.2005.05.001

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research*, 287. https://doi.org/10.1016/j.psychres.2020.112934

Carmody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine, 31*, 23–33. https://doi.org/10.1007/s10865-007-9130-7

Cassidy, S. F. (2016). The Academic Resilience Scale (ARS-30): a new multidimensional construct measure. *Frontiers in Psychology, 7*. doi:10.3389/fpsyg.2016.01787

Cejudo, J., Rodrigo-Ruiz, D., Lopez-Delgado, M., & Losada, L. (2018). Emotional Intelligence and its Relationship with Levels of Social Anxiety and Stress in Adolescents. *International Journal of Environmental Research and Public Health, 15*, 1073. https://doi.org/10.3390/ijerph15061073

Chapman, H., Chipchase, S., & Bretherton, R. (2017). The evaluation of a continuing professional development package for primary care dentists designed to reduce stress, build resilience and improve clinical decision-making. *British Dental Journal, 223*, 261–271. https://doi.org/10.1038/sj.bdj.2017.712

Chen, X., Wang, Y., & Yan, Y. (2016). The essential resilience scale: Instrument development and prediction of perceived health behaviour. *Stress and Health, 32*, 533–542. doi:10.1002/smi.2659

Choi, J.- W., Cha, B., Jang, J., Park, C. -S., Kim, B.-J., Lee, C. S., & Lee, S. J. (2015). Resilience and impulsivity in euthymic patients with bipolar disorder. *Journal of Affective Disorders, 170*, 172–177. https ://doi.org/10.1016/j.jad.2014.08.056

Cigna, (2020). *Cigna Resilience Index (2020 U.S. Report*). https://cignaresilience.com/

Coifman, K. G., Bonanno, G. A., & Rafaeli, E. (2007). Affect dynamics, bereavement and resilience to loss. *Journal of Happiness Studies, 8*, 371–392. https://doi.org/10.1007/s10902-006-9014-5

Connor, K. M., & Davidson, J. R. (2003). Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC). *Depression and Anxiety*, *18*, 76–82. doi:10.1002/da.10113

Connor-Smith, J. K., Compas, B. E. (2002). Vulnerability to Social Stress: Coping as a Mediator or Moderator of Sociotropy and Symptoms of Anxiety and Depression. *Cognitive Therapy and Research 26*, 39–55. https://doi.org/10.1023/A:1013889504101

Corr, P. J. (2004). Reinforcement sensitivity theory and personality. *Neuroscience & Biobehavioral Reviews, 28*, 317–332. https://doi.org/10.1016/j.neubiorev.2004.01.005

Ćosić, K., Šarlija, M., Ivkovic, V., & Zhang, Q., Strangman, G., & Popović, S. (2019). Stress resilience assessment based on physiological features of air traffic controllers. *IEEE Access PP, 99.* doi:10.1109/ACESS.2019.2907479

Cowden, R. G., Meyer-Weitz. A., & Asante, K. O. (2016). Mental Toughness in Competitive Tennis: Relationships with Resilience and Stress. *Frontiers in Psychology, 7*, 320. doi:10.3389/fpsyg.2016.00320

Crane, M. F., & Searle, B. J. (2016). Building resilience through exposure to stressors: The effects of challenges versus hindrances. *Journal of Occupational Health Psychology*, *21*, 468–479. https://doi.org/10.1037/a0040064

Cribb, G., Moulds, M. L., & Carter, S. (2006). Rumination and Experiential Avoidance in Depression. *Behaviour Change, 23,* 165–176. https://doi.org/10.1375/bech.23.3.165

Cropley, M., Michalianou, G., Pravettioni, G., & Millward, L. J. (2011). The Relation of Post-work Ruminative Thinking with Eating Behaviour. *Stress & Health, 28(*1), 23–30. https://doi.org/10.1002/smi.1397

Curtin, S. & Brown, L. (2018). Travelling with a purpose: An ethnographic study of the eudemonic experiences of volunteer expedition participants. *Tourist Studies, 19,* 192–214. https://doi.org/10.1177/1468797618804162

Daniel, B. (2007). The Life Significance of a Spiritually Oriented, Outward Bound-Type Wilderness Expedition. *Journal of Experiential Education, 29*(3), 386–389. https://doi.org/10.1177%2F105382590702900312

Dantzer, R., Cohen, S., Russo, S. J., & Dinan, T. G. (2018). Resilience and immunity. *Brain, Behaviour, and Immunity, 74,* 28–42. doi:10.1016/j.bbi.2018.08.010

De Terte, I., Becker, J., & Stephens, C. (2009). An integrated model for understanding and developing resilience in the face of adverse events. *Journal of Pacific Rim Psychology*, *3*(1), 20–26.

Deffenbacher, J. L., & Suinn, R. M. (1988). Systematic desensitization and the reduction of anxiety. *The Counseling Psychologist*, *16*(1), 9–30. https://doi.org/10.1177%2F0011000088161002

Depaoli, S., & van de Schoot, R. (2016). Improving transparency and replication in Bayesian statistics: The WAMBS-checklist. *Psychological Methods,* 22, 240–261. https//doi.org/10.1037/met0000065

Derakhshan, N. (2020). Attentional control and cognitive biases as determinants of vulnerability and resilience in anxiety and depression. In T. Aue & H. Okon-Singer (Eds.), *Cognitive biases in health and psychiatric disorders: Neurophysiological foundations* (pp. 261–274). Elsevier Academic Press.

Dickson, K. S., Ciesla, J. A., & Reilly, L. C. (2012). Rumination, Worry, Cognitive Avoidance, and Behavioural Avoidance: Examination of Temporal Effects. *Behavior Therapy, 43(*3), 629–640. https://doi.org/10.1016/j,beth.2011.11.002

Dong, S. Y., Lee, M., Park, H., & Youn, I. (2018). Stress resilience measurement with heart-rate variability during mental and physical stress. *2018 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC).* doi:10.1109/EMBC.2018.8513531.

Doorn, N., Gardoni, P., & Murphy, C. (2018). A multidisciplinary definition and evaluation of resilience: the role of social justice in defining resilience. *Sustainable and Resilient Infrastructure.* doi:10.1080/23789689.2018.1428162

Edwards, A. L. (1991). Social desirability and ego resiliency. *American Psychologist, 46*, 250–251. https://doi.org/10.1037/0003-066X.46.3.250

Edward, K. L., & Warelow, P. (2005). Resilience: When coping is emotionally intelligent. *Journal of the American Psychiatric Nurses Association, 11*, 101–102. https://doi.org/10.1177/1078390305277526

Egeland, B., Carlson, E., & Sroufe, L. A. (1993). Resilience as process. *Development and Psychopathology, 5*, 517–528. https://doi.org/10.1017/S0954579400006131

Estrada, A. X., Severt, J. B., & Jiménez-Rodríguez, M. (2016). Elaborating on the conceptual underpinnings of resilience. *Industrial and Organizational Psychology*, *9*(2), 497–502.

Ewert, A., & Yoshino, A. (2011). The influence of short-term adventure-based experiences on levels of resilience. *Journal of Adventure Education and Outdoor Learning*, *11*, 35–50. https://doi.org/10.1080/14729679.2010.532986

Eysenck, M. W., Derakshan, N., Santos, R., & Calvo, M. G. (2007). Anxiety and cognitive performance: Attentional control theory. *Emotion, 7,* 336–353. https://doi.org/10.1037/1528-3542.7.2.336

Fenz, W. D., & Jones, G. B. (1972). The effect of uncertainty on mastery of stress: A case study. *Psychophysiology*, *9*(6), 615–619. https://doi.org/10.1111/j.1469-8986.1972.tb00771.x

Fisk, G. M., & Dionisi, A. (2010). Building and sustaining resilience in organizational settings: the critical role of emotion regulation. In W. J. Zerbe, C. E. J. Härtel, & N. M. Ashkanasy (Eds.), *Emotions and organizational dynamism (*pp. 167–188). Emerald Group Publishing Limited.

Fleming, J., & Ledogar, R. J. (2008). Resilience, an Evolving Concept: A Review of Literature Relevant to Aboriginal research. *Pimatisiwin, 6,* 7–23.

Fletcher, D., & Sarkar, M. (2012). A grounded theory of psychological resilience in Olympic champions. *Psychology of Sport & Exercise, 13,* 669–678. doi: 10.1016/j.psychsport.2012.04.007

Fletcher, D., & Sarkar, M. (2013). Psychological resilience: A review and critique of definitions, concepts and theory. *European Psychologist, 18*, 12–23.

Fletcher, D. & Sarkar, M. (2016). Mental fortitude training: An evidence-based approach to developing psychological resilience for sustained success. *Journal of Sport Psychology in Action, 7,* 135–157. doi:10.1080/21520704.2016.1255496

Ford, J. K., MacCallum, R. C., & Tait, M. (1986). The Application of Exploratory Factor Analysis in Applied Psychology: A critical review and analysis. *Personnel Psychology, 39,* 291–314.

Fu, S., Greco, L. M., Lennard, A. C., & Dimotakis, N. (2021). Anxiety responses to the unfolding COVID-19 crisis: Patterns of change in the experience of prolonged exposure to stressors. *Journal of Applied Psychology, 106,* 48–61.

Fullerton, D. J., Zhang, L. M., Kleitman, S. (2021). An integrative process model of resilience in an academic context: Resilience resources, coping strategies, and positive adaptation. *PLoS ONE, 16*. https://doi.org/10.1371/journal.pone.0246000

Furman, N., & Sibthorp, J. (2014). The Development of Prosocial Behavior in Adolescents. *Journal of Experiential Education, 37,* 160–175. https://doi.org/10.1177%2F1053825913489105

Frydenberg, E., & Lewis, R. (1993). Boys play sport and girls turn to others: Age, gender and ethnicity as determinants of coping. *Journal of Adolescence, 16,* 253–266. https://doi.org/10.1006/jado.1993.1024

Garber, M. C. (2017). Exercise as a stress coping mechanism in a pharmacy student population. *American Journal of Pharmaceutical Education, 81,* 50. https://doi.org/10.5688/ajpe81350

Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). *Bayesian data analysis*. Chapman and Hall/CRC Press.

Gerhardt, C., Semmer, N. K., Sauter, S., Walker, A., Wijn, N. Kälin, W., Kottwitz, M. U., Kersten, B., Ulrich, B., & Elfering, A. (2021). How are social stressors at work related to well-being and health? A systematic review and meta-analysis. *BMC Public Health, 21,* 890. https://doi.org/10.1186/s12889-021-10894-7

Gillet, N., Morin, A. J. S., & Reeve, J. (2017) Stability, change, and implications of students' motivation profiles: A latent transition analysis. *Contemporary Educational Psychology, 51,* 222–239. https://doi.org/10.1016/j.cedpsych.2017.08.006

Gilman, R., Laughlin, J. E., & Huebner, E. S. (1999). Validation of the Self-Description Questionnaire-II with an American sample. *School Psychology International*, *20,* 300–307. https://doi.org/10.1177%2F0143034399203005

Gooding, P., Hurst, A., Johnson, H. J., & Tarrier, N. (2011). Psychological resilience in young and older adults. *International Journal of Geriatric Psychiatry, 27,* 262–270. https://doi.org/10.1002/gps.2712

Gottlieb, B. H., & Rooney, J. A. (2004). Coping effectiveness: determinants and relevance to the mental health and affect of family caregivers of persons with dementia. *Aging & Mental Health*, *8,* 364–373. https://doi.org/10.1080/13607860410001709719

Gould, D., Finch, L. M., & Jackson, S. A. (1993). Coping strategies used by national champion figure skaters. *Research Quarterly for Exercise and Sport*, *64,* 453-468.

Grant, L., & Kinman, G. (2012). Enhancing wellbeing in social work students: Building resilience in the next generation. *Social Work Education*, *31,* 605–621.

Grant, L., & Kinman, G. (2015). *Guide to developing emotional resilience.* Community Care Inform. https://www.iasw.ie/download/201/Guide-to-emotional-resilience-download.pdf

Gray, J. A., & McNaughton, N. (2000). *The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system*. Oxford University Press.

Griffith, J., & West, C. (2013). Master Resilience Training and Its Relationship to Individual Well-Being and Stress Buffering Among Army National Guard Soldiers. The *Journal of Behavioral Health Services & Research, 40***,** 140–155. https://doi.org/10.1007/s11414-013-9320-8

Gross, J. J. (2002). Emotional regulation: Affective, cognitive, and social consequences. *Psychophysiology, 39,* 281–291. doi:10.1017/s0048577201393198

Gucciardi, D. F., & Hanton, S. (2016). Mental toughness: Critical reflections and future considerations. In R. J. Schinke, K. R. McGannon, & B. Smith (Eds.), *Routledge international handbook of sport psychology* (pp. 439–448). Routledge/Taylor & Francis Group.

Gucciardi, D. F., Jackson, B., Coulter, T. J., & Mallett, C. J. (2011). The Connor-Davidson Resilience Scale (CD-RISC): Dimensionality and age-related measurement invariance with Australian cricketers. *Psychology of Sport and Exercise, 12,* 423–433. https://doi.org/10.1016/j.psychsport.2011.02.005

Gucciardi, D., & Mallett, C. (2010). Understanding mental toughness and its development in sport. In S. J. Hanrahan & M. B. Andersen (Eds.), *Routledge handbook of applied sport psychology* (pp. 547–556). Routledge.

Hagger, M. S., & Chatzisarantis, N. L. (2011). Never the twain shall meet? Quantitative psychological researchers' perspectives on qualitative research. *Qualitative Research in Sport, Exercise and Health, 3,* 266–277. https://doi.org/10.1080/2159676X.2011.607185

Hamid, R. A., Sami, W., & Sidek, M. H. M. (2017). Discriminant validity assessment: Use of Fornell & Larcker criterion versus HTMT Criterion. *Journal of Physics: Conference series, 890.*

Hans, T. A. (2000). A meta-analysis of the effects of adventure programming on locus of control. *Journal of Contemporary Psychotherapy, 30,* 33–60. https://doi.org/10.1023/A:1003649031834

Hardy, L., Barlow, M., Evans, L., Rees, T., Woodman, T., & Warr, C. (2017). Great British medalists: Response to the commentaries. *Progress in Brain Research, 232,* 207–216. https://doi.org/10.1016/bs.pbr.2017.03.005

Hardy, L., Beattie, S., & Woodman, T. (2007). Anxiety-induced performance catastrophes: investigating effort required as an asymmetry factor. *British Journal of Psychology, 98,* 15–31. doi:10.1348/000712606x103428

Hardy, L., Bell, J., & Beattie, S. (2014). A neuropsychological model of mentally tough behaviour. *Journal of Personality, 8,* 69–81. doi:10.1111/jopy.12034

Hardy, L., Jones, G., & Gould, D. (1996). *Understanding psychological preparation for sport: theory and practice of elite performers.* Wiley.

Harrison, D., Sarkar, M., Saward, C., & Sunderland, C. (2021). Exploration of Psychological Resilience during a 25-Day Endurance Challenge in an Extreme Environment. *International Journal Environmental Research and Public Health, 18,* 12707. https://doi.org/10.3390/ ijerph182312707

Hascher, T., Beltman, S., & Mansfield, C. (2021). Teacher wellbeing and resilience: Towards an integrative model. *Educational Research, 63,* 416–439. doi:10.1080/00131881.2021.1980416

Hattie, J., Marsh, H. W., Neill, J. T., & Richards, G. E. (1997). Adventure Education and Outward Bound: Out-of-Class Experiences that Make a Lasting Difference. *Review of Educational Research, 67,* 43–87. https://doi,org/10.3102/00346547001043

Hayman, K. J., Kerse, N., & Consedine, N. S. (2017). Resilience in context: the special case of advanced age. *Aging & Mental Health, 21,* 577–585. doi:10.1080/13607863.2016.1196336

Hellerstein, D. (2011). *Heal your brain: How the new neuropsychiatry can help you go from better to well*. Johns Hopkins University Press.

Herman, A. M., Critchley, H. D., & Duka, T. (2018). Risk-taking and Impulsivity: The Role of Mood States and Interoception. *Frontiers in Psychology, 9*, 1625. https://doi.org/10.3389/fpsyg.2018.01625

Hernández-Ruiz, E. (2005). Effect of music therapy on the anxiety levels and sleep patterns of abused women in shelters. *Journal of Music Therapy, 42*, 140–158. https://doi.org/10.1093/jmt/42.2.140

Hicks, M. M., & Conner, N. E. (2014). Resilient ageing: A concept analysis. *Journal of Advanced Nursing, 70*, 744–755. https://doi.org/10.1111/jan.12226

Holmes, P. E., & River, P. L. (1998). Individual strategies for coping with he stigma of severe mental illness. *Cognitive and Behavioral Practice, 5*, 231–239. https://doi.org/10.1016/S1077-7229(98)80008-4

Howells, K., & Fletcher, D. (2015). Sink or swim: Adversity- and growth-related experiences in Olympic swimming champions. *Psychology of Sport and Exercise, 16*, 37–48. doi:10.1016/j.psychsport.2014.08.004

Howie, M. (2021). *UK now second highest in world for new Covid cases – as global infections jump 12% in a week*. Evening Standard. https://www.standard.co.uk/news/uk/uk-latest-covid-cases-global-pandemic-second-highest-behind-us-b946968.html

Hull, J. H., Loosemore, M., & Schwellnus, M. (2020). Respiratory health in athletes: facing the COVID-19 challenge. *The Lancet Respiratory Medicine, 8*(6), 557–558. https://doi.org/10.1016/s2213-2600(20)30175-2

Ingram, J., Hand. C. J., & Maciejewski, G. (2021). Social isolation during COVID-19 lockdown impairs cognitive function. *Applied Cognitive Psychology, 35*, 935–947. https://doi.org/10.1002/acp.3821

Isles, A. R., Winstanley, C. A., & Humby, T. (2018). Risk taking and impulsive behaviour: fundamental discoveries, theoretical perspectives and clinical implications. *Philosophical Transactions of the Royal Society B: Biological Sciences, 374(*1766). https://doi.org/10.1098/rstb.2018.0128

Jackson, R., & Watkin, C. (2004). The resilience inventory: Seven essential skills for overcoming life's obstacles and determining happiness. *Selection & Development Review, 20,* 13–17.

Jones, G., Hanton, S., & Connaughton, D. (2002). What is this thing called mental toughness? An investigation of elite sport performers. *Journal of Applied Sport Psychology, 14,* 205–218.

Joyce, S., Shand, F., Tighe, J., Laurent, S., Bryant, R. A., & Harvey, S. B. (2018) Road to resilience: a systematic review and meta-analysis of resilience training programmes and interventions. *BMJ Open, 8*(6), e017858. https//doi.org/10.1136/ bmjopen-2017-017858

Kale, D., Stautz, K., & Cooper, A. (2018). Impulsivity related personality traits and cigarette smoking in adults: A meta-analysis using the UPPS-P model of impulsivity and reward sensitivity. *Drug and Alcohol Dependence, 185,* 149–167. https://doi.org/10.1016/j.drugalcdep.2018.01.003

Killgore, W. D., Taylor, E. C., Cloonan, S. A., & Dailey, N. S. (2020). Psychological resilience during the COVID-19 lockdown. *Psychiatry Research, 291*. https://doi.org/10.1016/j.psychres.2020.113216

Kılınç, T., & Sis Çelik, A. (2021). Relationship between the social support and psychological resilience levels perceived by nurses during the COVID-19 pandemic: A study from Turkey. *Perspectives in Psychiatric Care, 57,* 1000–1008. https://doi.org/10.1111/ppc.12648

Kinard, E. M. (1998). Methodological issues in assessing resilience in maltreated children. *Child Abuse & Neglect, 22,* 669–680. doi:10.1016/s0145-2134(98)00048-9

Kirsh, D. (2000). A few thoughts on Cognitive Overload. *Intellectica, 1*(30), 19–51.

Kocalevent, R.-D., Zenger, M., Heinen, I., Dwinger, S., Decker, O., & Brahler, E. (2015). Resilience in the General Population: Standardization of the Resilience Scale (RS-11). *PLOS ONE 10(11*). https://doi.org/10.1371/journal.pone.0140322

Koster, E. H., & Hoorelbeke, K. (2015). Cognitive bias modification for depression. *Current Opinion in Psychology*, *4*, 119–123. https://doi.org/10.1016/j.copsyc.2014.11.012

Krane, V. (1994). The Mental Readiness Form as a Measure of Competitive State Anxiety. *The Sport Psychologist, 8*(2), 189–202.

Krieger, T., Zimmermann, J., Huffziger, S., Ubl, B., Diener, C., Kuehner, C., & Holtforth, M. G. (2014). Measuring depression with a well-being index: further evidence for the validity of the WHO Well-Being Index (WHO-5) as a measure of the severity of depression. *Journal of Affective Disorders*, *156*, 240–244. https://doi.org/10.1016/j.jad.2013.12.015

Kroenke, K., Spitzer, R. L., Williams, J. B. W., & Löwe, B. (2009). An Ultra-Brief Screening Scale for Anxiety and Depression: The PHQ-4. *Psychosomatics, 50,* 613–621.

Labrague, L. J., & Ballad, C. A. (2021). Lockdown fatigue among college students during the COVID-19 pandemic: Predictive role of personal resilience, coping behaviours, and health. *Perspectives in Psychiatric Care*. 1–8.

Lau, C., Chiesi, F., Saklofske, D. h., Yan, G., & Li, C. (2020). How essential is the essential resilience scale? Differential item functioning of Chinese and English versions and criterion validity. *Personality and Individual Differences, 155*. https://doi.org/ 10.1016/j.paid.2019.109666

Lazarus, R. S. (1991). Progress on a cognitive-motivational-relational theory of Emotion. *American Psychologist, 46*, 819–834. https://doi.og/10.1037/0003-066x.46.8.819

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer publishing company.

Leighton, S. (2010). Using a vignette-based questionnaire to explore adolescents' understanding of mental health issues. *Clinical Child Psychology and Psychiatry, 15*, 231–250. https://doi.org/10.1177%2F1359104509340234

Li, F., Cohen, A., Bottge, B., & Templin, J. (2016). A Latent Transition Analysis Model for Assessing Change in Cognitive Skills. *Educational and Psychological Measurement, 76*(2), 181–204.

Lines, R. L. J., Crane, M., Ducker, K. J., Ntoumanis, N., Thøgersen-Ntoumani, C., Fletcher, D., & Gucciardi, D. F. (2020). Profiles of adversity and resilience resources: A latent class analysis of two samples. *British Journal of Psychology, 111,* 174–199. https://doi.org/10.1111/bjop.12397

Löwe, B., Kroenke, K., & Gräfe, K. (2005). Detecting and monitoring depression with a two-item questionnaire (PHQ-2). *Journal of Psychosomatic Research, 58,* 163–171. doi:10.16/j.jpsychores.2004.09.006

Löwe, B., Wahl, I., Rose, M., Spitzer, C., Glaesmer, H., Wingenfeld, K., Schneider, A., & Brähler, E. (2010). A 4-item measure of depression and anxiety: Validation and standardization of the Patient Health Questionnaire-4 (PHQ-4) in the general population. *Journal of Affective Disorders, 122*, 86–95. doi:10.1016/j.jad.2009.06.019

Lumley, M. A., Cohen, J. L., Borszcz, G. S., Cano, A., Radcliffe, A. M., Porter, L. S., Schubiner, H., & Keefe, F. J. (2011). Pain and emotion: A biopsycholosocial review of recent research. *Journal of Clinical Psychology, 67*, 942–968. doi:10.1002/jclp.20816

Luthar, S. S. (2006). Resilience in development: A synthesis of research across five decades. In D. Cicchetti, & D. Cohen (Eds.), *Developmental psychopathology: Risk, disorder, and adaptation* (pp. 739–795). Wiley.

Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: a critical evaluation and guidelines for future work. *Child Development, 71*, 543–562.

Luthar, S. S., & Zelazo, L. B. (2003). Research on resilience: An integrative review. In S. S. Luthar (Ed.), *Resilience and vulnerability: Adaptation in the context of childhood adversities* (pp. 510-549). Cambridge University Press.

MacKenzie, S. B., Podsakoff, P. M., & Podsakoff, N. P. (2011). Construct measurement and validation procedures in MIS and behavioral research: Integrating new and existing techniques. *MIS Quarterly*, 293–334. https://doi.org/10.2307/23044045

MacLeod, C., & Mathews, A. (2012). Cognitive bias modification approaches to anxiety. *Annual Review of Clinical Psychology*, *8*, 189–217.

MacLeod, C., Mathews, A., & Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology, 95*, 15–20. https://doi.org/10.1037/0021-843X.95.1.15

Madison, A. A., Shrout, M. R., Renne, M. E., & Kiecolt-Glaser, J. K. (2021). Psychological and Behavioral Predictors of Vaccine Efficacy: Considerations for COVID-19. *Perspectives on Psychological Science, 16,* 191–203. https://doi.org/10.1177/1745691621989243

Magner, M. (2018). Social Media's Effect on Mental Health: How America's Youth are More Vulnerable to its Negative Implications. *Pop Culture Intersections*. *20*.

Major, B., Richards, C., Cozzarelli, C., Cooper, M. L., & Zubek, J. (1998). Personal resilience, cognitive appraisals and coping: An integrative model of adjustment to abortion. *Journal of Personality and Social Psychology, 74*, 735–752. doi:10.1037//0022-3514.74.3.735

Malla, A., Joober, R., & Garcia, A. (2015). "Mental illness is like any other medical illness": a critical examination of the statement and its impact on patient care and society. *Journal of Psychiatry & Neuroscience: 40*, 147–150.

Markland, D. (2007). The golden rule is that there are no golden rules: A commentary on Paul Barrett's recommendations for reporting model fit in structural equation modelling. *Personality and Individual Differences, 42*, 851–858. https://doi.org/10.1016/j.paid.2006.09.023

Marsh, H. W. (1986). Global self-esteem: Its relation to specific facets of self-concept and their importance. *Journal of personality and social psychology, 51*, 1224–1236. https://psycnet.apa.org/doi/10.1037/0022-3514.51.6.1224

Marsh, H. W. (1992). *Self-Description Questionnaire II: Manual*. University of Western Sydney, SELF Research Centre.

Marsh, H. W., Ellis, L. A., Parada, R. H., Richards, G., & Heubeck, B. G. (2005). A Short Version of the Self-Description Questionnaire II: Operationalizing Criteria for Short-Form Evaluation with New Applications of Confirmatory Factor Analyses. *Psychological Assessment. 17*. 81–102. https://doi.org/10.1037/1040-3590.17.1.81

Marsh, H. W., & O'Neill, R. (1984). Self Description Questionnaire III: The construct validity of multidimensional self-concept ratings by late adolescents. *Journal of Educational Measurement, 21,* 153–174. doi:10.1111/j.1745-3984.1984.tb00227.x

Marsh, H. W., Parada, R. H., & Ayotte, V. (2004). A Multidimensional Perspective of Relations Between Self-Concept (Self Description Questionnaire II) and Adolescent Mental Health (Youth Self-Report). *Psychological Assessment, 16,* 27–41. doi:10.1037/1040-3590.16.1.27

Martins, M. H., & Neto, V. C. (2016). Resilience and self concept of competence in institutionalized and non institutionalized young people. *Psicologia, 30*(2), 61–76. https://doi.org/10.17575/rpsicol.v30i2.1122

Martin-Breen, P., & Anderies, J. M. (2011). *Resilience: A Literature Review.* Bellagio Initiative, Brighton: Institute of Development Studies (IDS). http://opendocs.ids.ac.uk/opendocs/handle/123456789/3692

Masten, A. S., & Tellegen, A. (2012). Resilience in developmental psychopathology: Contributions of the Project Competence Longitudinal Study. *Development and Psychopathology, 24,* 345–361. doi:10.1017/ S095457941200003X

Matthews, G., Wohleber, R. W., & Lin, J. (2019). Stress, Skilled Performance, and Expertise: *The Oxford Handbook of Expertise,* 489–524.

Maunder, R. D., & White, F. A. (2019). Intergroup contact and mental health stigma: A comparative effectiveness meta-analysis. *Clinical Psychology Review, 72*. https://doi.org/10.1016/j.cpr.2019.101749

McAllister, S. J., Vincent, A., Hassett, A. L., Whipple, M. O., Oh, T. H., Benzo, R. P., & Toussaint, L. L. (2015). Psychological Resilience, Affective Mechanisms and Symptom Burden in a Tertiary-care Sample of Patients with Fibromyalgia. *Stress and health: Journal of the International Society for the Investigation of Stress, 31,* 299–305. doi:10.1002/smi.2555

McDonald, J. D. (2008). Measuring personality constructs: The advantages and disadvantages of self-reports, informant reports and behavioural assessments. *Enquire, 1*(1), 75–94.

McElligott, S. J. (2015). *Overseas Expeditions: Self-Esteem and Transformational Leadership.* [Doctoral thesis, Bangor University]. Bangor University Research Repository. http://e.bangor.ac.uk/6025/

McEwan, D., Zumbo, B. D., Eys, M., & Beauchamp, M. (2018). The development and psychometric properties of the multidimensional assessment of teamwork in sport. *Journal of Sport and Exercise Psychology, 40,* 1–13. doi:10.1123/jsep.2017-0193

McFadden, T. J., Helmreich, R. L., Rose, R. M., Fogg, L. F. (1994). Predicting astronaut effectiveness: A multivariate approach. *Aviation, Space, and Environmental Medicine, 65,* 904–90.

McFadden, P., Ross, J., Moriarty, J., Mallett, J., Schroder, H., Ravalier, J., Manthorpe, J., Currie, D., Harron, J., & Gillen, P. (2021). The Role of Coping in the Wellbeing and Work-Related Quality of Life of UK Health and Social Care Workers during COVID-19. *International Journal of Environmental Research and Public Health*, *18*(2), 815. doi:10.3390/ijerph18020815

McManus, S., Meltzer, H., Brugha, T. S., Bebbington, P. E., & Jenkins, R. (2009). *Adult psychiatric morbidity in England, 2007: results of a household survey*. NHS. https://digital.nhs.uk/data-and-information/publications/statistical/adult-psychiatric-morbidity-survey/adult-psychiatric-morbidity-in-england-2007-results-of-a-household-survey

Meichenbaum, D., & Novaco, R. (1985). Stress inoculation: A preventative approach. *Issues in Mental Health Nursing, 7,* 419–435. https://doi.org/10.3109/01612848509009464

Meijen, C., Turner, M., Jones, M. V., Sheffield, D., & McCarthy, P. (2020). A Theory of Challenge and Threat States in Athletes: A revised conceptualization. *Frontiers in Psychology.* https://doi.org/10.3389/fpsyg.2020.00126

Mertens, G., Gerritsen, L., Duijndam, S., Salemink, E., & Engelhard, I. M. (2020). Fear of the coronavirus (COVID-19): Predictors in an online study conducted in March 2020. *Journal of Anxiety Disorders, 74.* https://doi.org/10.1016/j.janxdis.2020.102258

Michinov, E., & Michinov, N. (2021) Stay at home! When personality profiles influence mental health and creativity during the COVID-19 lockdown. *Current Psychology*. 1–12. doi:10.1007/s12144-021-01885-3

Moore, L. J., Vine, S. J., Wilson, M. R., & Freeman, P. (2012). The effect of challenge and threat states on performance: An examination of potential mechanisms. *Psychophysiology*, *49*(10), 1417–1425. https://doi.org/10.1111/j.1469-8986.2012.01449.x

Montpetit, M. A., & Tiberio, S. S. (2016). Probing resilience: Daily environmental mastery, self-esteem, and stress appraisal. *The International Journal of Aging and Human Development*, *83*, 311–332.

Morrison, R., & O'Connor, R. (2004). Predicting psychological distress in college students: The role of rumination and stress. *Journal of Clinical Psychology, 61,* 447–460. https://doi.org/10.1002/jclp.20021

Mummery, W. K., Schofield, G., & Perry, C. (2004). Bouncing back: The role of coping style, social support and self-concept in resilience of sport performance. *Athletic Insight*, *6*(3), 1–15.

Muthén, B. (2003). Statistical and Substantive Checking in Growth Mixture Modeling: Comment on Bauer and Curran (2003). *Psychological Methods, 8*(3), 369–377. https://doi.org/10.1037/1082-989X.8.3.369

Muthén, B., & Asparouhov, T. (2012). Bayesian structural equation modelling: a more flexible representation of substantive theory. *Psychological Methods, 17,* 313–335. https://doi.org/10.1037/a0026802

Mutz, M., & Müller, J. (2016). Mental health benefits of outdoor adventures: Results from two pilot studies. *Journal of Adolescence, 49,* 105–114. doi:10.106/j.adolescence.2016.03.009

Myers, N. D., Ntoumanis, N., Gunnell, K. E., Gucciardi, D. F., & Lee, S. (2018). A review of some emergent quantitative analyses in sport and exercise psychology. *International Review of Sport and Exercise Psychology, 11,* 70–100. https://doi.org/10.1080/1750984X.2017.1317356

Nazlı, Ş. B., Yığman, F., Sevindik, M., & Deniz Özturan, D. (2021). Psychological factors affecting COVID-19 vaccine hesitancy. *Irish Journal of Medical Science, 191,* 71–80. https://doi.org/10.1007/s11845-021-02640-0

Neill, J. T., & Dias, K. L. (2001). Adventure Education and Resilience: The Double-Edged Sword. *Journal of Adventure Education and Outdoor Learning, 1*(2), 35–42.

Nicholls, A. R., Levy, A. R., & Perry, J. L. (2015). Emotional maturity, dispositional coping, and coping effectiveness among adolescent athletes. *Psychology of Sport and Exercise, 17,* 32–39. https://doi.org/10.1016/j.psychsport.2014.11.004

Niven, A. G., & Markland, D. (2016). Using self-determination theory to understand motivation for walking: Instrument development and model testing using Bayesian structural equation modelling. *Psychology of Sport and Exercise, 23,* 90–100. https://doi.org/10.1016/j.psychsport.2015.11.004

O'Connor, D. B., O'Connor, R. C., & Marshall, R. (2007). Perfectionism and psychological distress: evidence of the mediating effects of rumination. *European Journal of Personality, 21,* 429–452. https://doi.org/10.1002/per.616

Okafor, E., Lucier-Greer, M., & Mancini, J. A. (2016). Social stressors, coping behaviors, and depressive symptoms: A latent profile analysis of adolescents in military families. *Journal of Adolescence, 51*, 133–143. https://doi.org/10.1016/j.adolescence.2016.05.010

Oliver, K. G., Collin, P., Burns, J., & Nicholas, J. (2006) Building resilience in young people through meaningful participation. *Australian E-Journal for the Advancement of Mental Health, 5(*1), 34-40. https://doi.org/10.5172/jamh.5.1.34

Olsson, C. A., Bond, L., Burns, J. M., Vella-Brodrick, D. A., & Sawyer, S. M. (2003). Adolescent resilience: a concept analysis. *Journal of Adolescence, 26*, 1–11. https://doi.org/10.1016/s0140-1971(02)0011805

Oudejans, R. R., & Pijpers, J. R. (2010). Training with mild anxiety may prevent choking under higher levels of anxiety. *Psychology of Sport and Exercise*, *11*(1), 44–50. https://doi.org/10.1016/j.psychsport.2009.05.002

Outlook Expeditions (2022, August) *Expeditions*. https://outlookexpeditions.com/

Ozbay, F., Johnson, D. C., Dimoulas, E., Morgan, C. A. III., Charney, D., & Southwick, S. (2007). Social support and resilience to stress: From neurobiology to clinical practice. *Psychiatry, 4*(5), 35–40.

Palinkas, L. A., & Suedfeld, P. (2008). Psychological effects of polar expeditions. *The Lancet, 371*, 153–163. doi:10.1016/S0140-6736(07)61056-3

Palamarchuk, I. S. & Vaillancourt, T. (2021). Mental resilience and coping with stress: A comprehensive, multi-level model of cognitive processing, decision making, and behavior, *Frontiers in Behavioural Neuroscience, 15*, 719674. doi:10.3389/fnbeh.2021.719674

Panchal, N., Kamal, R., Cox, C., & Garfield, R. (2021). The implications of COVID-19 for mental health and substance use. https://www.kff.org/coronavirus-covid-19/issue-brief/the-implications-of-covid-19-for-mental-health-and-substance-use/

Pangallo, A., Zibarras, L., Lewis, R., & Flaxman, P. (2015). Resilience through the lens of interactionism: A systematic review. *Psychological Assessment, 27,* 1–20. https://doi.org/10.1037/pas0000024

Pattison, S. (2011). The development and implementation of a mental toughness training programme for young cricketers [Doctoral thesis, Rhodes University]. Rhodes University Digital Commons. https://vital.seals.ac.za/vital/access/manager/Repository/vital:3037?site_name=GlobalView&view=grid&f0=sm_subject%3A%22Mental+discipline%22&f1=sm_creator%3A%22Pattison%2C+Stuart%22&sort=sort_ss_sm_creator+asc

Paulhus, D. L., & Vazire, S. (2007). The self-report method. In R. W. Robins, R. C. Fraley, & R. F. Krueger (Eds.), *Handbook of research methods in personality psychology* (pp. 224–239). The Guilford Press.

Pedersen, W. C., Denson, T. F., Goss, R. J., Vasquez, E. A., Kelley, N. J., & Miller, N. (2011). The impact of rumination on aggressive thoughts, feelings, arousal, and behaviour. *British Journal of Social Psychology, 50, 281–301.* https://doi.org/10.1348/014466610X515696

Petzold, M. B., Bendau, A., Plag, J., Pyrkosch, L., Mascarell Maricic, L., Betzler, F., ... & Ströhle, A. (2020). Risk, resilience, psychological distress, and anxiety at the beginning of the COVID-19 pandemic in Germany. *Brain and Behavior, 10.* https://doi.org/10.1002/brb3.1745

Pietrzak R. H, & Southwick S. M. (2011). Psychological resilience in OEF-OIF Veterans: Application of a novel classification approach and examination of demographic and psychosocial correlates. *Journal of Affect Disorders, 133,* 560–568.

Putman, P., Verkuil, B., Arias-Garcia, E., Pantazi, I., & Van Schie, C. (2014). EEG theta/beta ratio as a potential biomarker for attentional control and resilience against deleterious effects of stress on attention. *Cognitive, Affective, & Behavioral Neuroscience*, *14,* 782–791. https://doi.org/10.3758/s13415-013-0238-7

Putwain, D. W., Daly, A. L., Chamberlain, S., & Sadreddini, S. (2015). 'Sink or swim': buoyancy and coping in the cognitive test anxiety – academic performance relationship. *Educational Psychology, 36,* 1807–1825. https://doi.org/10.1080/01443410.2015.1066493

Radez, J., Reardon, T., Creswell, C., Lawrence, P. J., Evdoka-Burton, G., & Waite, P. (2021). Why do children and adolescents (not) seek and access professional help for their mental health problems? A systematic review of quantitative and qualitative studies. *European Child & Adolescent Psychiatry, 30,* 183–211. https://doi.org/10.1007/s00787-019-01469-4

Rajaleid, K., Nummi, T., Westerlund, H., Virtanen, P., Gustafsson, P. E., Hammarström, A. (2015). Social adversities in adolescence predict unfavourable trajectories of internalized mental health symptoms until middle age: results from the Northern Swedish Cohort. *European Journal of Public Health*, *26,* 23–29. doi:10.1093/eurpub/ckv150

Ramírez-Maestre, C., de la Vega, R., Sturgeon, J. A., & Peters, M. (2019). Editorial: Resilience Resources in Chronic Pain Patients: The Path to Adaptation. *Frontiers in Psychology, 10,* 2848. doi:10.3389/fpsyg.2019.02848

Ran, L., Wang, W., Ai, M., Kong, Y., Chen, J., & Kuang, L. (2020). Psychological resilience, depression, anxiety, and somatization symptoms in response to COVID-19: A study of the general population in China at the peak of its epidemic. *Social Science & Medicine, 262*. https://doi.org/10.1016/j.socscimed.2020.113261

Reivich, K. J., Seligman, M. E. P., & McBride, S. (2011). Master resilience training in the U.S. Army. *American Psychologist, 66*, 25–34. https://doi.org/10.1037/a0021897

Resnick, B., Galik, E., Dorsey, S., Scheve, A., & Gutkin, S. (2011). Reliability and Validity Testing of the Physical Resilience Measure. *The Gerontologist, 51*, 643–652.

Ringeisen, T., & Raufelder, D. (2015). The interplay of parental support, parental pressure and test anxiety – Gender differences in adolescents. *Journal of Adolescence, 45*, 67–79. https://doi.org/10.1016/j.adolescence.2015.08.018

Robb, S. L. (2000). Music assisted progressive muscle relaxation, progressive muscle relaxation, music listening, and silence: A comparison of relaxation techniques. *Journal of Music Therapy, 37*, 2–21. https://doi.org/10.1093/jmt/37.1.2

Robertson, I. T., Cooper, C. L., Sarkar, M., & Curran, T. (2015). Resilience training in the workplace from 2003 to 2014: A systematic review. *Journal of Occupational and Organizational Psychology, 88*, 533–562. https://doi.org/10.1111/joop.12120

Rose, S., & Palattiyil, G. (2020). Surviving or thriving? Enhancing the emotional resilience of social workers in their organisational settings. *Journal of Social Work, 20,* 23–42. doi:10.1177/1468017318793614

Rossato, C. J. L., Uphill, M. A., Swain, J., & Coleman, D. A. (2016). The development and preliminary validation of the Challenge and Threat in Sport (CAT-Sport) Scale. *International Journal of Sport and Exercise Psychology, 16,* 164–177. https://doi.org/10.1080/1612197X.2016.1182571

Rutter, M. (1985). Resilience in the face of adversity: Protective factors and resistance to psychiatric disorder. *The British Journal of Psychiatry*, *147*, 598–611.

Rutter, M. (1987). Psychosocial resilience and protective mechanisms. *American Journal of Orthopsychiatry. 57*, 316–331.

Ryb, G. E., Dischinger, P. C., Kufera, J. A., & Read, K. M. (2006). Risk perception and impulsivity: Association with risky behaviors and substance abuse disorders. *Accident Analysis & Prevention, 38(*3), 567–573. https://doi.org10.1016/j.aap.2005.12.001

Salovey, P., Bedell, B. T., Detweiler, J. B., & Mayer, J. D. (1999). Coping intelligently: Emotional intelligence and the coping process. In C. R. Snyder (Ed.), *Coping: The psychology of what works* (pp. 141–164). Oxford University Press.

Sandal, G. M., Grønningsæter, H., Eriksen, H. E., Gravraakmo, A., Birkeland, K., & Ursin, H. (1998). Personality and endocrine activation in military stress situations. *Military Psychology, 10*, 45–61. doi:10.1207/s15327876mp1001_4

Sanders, J., Munford, R., Thimasarn-Anwar, T., Liebenberg, L., & Ungar, M. (2015). The role of positive youth development practices in building resilience and enhancing wellbeing for at-risk youth. *Child Abuse & Neglect, 42*, 40–53.

Sarkar, M & Fletcher, D. (2013). How Should We Measure Psychological Resilience in Sport Performers? *Measurement in Physical Education and Exercise Science, 17*, 264–280, doi:10.1080/1091367X.2013.805141

Sarrionandia, A., Ramos-Díaz, E., & Fernández-Lasarte, O. (2018). Resilience as a Mediator of Emotional Intelligence and Perceived Stress: A Cross-Country Study. *Frontiers in Psychology, 9,* 2653. https://doi.org/ 10.3389/fpsyg.2018.02653

Sayer, A. (2011). *Why things matter to people: social science, values and ethical life.* Cambridge University Press.

Scherer, K. R., & Shorr, A., & Johnstone, T. (Ed.). (2001*). Appraisal Processes in Emotion: Theory, Methods, Research.* Oxford University Press.

Schneider, T. R., Lyons, J. B., & Khazon, S. (2013). Emotional intelligence and resilience. *Personality and Individual Differences, 55,* 909–914. https://doi.org/10.1016/j.paid.2013.07.460

Scrutton, R., & Beames, S. (2015). Measuring the Unmeasurable: Upholding rigor in quantitative studies of personal and social development in outdoor adventure education. *Journal of Experiential Education*, *38,* 8–25. https://doi.org/10.1177%2F1053825913514730

Seery, M. D. (2011). Challenge or threat? Cardiovascular indexes of resilience and vulnerability to potential stress in humans. *Neuroscience & Biobehavioral Reviews, 35*, 1603–1610. doi:10.1016/j.neubiorev. 2011.03.003

Seery, M. D., & Quinton, W. J. (2016). Understanding resilience: From negative life events to everyday stressors. In *Advances in experimental social psychology* (Vol. 54, pp. 181–245). Academic Press.

Seifried, C. (2008). Examining Punishment and Discipline: Defending the Use of Punishment by Coaches. *Quest, 60,* 370–386. doi:10.1080/00336297.2008.10483587

Seligman, M. E., Steen, T. A., Park, N., & Peterson, C. (2005). Positive psychology progress: empirical validation of interventions. *American psychologist*, *60.* 410–421. https://psycnet.apa.org/doi/10.1037/0003-066X.60.5.410.

Senior, C. J., Godovich, S. A., Habayeb, S., Alvord, M. K., & Rich, B. A. (2020) The Effects of a Resilience-based Group Intervention for Youth with ADHD. *Journal of Child and Adolescent Counseling, 6*(3), 200–214. https://doi.org/10.1080/23727810.2020.1719353

Skehill, C. M. (2001). Resilience, coping with an extended stay outdoor education program, and adolescent mental health [Doctoral thesis, University of Canberra]. University of Canberra Cite Seer. http://www.wilderdom.com/pdf/Skehill2001ResilienceCopingOutdoorEducation.pdf

Smith, N., Barrett, E., & Sandal, G, M. (2018). Monitoring daily events, coping strategies, and emotion during a desert expedition in the Middle East. *Stress and Health*, *34*, 534–544. https://doi.org/10.1002/smi.2814

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: assessing the ability to bounce back. *International Journal of Behavioral Medicine*, *15*, 194–200. doi:10.1080/10705500802222972

Smith, N., Keatley, D., Sandal, G. M., Kjaergaard, A., Stoten, O., Facer-Childs, J., & Barrett, E. C. (2021). Relations Between Daily Events, Coping Strategies and Health During a British Army Ski Expedition Across Antarctica. *Environment and Behavior. 53,* 91–116. doi:10.1177/0013916519886367

Smith, N., Kinnafick, F., Cooley, S. J., & Sandal, G. M. (2016). Reported growth following mountaineering expeditions: The role of personality and perceived stress. *Environment and Behaviour, 49*, 933–955. doi:10.1177/0013916516670447

Smith, N., Sandal, G. M., Leon, G. R., & Kjærgaard, A. (2017). Examining personal values in extreme environment contexts: Revisiting the question of generalizability. *Acta Astronautica, 137*, 138–144. https://doi.org/10.1016/j.actaastro.2017.04.008

Sontag, L. M., Graber, J. A., Brooks-Gunn, J., & Warren, M. P. (2008). Coping with social stress: implications for psychopathology in young adolescent girls. *Journal of abnormal child psychology, 36*, 1159–1174. https://doi.org/10.1007/s10802-008-9239-3

Spurk, D., Hirschi, A., Wang. M., Valero, D., & Kauffeld, S. (2020). Latent profile analysis: A review and "how to" guide of its application within vocational behavior research. *Journal of Vocational Behavior, 120*. https://doi.org/10.1016/j.jvb.2020.103445

Staddon, J. (2017). *Scientific Method*. Routledge. doi:10.4324/9781315100708

Steel-Fisher, G. K., Blendon, R. J., Ward, J. R., Rapoport, R., Kahn, E. B., & Kohl, K. S. (2012). Public response to the 2009 influenza A H1N1 pandemic: a polling study in five countries. *The Lancet. Infectious Diseases, 12*(11), 845C850. https://doi.org/10.1016/S1473-3099(12)70206-2

Stein, D. J., & Nesse, R. M. (2011). Threat detection, precautionary responses, and anxiety disorders. *Neuroscience & Biobehavioral Reviews, 35*, 1075–1079. https://doi.org/10.1016/j.neubiorev.2010.11.012

Steinberg, L., Sharp, C., Stanford, M. S., & Tharp, A. T. (2013). New tricks for an old measure: The development of the Barratt Impulsiveness Scale–Brief (BIS-Brief). *Psychological Assessment, 25*, 216–226. https://doi.org/10.1037/a0030550

Stott, T. A., Allison, P., & Von Wald, K. (2013). Learning outcomes of young people on a Greenland expedition: Assessing the educational value of adventure tourism. In S. Taylor, P. Varley & T. Johnston (Eds.), *Adventure tourism: Meanings, experience and learning* (pp. 148–160). Routledge.

Suedfeld, P. (2001). Applying positive psychology in the study of extreme environments. Journal of Human Performance in Extreme Environments, 6, 21–25. https://doi.org/10.7771/2327-2937.1020

Thompson, K. L., Hannan, S. M., & Miron, L. R. (2014). Fight, flight, and freeze: Threat sensitivity and emotion dysregulation in survivors of chronic childhood maltreatment. *Personality and Individual Differences, 69*, 28–32. https://doi.org/10.1016/j.paid.2014.05.005

Thwaites, R., & Freeston, M. H. (2005). Safety-seeking behaviours: Fact or function? How Can We Clinically Differentiate Between Safety Behaviours and Adaptive Coping Strategies Across Anxiety Disorders? *Behavioural and Cognitive Psychotherapy, 33*, 177–188. https://doi.org/10.1017/S1352465804001985

Tomaka, J., Blascovich, J., Kelsey, R. M., & Leitten, C. L. (1993). Subjective, physiological, and behavioral effects of threat and challenge appraisal. *Journal of Personality and Social Psychology, 65*, 248–260.

Topp, C. W., Østergaard, S. D., Søndergaard, S., & Bech, P. (2015). The WHO-5 Well-Being Index: a systematic review of the literature. *Psychotherapy and psychosomatics, 84*, 167–176. https://doi.org/10.1159/000376585

Trivate, T., Dennis, A. A., Sholl, S., & Wilkinson, T. (2019). Learning and coping through reflection: exploring patient death experiences of medical students. *BMC medical education, 19*, 451.

Turner, M., Scott-Young, C. M., & Holdsworth, S. (2017). Promoting wellbeing at university: The role of resilience for students of the built environment. *Construction Management and Economics, 35*, 707–718. https://doi.org/10.1080/01446193.2017.1353698

Uphill, M. A., Rossato, C. J. L., Swain, J., & O'Driscoll, J. (2019). Challenge and threat: A critical review of the literature and an alternative conceptualization. *Frontiers in Psychology, 10*, 1255. https://doi.org/10.3389/fpsyg.2019.01255

Usher, K., Bhullar, N., & Jackson, D. (2020). Life in the pandemic: Social isolation and mental health. *Journal of Clinical Nursing*, 29, 15–16. https://doi.org/10.1111/jocn.15290.

Van Boven, L., & Ashworth, L. (2007). Looking forward, looking back: Anticipation is more evocative than retrospection. *Journal of Experimental Psychology: General, 136,* 289–300.

Vanhove, A. J., Herian, M. N., Perez, A. L. U., Harms, P. D., & Lester, P. B. (2016). Can resilience be developed at work? A meta-analytic review of resilience-building programme effectiveness. *Journal of Occupational and Organizational Psychology*, *89*(2), 278–307. doi:10.1111/joop.12123

Wagnild, G. M., & Young, H. M. (1993). Development and psychometric evaluation of the resilience scale. *Journal of Nursing Measurement, 1*, 165–178.

Wang, Y., Kim, E., & Yi, Z. (2021). Robustness of Latent Profile Analysis to Measurement Noninvariance Between Profiles. *Educational and Psychological Measurement*. https://doi.org/10.1177%2F0013164421997896

Wang. C., & Zhao, H. (2020). The Impact of COVID-19 on Anxiety in Chinese University Students. *Fronters in Psychology, 11*, 1168. doi:10.3389/fpsyg.2020.01168

Weiner, B. (1980). *Human motivation*. Erlbaum.

Windle, G., Bennett, K., & Noyes, J. (2011). A methodological review of resilience measurement scales. *Health and Quality of Life Outcomes, 9,* 8. doi:10.1186/1477-7525-9-8

Winslow, B. D., Carroll, M. B., Martin, J. W., Surpris, G., & Chadderdon, G. L. (2015). Identification of resilient individuals and those at risk for performance deficits under stress. *Frontiers in Neuroscience.* https://doi.org/10.3389/fnins.2015.00328

Wirtz, P, W., Rohrbeck, C. A., & Burns, K. M. (2017). Anxiety effects on disaster precautionary behaviors: A multi-path cognitive model. *Journal of Health Psychology, 24,* 1401–1411. https://doi.org/10.1177%2F1359105317720277

Wolke, D., Waylen, A., Samara, M., Steer, C., Goodman, R., Ford, T., & Lamberts, K. (2009). Selective drop-out in longitudinal studies and non-biased prediction of behaviour disorders. *The British Journal of Psychiatry: The Journal of Mental Science, 195*, 249–256. https://doi.org/10.1192/bjp.bp.108.053751

Wolpe, J. (1958). *Psychotherapy by reciprocal inhibition*. Stanford University Press

Wood, S. K., & Bhatnagar, S. (2015). Resilience to the effects of social stress: Evidence from clinical and preclinical studies on the role of coping strategies. *Neurobiology of Stress, 1,* 164–173. https://doi.org/10.1016/j.ynstr.2014.11.002

World Health Organization. (2020a). *Coronavirus disease (COVID-19) weekly epidemiological update.* https://www.who.int/publications/m

World Health Organization. (2020b). *Survey tool and guidance.* https://www.euro.who.int/__data/assets/pdf_file/0007/436705/COVID-19-survey-tool-and-guidance.pdf

Yaroush, R. A., & Bourne, L. E. (2008). Cognitive performance and resilience to stress. In M. A. Staal., & L. E. Bourne (Eds.), *Biobehavioral resilience to stress* (pp. 261–287). Routledge.

Yildırım, M., & Arslan, G. (2020). Exploring the associations between resilience, dispositional hope, preventive behaviours, subjective well-being, and psychological health among adults during early stage of COVID-19. *Current Psychology*, 1–11. https://doi.org/10.1007/s12144-020-01177-2

Yıldırım, M., Arslan, G., & Özaslan, A. (2020). Perceived risk and mental health problems among healthcare professionals during COVID-19 pandemic: Exploring the mediating effects of resilience and coronavirus fear. *International Journal of Mental Health and Addiction,* 1–11. https://doi.org/10.1007/s11469-020-00424-8

Yoshino, A. (2008). *Stress and coping in the context of adventure education: Testing a hypothetical model of perceived psychological growth* [Doctoral thesis, Indiana University]. ProQuest. https://search.proquest.com/openview/29adff239e401c69ebed5878d33ac35e/1?pq-origsite=gscholar&cbl=18750&diss=y

Zapater-Fajari, M., Crespo-Sanmiguel, I., Pulopulos, M. M., Hidalgo, V., & Salvador, A. (2021). Resilience and psychobiological response to stress in older people: The mediating role of coping strategies. *Frontiers in Aging Neuoscience.* https://doi.org/10.3389/fnagi.2021.632141

Zautra, A. J., Arewasikporn, A., & Davis, M. C. (2010). Resilience: Promoting well-being through recovery, sustainability, and growth. *Research in Human Development, 7*, 221–238. doi:10.1080/ 15427609.2010.504431

Zeidner, M., Matthews, G., & Roberts, R. D. (2012). The emotional intelligence, health, and well-being nexus: What have we learned and what have we missed?. *Applied Psychology: Health and Well-Being*, *4*(1), 1–30. https://doi.org/10.1111/j.1758-0854.2011.01062.x

Zhang, D. C., Highhouse, S., & Nye, C. D. (2018). Development and validation of the general risk propensity scale (GRiPS). *Journal of Behavioral Decision Making*, *32*, 152–167. https://doi.org/10.1002/bdm.2102

Zhang, S., Roberts, R., Woodman, T., Pitkethly, A., English, C., & Nightingale, D. (2021). 'Foresee the glory and train better: Narcissism, goal-setting and athlete training'. *Sport, Exercise, and Performance Psychology*, 1–31. https://doi.org/10.1037/spy0000264

Zimmer-Gembeck, M. J., Skinner, E. A., Modecki, K. L., Webb, H. J., Gardner, A. A., Hawes, T., & Rapee, R. M. (2018). The self-perception of flexible coping with stress: A new measure and relations with emotional adjustment, *Cogent Psychology*, *5*(1). https://psycnet.apa.org/doi/10.1080/23311908.2018.1537908

Appendices

Appendix A: 20-Items of the Resilience Process Scale (Final 13-Items are in Bold)

The Resilience Process Scale (RPS).

General

Please think of different tough situations, life events, challenges and obstacles that you may have experienced in the past or may experience in the future. This could be any event in which you have, or could experience stress, pressure, or hardship.
Indicate below the extent to which you agree with each statement about yourself with regards to this/these experience(s), by circling the relevant number on the rating scale from "1" (Strongly Disagree) to "7" (Strongly Agree), with "4" being that you neither agree or disagree. Choose a number which best indicates your feelings about that statement. There are no right or wrong answers and all ratings will be kept confidential so please answer honestly. Everyone differs in how they deal with different situations. It is likely that there will be areas that you are better or worse in; this is totally normal and something we would expect.

In these situations…	Strongly Disagree			Neither agree or disagree			Strongly Agree
1. I reflect and learn from difficult experiences.	1	2	3	4	5	6	7
2. I remain positive, even when things seem hopeless.	1	2	3	4	5	6	7
3. I make back-up plans for when things might go wrong.	1	2	3	4	5	6	7
4. I tend to organise myself well to deal with challenges.	1	2	3	4	5	6	7
5. I bounce-back easily after a challenge.	1	2	3	4	5	6	7
6. When things get bad, I don't let them get to me.	1	2	3	4	5	6	7
7. I can anticipate when help is going to be needed.	1	2	3	4	5	6	7
8. I quickly get over set-backs.	1	2	3	4	5	6	7
9. I keep a clear head under pressure.	1	2	3	4	5	6	7
10. I give my best effort no matter the obstacle.	1	2	3	4	5	6	7
11. I know how to stop the same things getting to me in the future.	1	2	3	4	5	6	7
12. I recognise when tough challenges are approaching.	1	2	3	4	5	6	7
13. I know when to get help after a tough situation.	1	2	3	4	5	6	7
14. I seek out support before stress affects me.	1	2	3	4	5	6	7
15. I can anticipate when a situation will stress me.	1	2	3	4	5	6	7
16. I recover quickly after feeling worn-out.	1	2	3	4	5	6	7
17. I notice possible difficult situations early.	1	2	3	4	5	6	7
18. In stressful situations I usually maintain focus.	1	2	3	4	5	6	7
19. I prepare myself for upcoming challenges.	1	2	3	4	5	6	7
20. I know where I can get help when difficult problems are approaching.	1	2	3	4	5	6	7

The Resilience Process Scale (RPS).
Physical

Please think of different tough **physical** situations, life events, challenges and obstacles that you may have experienced in the past or may experience in the future. This could range from exercise, sport, outdoors activities, illness, injury in which you have or may experience exhaustion, hunger, thirst, or any other physical issue.

In these situations…

	Strongly Disagree			Neither agree or disagree			Strongly Agree
1. I reflect and learn from difficult experiences.	1	2	3	4	5	6	7
2. I remain positive, even when things seem hopeless.	1	2	3	4	5	6	7
3. I make back-up plans for when things might go wrong.	1	2	3	4	5	6	7
4. I tend to organise myself well to deal with challenges.	1	2	3	4	5	6	7
5. I bounce-back easily after a challenge.	1	2	3	4	5	6	7
6. When things get bad, I don't let them get to me.	1	2	3	4	5	6	7
7. I can anticipate when help is going to be needed.	1	2	3	4	5	6	7
8. I quickly get over set-backs.	1	2	3	4	5	6	7
9. I keep a clear head under pressure.	1	2	3	4	5	6	7
10. I give my best effort no matter the obstacle.	1	2	3	4	5	6	7
11. I know how to stop the same things getting to me in the future.	1	2	3	4	5	6	7
12. I recognise when tough challenges are approaching.	1	2	3	4	5	6	7
13. I know when to get help after a tough situation.	1	2	3	4	5	6	7
14. I seek out support before stress affects me.	1	2	3	4	5	6	7
15. I can anticipate when a situation will stress me.	1	2	3	4	5	6	7
16. I recover quickly after feeling worn-out.	1	2	3	4	5	6	7
17. I notice possible difficult situations early.	1	2	3	4	5	6	7
18. In stressful situations I usually maintain focus.	1	2	3	4	5	6	7
19. I prepare myself for upcoming challenges.	1	2	3	4	5	6	7
20. I know where I can get help when difficult problems are approaching.	1	2	3	4	5	6	7

The Resilience Process Scale (RPS).
Social

Please think of different tough **social** situations, life events, challenges and obstacles you may have experienced in the past or may experience in the future. This could range from arguments, criticism you have had or may experience, public speaking, making new friends, and other difficult relationship, family and friendship issues.

In these situations…	Strongly Disagree			Neither agree or disagree			Strongly Agree
1. I reflect and learn from difficult experiences.	1	2	3	4	5	6	7
2. I remain positive, even when things seem hopeless.	1	2	3	4	5	6	7
3. I make back-up plans for when things might go wrong.	1	2	3	4	5	6	7
4. I tend to organise myself well to deal with challenges.	1	2	3	4	5	6	7
5. I bounce-back easily after a challenge.	1	2	3	4	5	6	7
6. When things get bad, I don't let them get to me.	1	2	3	4	5	6	7
7. I can anticipate when help is going to be needed.	1	2	3	4	5	6	7
8. I quickly get over set-backs.	1	2	3	4	5	6	7
9. I keep a clear head under pressure.	1	2	3	4	5	6	7
10. I give my best effort no matter the obstacle.	1	2	3	4	5	6	7
11. I know how to stop the same things getting to me in the future.	1	2	3	4	5	6	7
12. I recognise when tough challenges are approaching.	1	2	3	4	5	6	7
13. I know when to get help after a tough situation.	1	2	3	4	5	6	7
14. I seek out support before stress affects me.	1	2	3	4	5	6	7
15. I can anticipate when a situation will stress me.	1	2	3	4	5	6	7
16. I recover quickly after feeling worn-out.	1	2	3	4	5	6	7
17. I notice possible difficult situations early.	1	2	3	4	5	6	7
18. In stressful situations I usually maintain focus.	1	2	3	4	5	6	7
19. I prepare myself for upcoming challenges.	1	2	3	4	5	6	7
20. I know where I can get help when difficult problems are approaching.	1	2	3	4	5	6	7

The Resilience Process Scale (RPS).
Cognitive

Please think of different tough **cognitive** situations, life events, challenges and obstacles you may have experienced in the past or may experience in the future. This could range from exams, studies, puzzles, or other tough situations which required or may require concentration, decision making, and thinking skills.

In these situations…

	Strongly Disagree			Neither agree or disagree			Strongly Agree
1. I reflect and learn from difficult experiences.	1	2	3	4	5	6	7
2. I remain positive, even when things seem hopeless.	1	2	3	4	5	6	7
3. I make back-up plans for when things might go wrong.	1	2	3	4	5	6	7
4. I tend to organise myself well to deal with challenges.	1	2	3	4	5	6	7
5. I bounce-back easily after a challenge.	1	2	3	4	5	6	7
6. When things get bad, I don't let them get to me.	1	2	3	4	5	6	7
7. I can anticipate when help is going to be needed.	1	2	3	4	5	6	7
8. I quickly get over set-backs.	1	2	3	4	5	6	7
9. I keep a clear head under pressure.	1	2	3	4	5	6	7
10. I give my best effort no matter the obstacle.	1	2	3	4	5	6	7
11. I know how to stop the same things getting to me in the future.	1	2	3	4	5	6	7
12. I recognise when tough challenges are approaching.	1	2	3	4	5	6	7
13. I know when to get help after a tough situation.	1	2	3	4	5	6	7
14. I seek out support before stress affects me.	1	2	3	4	5	6	7
15. I can anticipate when a situation will stress me.	1	2	3	4	5	6	7
16. I recover quickly after feeling worn-out.	1	2	3	4	5	6	7
17. I notice possible difficult situations early.	1	2	3	4	5	6	7
18. In stressful situations I usually maintain focus.	1	2	3	4	5	6	7
19. I prepare myself for upcoming challenges.	1	2	3	4	5	6	7
20. I know where I can get help when difficult problems are approaching.	1	2	3	4	5	6	7

The Resilience Process Scale (RPS).
Emotional

Please think of different tough **emotional** situations, life events, challenges and obstacles you may have experienced in the past or may experience in the future. This could be *any* situation in which you have felt or may feel anxious, angry, sad, afraid or emotionally stressed.

In these situations…

	Strongly Disagree			Neither agree or disagree			Strongly Agree
1. I reflect and learn from difficult experiences.	1	2	3	4	5	6	7
2. I remain positive, even when things seem hopeless.	1	2	3	4	5	6	7
3. I make back-up plans for when things might go wrong.	1	2	3	4	5	6	7
4. I tend to organise myself well to deal with challenges.	1	2	3	4	5	6	7
5. I bounce-back easily after a challenge.	1	2	3	4	5	6	7
6. When things get bad, I don't let them get to me.	1	2	3	4	5	6	7
7. I can anticipate when help is going to be needed.	1	2	3	4	5	6	7
8. I quickly get over set-backs.	1	2	3	4	5	6	7
9. I keep a clear head under pressure.	1	2	3	4	5	6	7
10. I give my best effort no matter the obstacle.	1	2	3	4	5	6	7
11. I know how to stop the same things getting to me in the future.	1	2	3	4	5	6	7
12. I recognise when tough challenges are approaching.	1	2	3	4	5	6	7
13. I know when to get help after a tough situation.	1	2	3	4	5	6	7
14. I seek out support before stress affects me.	1	2	3	4	5	6	7
15. I can anticipate when a situation will stress me.	1	2	3	4	5	6	7
16. I recover quickly after feeling worn-out.	1	2	3	4	5	6	7
17. I notice possible difficult situations early.	1	2	3	4	5	6	7
18. In stressful situations I usually maintain focus.	1	2	3	4	5	6	7
19. I prepare myself for upcoming challenges.	1	2	3	4	5	6	7
20. I know where I can get help when difficult problems are approaching.	1	2	3	4	5	6	7

Appendix B: Observer RPS (Study 3 & 4)

The Observer Resilience Process Scale (ORPS).

General

Please think of different tough situations, life events, challenges and obstacles that the **indicated person** has experienced in the past or may experience in the future. This could be any event in which they have, or could experience stress, pressure, or hardship.
Indicate below the extent to which you agree with each statement about this person with regards to this/these experience(s), by circling the relevant number on the rating scale from "1" (Strongly Disagree) to "7" (Strongly Agree), with "4" being that you neither agree or disagree. Choose a number which best indicates your feelings about that statement with regards to them. There are no right or wrong answers and all ratings will be kept confidential so please answer honestly.
Everyone differs in how they deal with different situations. It is likely that there will be areas that they are better or worse in; this is totally normal and something we would expect.

In these situations…	Strongly Disagree			Neither agree or disagree			Strongly Agree
1. They tend to organise themselves well to deal with challenges.	1	2	3	4	5	6	7
2. When things get bad, they don't let it get to them.	1	2	3	4	5	6	7
3. They bounce-back easily after a challenge.	1	2	3	4	5	6	7
4. They can anticipate when a situation will stress them.	1	2	3	4	5	6	7

Physical

Please think of different tough **physical** situations, life events, challenges and obstacles that the **indicated person** may have experienced in the past or may experience in the future. This could range from exercise, sport, outdoors activities, illness, injury in which they have or may experience exhaustion, hunger, thirst, or any other physical issue.

In these situations…	Strongly Disagree			Neither agree or disagree			Strongly Agree
1. They tend to organise themselves well to deal with challenges.	1	2	3	4	5	6	7
2. When things get bad, they don't let them get to them.	1	2	3	4	5	6	7
3. They know how to stop the same things getting to them in the future.	1	2	3	4	5	6	7
4. They can anticipate when a situation will stress them.	1	2	3	4	5	6	7

The Observer Resilience Process Scale (ORPS).
Social

Please think of different tough **social** situations, life events, challenges and obstacles that the **indicated person** may have experienced in the past or may experience in the future. This could range from arguments, criticism they have had or may experience, public speaking, making new friends, and other difficult relationship, family and friendship issues.

In these situations…

	Strongly Disagree			Neither agree or disagree			Strongly Agree
1. They tend to organise themselves well to deal with challenges.	1	2	3	4	5	6	7
2. When things get bad, they don't let them get to them.	1	2	3	4	5	6	7
3. They know how to stop the same things getting to them in the future.	1	2	3	4	5	6	7
4. They can anticipate when a situation will stress them.	1	2	3	4	5	6	7

Mental

Please think of different tough **mental** situations, life events, challenges and obstacles that the **indicated person** may have experienced in the past or may experience in the future. This could range from exams, studies, puzzles, or other tough situations which required or may require concentration, decision making, and thinking skills.

In these situations…

	Strongly Disagree			Neither agree or disagree			Strongly Agree
1. They tend to organise themselves well to deal with challenges.	1	2	3	4	5	6	7
2. When things get bad, they don't let them get to them.	1	2	3	4	5	6	7
3. They know how to stop the same things getting to them in the future.	1	2	3	4	5	6	7
4. They can anticipate when a situation will stress them.	1	2	3	4	5	6	7

Emotional

Please think of different tough **emotional** situations, life events, challenges and obstacles that the **indicated person** may have experienced in the past or may experience in the future. This could be *any* situation in which they have felt or may feel anxious, angry, sad, afraid or emotionally stressed.

In these situations…

	Strongly Disagree			Neither agree or disagree			Strongly Agree
1. They tend to organise themselves well to deal with challenges.	1	2	3	4	5	6	7
2. When things get bad, they don't let them get to them.	1	2	3	4	5	6	7
3. They know how to stop the same things getting to them in the future.	1	2	3	4	5	6	7
4. They can anticipate when a situation will stress them.	1	2	3	4	5	6	7

Appendix C: WHO-5, Cognitive Appraisal Ratio, and Self-Description Questionnaire

(Study 3 & 4)

WHO-5 Well-Being Index

Please indicate for each of the five statements which is closest to how you have been feeling over the last two weeks.

	Over the last two weeks	All of the time	Most of the time	More than half of the time	Less than half of the time	Some of the time	At no time
1	**I have felt cheerful and in good spirits**	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0
2	**I have felt calm and relaxed**	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0
3	**I have felt active and vigorous**	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0
4	**I woke up feeling fresh and rested**	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0
5	**My daily life has been filled with things that interest me**	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0

Cognitive Appraisal Ratio

In relation to your expedition, please rate from 1 (*not at all*) to 6 (*extremely*).

1. How demanding do you expect the expedition to be?[10]

   _____

2. How able are you to cope with the demands of the expedition?

   _____

Self-Description Questionnaire 2 (and Problem-Solving domain from SDQ 3) - Brief[11]

PLEASE READ THESE INSTRUCTIONS FIRST

This is not a test - there are no right or wrong answers.

This is a chance for you to consider how you think and feel about yourself. **This is not a test** and everyone will have different responses. The purpose of this study is to determine how people describe themselves and what characteristics are most important to how people feel about themselves.

On the following pages are a series of statements that are more or less true (or more or less false) descriptions of you. Please use the following five-point response scale to **indicate how true (5) (or false, 1)** each item is as a description of you. Respond to the items as you now feel even if you felt differently at some other time in your life. In a few instances, an item may no longer be appropriate to you, though it was at an earlier period of your life (e.g., an item about your present relationship with your parents if they are no longer alive). In such cases, respond to the item as you would have when it was appropriate. Try to avoid leaving any items blank.

[10] For Timepoint 2, the wording of this is changed to "How demanding do you find the expedition to be".
[11] Questionnaire items removed for copyright reasons.

Appendix D: Physical, Social, Cognitive, and Emotional Domains Correlations with SDQ (Study 3)

Physical

	Anticipate	Minimise	Manage	Mend
Self-Esteem	.235*	.256*	.265*	.234*
Emotional Stability	0.152	-0.110	0.138	.229*
Same-Sex Relations	0.188	-0.050	.227*	0.193
Opp-Sex Relations	0.099	-0.052	.241*	0.164
Parent Relations	0.072	0.000	.230*	0.160
Physical Ability	0.219	.280*	.370**	.388**
Gen School Ability	0.091	0.142	0.159	0.176
Problem Solving	.294**	.374**	.252*	.284*

Note. p < .05; p < .01***

	Anticipate	Minimise	Manage	Mend
Self-Esteem	0.153	.239*	.455**	.425**
Emotional Stability	0.109	-.240*	-0.090	-0.033
Same-Sex Relations	0.093	.265*	.293**	.244*
Opp-Sex Relations	0.021	0.205	.255*	0.170
Parent Relations	0.077	0.118	.295**	.297**
Physical Ability	0.083	0.160	0.163	0.197
Gen School Ability	0.007	0.079	0.212	0.186
Problem Solving	0.119	0.145	0.171	0.198

Note. p < .05; p < .01***

	Anticipate	Minimise	Manage	Mend
Self-Esteem	.387**	.385**	.467**	.518**
Emotional Stability	0.154	-0.042	0.090	0.126
Same-Sex Relations	0.063	0.058	0.094	0.058
Opp-Sex Relations	0.028	0.141	0.138	0.045
Parent Relations	0.205	0.211	.343**	.308**
Physical Ability	0.186	.226*	0.150	.235*
Gen School Ability	.262*	0.133	.355**	.346**
Problem Solving	.342**	.424**	.351**	.364**

Note. p < .05; p < .01***

	Emotional			
	Anticipate	Minimise	Manage	Mend
Self-Esteem	.287*	.358**	.452**	.457**
Emotional Stability	0.145	-0.153	0.018	0.077
Same-Sex Relations	0.129	.256*	.289*	.232*
Opp-Sex Relations	0.105	.320**	.286*	0.223
Parent Relations	0.200	.230*	.402**	.318**
Physical Ability	.293**	.250*	0.198	.234*
Gen School Ability	0.123	0.029	.243*	.251*
Problem Solving	.272*	.350**	.384**	.301**

Note. $p < .05$; $p < .01$***

Appendix E: Exercise Booklet Contents given to Intervention Participants (Study 4)

Demographic Questions

1. Your name? _____
2. Age? ___
3. Gender? Male/Female/Non-binary/Prefer not to say/If you prefer to use your own term, please specify here _____
4. What do you consider your ethnicity to be? White/Mixed/Afro-Caribbean/Indian/Chinese/Other
5. Nationality (e.g. British, French)? _____
6. Year Group? _____
7. Do you take part in any extra-curricular activities such as sports, academic and social clubs (and if yes, please provide details)? _____

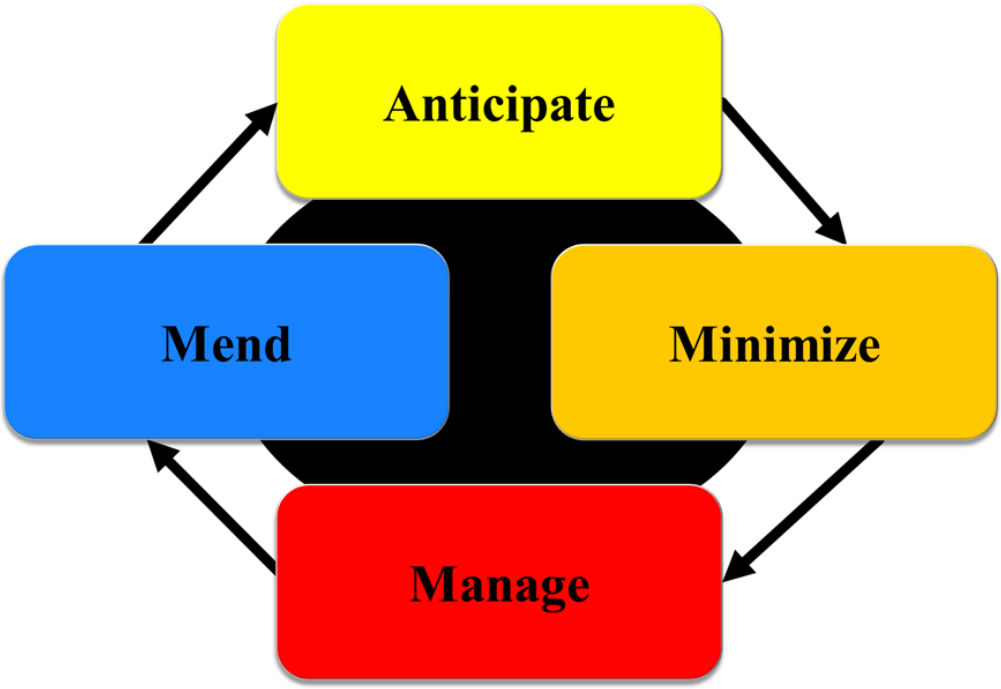
This weekend is designed to help prepare you for your upcoming expedition. You will have unique experiences, as well as face unique challenges.

This booklet is a part of some exercises that you will take part in over your training weekend.

Throughout, there are no right or wrong answers and everyone reacts to experiences differently. But anticipating, planning, managing, and reflecting/recovery from these experiences can help you achieve your goals and become a more resilient person in your own way. The exercises are designed to help you achieve these goals.

If you have any questions throughout the weekend, feel free to ask Joe, your teacher, or your Expedition Leader.

Resilience is defined as a process in which an individual can **anticipate**, **plan for**, **manage**, and **recover** from a variety of adverse challenges. Resilience can occur in a physical, cognitive, social, or emotional domain.



Physical: The ability to anticipate, plan for, manage and recover from challenges affecting physical health, performance and function.

Social: The ability to anticipate, plan for, manage and recover from challenges affecting relationships, teamwork, social isolation and function.

Cognitive: The ability to anticipate, plan for, manage and recover from challenges affecting decision making, memory, attention and mental function.

Emotional: The ability to anticipate, plan for, manage and recover from challenges affecting emotional regulation, stability and function.

Unhelpful Thinking Styles

Here are a list of thinking styles we all do:

All or nothing thinking

Sometimes called 'black and white thinking'

If I'm not perfect I have failed

Either I do it right or not at all

Over-generalizing

Seeing a pattern based upon a single event, or being overly broad in the conclusions we draw

Mental filter

Only paying attention to certain types of evidence

Noticing our failures but not seeing our successes

Disqualifying the positive

Discounting the good things that have happened or that you have done for some reason or another

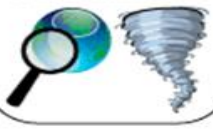
That doesn't count

Jumping to conclusions

There are two key types of jumping to conclusions:

- **Mind reading** (imagining we know what others are thinking)
- **Fortune telling** (predicting the future)

Magnification (catastrophising) & minimization



Blowing things out of proportion (catastrophizing), or inappropriately shrinking something to make it seem less important

Emotional reasoning

Assuming that because we feel a certain way what we think must be true

I feel embarrassed so I must be an idiot

should

must

Using critical words like 'should', 'must', or 'ought' can make us feel guilty, or like we have already failed

If we apply 'shoulds' to other people the result is often frustration

Labelling

Assigning labels to ourselves or other people

I'm a loser
I'm completely useless
They're such an idiot

Personalization

"this is my fault"

Blaming yourself or taking responsibility for something that wasn't completely your fault

Conversely, blaming other people for something that was your fault

Exercise:

With regards to these examples, imagine a situation in your past where you may have used these unhelpful thinking styles during a challenging situation, or may use over this weekend.

Pick three of these that you would want to change or used in Task 1 and write out an alternative (positive) example of each of them.

Thinking Style 1:

Thinking Style 2:

Thinking Style 3:

Task 1 Debrief:

Were you aware of any unhelpful thinking styles you may have used?

Did you use any strategies to try to challenge this?
Yes/No — If yes, how?

How did you feel if/when people didn't believe you?

How did you try to tell who was lying to you?

Did you feel any pre-task group dynamics/relations affected the task and the outcomes? How?

How do you think this task, its associated feelings and behaviours are relevant to the expedition?

Please answer the following:

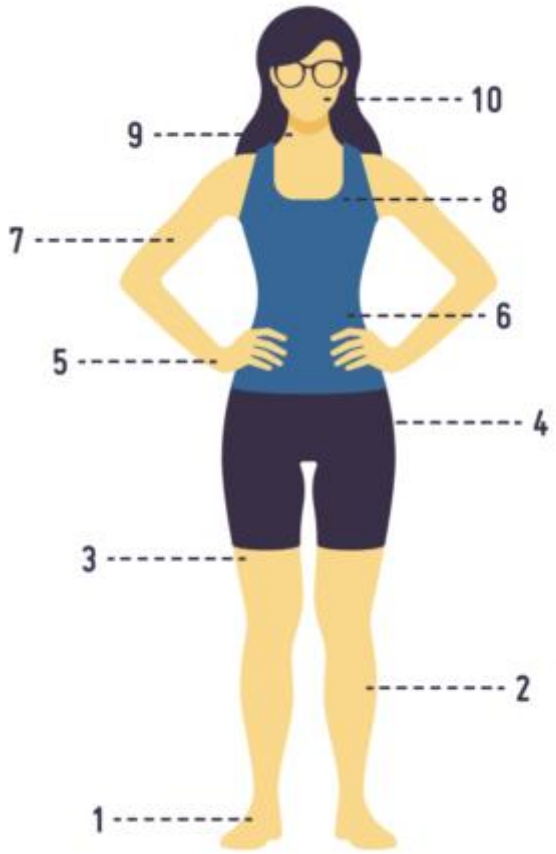
1. On a scale of 1 (calm) to 11 (worried):

   My thoughts are: ____

2. On a scale of 1 (relaxed) to 11 (tense):

   My body feels: ____

Progressive Muscular Relaxation (PMR)



Progressive Muscular Relaxation (PMR) Guidance:

PMR is designed to help you relax your muscles to lower overall tension and stress levels, and help you ease feelings of anxiety. It can also help reduce physical problems such as headaches and improve sleep.

We are often so tense throughout the day that we don't recognize what relaxed feels like, with practice PMR allows is to distinguish between a tense and relaxed muscle. Thus, allowing us to anticipate and manage when we are tense, along with relaxing afterward. Either before bed or during expedition, this skill may come in useful for you.

Find a comfortable place to sit, close your eyes and let your body go loose. **Take 5 slow, deep breaths before you begin.**

Step One: Tension

- Apply muscle tension to a specific part of the body, choose a part of your body (e.g. your left hand).
- Take a slow, deep breath and squeeze the muscles as hard as you can for 5 seconds (in this case, a closed fist).

Step Two: Relax

- After the 5 seconds, let all the tightness flow out as you relax the muscle and it should become loose and limp, focus on the difference of how it felt when tenses compared to relaxed.
- Remain relaxed for 15 seconds, then move on to the next muscle group.

Progressive Muscular Relaxation (PMR) Guidance:

The Different Muscle Groups:

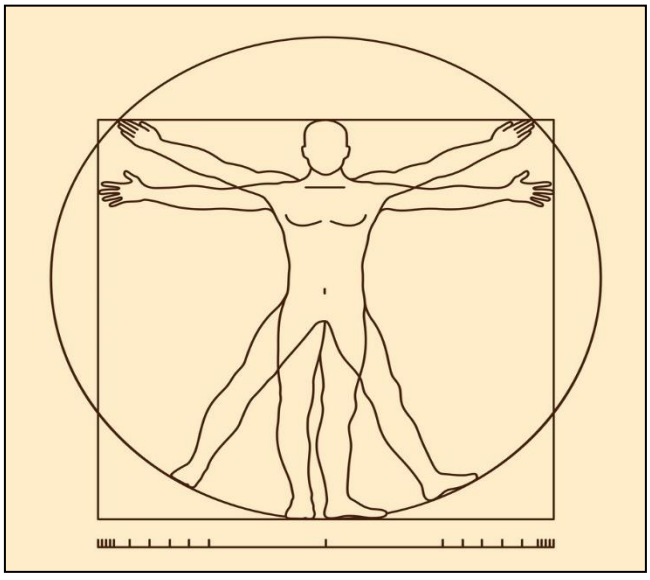
- **Foot** (curl your toes downward)
- **Lower leg and foot** (tighten your calf muscle by pulling toes towards you)

(Repeat on other side of body)

- **Hand** (clench your fist)
- **Entire right arm** (tighten biceps by drawing your forearm up towards shoulder while clenching fist)

(Repeat on other side of body)

- **Buttocks** (tighten by pulling your buttocks together)
- **Stomach** (suck your stomach in)
- **Chest** (tighten by taking deep breath, clenching together)
- **Neck and shoulders** (raise your shoulders up to touch your ears)
- **Mouth** (open your mouth wide enough to stretch the hinges of your jaw)
- **Eyes** (clench your eyelids tightly shut)
- **Forehead** (raise your eyebrows as far as you can)



Please answer the following:

1. When could this technique have been useful for you in the past/this weekend?

2. Going forward, when will you use it from now?

1. On a scale of 1 (calm) to 11 (worried):

   My thoughts are: ____

2. On a scale of 1 (relaxed) to 11 (tense):

   My body feels: ____

Task 2 Debrief:

Were you aware of any unhelpful thinking styles you may have used?

Did you use any strategies to try to challenge this?

Yes/No — If yes, how?

How did you feel putting your faith in your group leader?

What more could you have done to help the leader?

What did you do to deal with the task's complexity?

Did your team work well together? How?

How do you think this task, its associated feelings and behaviours are relevant to the expedition?

Based on all this, what can you do next time you are in a challenging situation?

What If
Imagine the following scenario below, then in the next box
describe how this may make you feel and **how you plan to deal with it:**

Being unable to use your phone to contact friends/family when feeling down/tired/stressed.	

List other challenges you can think of on expedition, then in the next box describe how this may make you feel and **how you plan to deal with it, you can use examples from this weekend:**

Overall Debrief: Reflecting on your training weekend...

What was the biggest **physical** challenge? How did you deal with it?

What was the biggest **social** challenge? How did you deal with it?

What was the biggest **cognitive** challenge? How did you deal with it?

What was the biggest **emotional** challenge? How did you deal with it?

Relating to the **unhelpful thinking styles**, did you find yourself using any of these? Did you challenge or change them at all?

Did you use or find the relaxation technique helpful?

Anything else you learned about yourself, or coping strategies you used?

What three strategies will you do over the next two weeks to practice or keep improving?

Appendix F: Latent Class Analysis Fit Indices and 4-Class Profile Solutions of other Resilience Domains (Study 5)

Physical	AIC	BIC	Adj BIC	Entropy	LMR LRT	BLRT
1 Class	6696.477	6731.029	6705.633	N/A	N/A	N/A
2 Class	6094.025	6150.171	6108.903	0.75	0.0052	<.000
3 Class	5815.632	5893.373	5836.233	0.81	0.0039	0.0045
4 Class	5691.435	5790.771	5717.759	0.835	0.2079	<.000
5 Class	5651.91	5772.846	5683.96	0.833	0.1084	<.000

Physical; 4-class	Ant	Min	Man	Men
Profile 1; *n* = 20	3.524	3.045	2.499	2.387
Profile 2; *n* = 144	4.507	4.201	3.974	3.875
Profile 3; *n* = 256	5.11	4.987	5.139	5.065
Profile 4; *n* = 135	6.074	6.09	6.201	6.2

Social	AIC	BIC	Adj BIC	Entropy	LMR LRT	BLRT
1 Class	7040.462	7075.014	7049.619	N/A	N/A	N/A
2 Class	6438.833	6494.979	6453.711	0.777	<.000	<.000
3 Class	6256.225	6333.966	6276.826	0.761	0.3363	<.000
4 Class	6137.69	6237.026	6164.014	0.802	0.039	<.000
5 Class	6080.083	6201.014	6112.13	0.804	0.0919	<.000

Social; 4-class	Ant	Min	Man	Men
Profile 1; *n* = 49	3.924	3.131	2.69	2.302
Profile 2; *n* = 220	4.502	4.216	3.966	3.783
Profile 3; *n* = 213	5.15	5.081	5.093	5.112
Profile 4; *n* = 73	6.219	6.256	6.173	6.28

Cognitive	AIC	BIC	Adj BIC	Entropy	LMR LRT	BLRT
1 Class	7005.73	7040.282	7014.887	N/A	N/A	N/A
2 Class	6430.429	6486.575	6445.307	0.763	0.0028	0.0032
3 Class	6183.365	6261.107	6203.967	0.79	0.1943	<.000
4 Class	6054.815	6154.152	6081.139	0.813	0.014	<.000
5 Class	5997.87	6118.8	6029.92	0.79	0.1376	<.000

Cognitive; 4-class	Ant	Min	Man	Men
Profile 1; *n* = 282	5.092	5.04	4.894	4.858
Profile 2; *n* = 18	2.646	2.216	2.281	1.92
Profile 3; *n* = 116	5.985	6.152	6.074	6.058
Profile 4; *n* = 138	4.503	4.079	3.511	3.551

Emotional	AIC	BIC	Adj BIC	Entropy	LMR LRT	BLRT
1 Class	7269.744	7304.296	7278.9	N/A	N/A	N/A
2 Class	6614.696	6670.843	6629.575	0.821	<.000	<.000
3 Class	6351.385	6429.126	6371.986	0.883	0.0005	0.0007
4 Class	6257.097	6356.322	6283.42	0.82	0.0116	0.013
5 Class	6197.509	6318.441	6229.556	0.82	0.196	<.000

Emotional; 4-class	Ant	Min	Man	Men
Profile 1; *n* = 31	3.065	2.302	2.157	1.859
Profile 2; *n = 257*	4.413	4.146	3.751	3.666
Profile 3; *n* = 184	5.014	4.962	5.249	5.074
Profile 4; *n* = 83	6.132	6.059	6.145	6.089

Mean	AIC	BIC	Adj BIC	Entropy	LMR LRT	BLRT
1 Class	6341.12	5375.5	6531.5	N/A	N/A	N/A
2 Class	4534.79	4590.65	4549.38	0.824	<.000	<.000
3 Class	4220.27	4297.62	4240.48	0.852	0.1928	<.000
4 Class	3971.94	4070.77	3997.76	0.875	0.0323	<.000
5 Class	3862.98	3983.3	3894.42	0.861	0.6444	<.000

Mean; 4-class	Ant	Min	Man	Men
Profile 1; n=45	3.861	3.446	3.142	3.269
Profile 2; n=228	4.619	4.421	4.274	4.234
Profile 3; n=54	6.067	6.014	6.057	6.045
Profile 4; n=216	5.226	5.19	5.163	5.165

Appendix G: Outcome Measures used in Study 6

Kroenke et al., (2009). PHQ-4 (Anxiety/Depression; 4-items).[12]

Variable: Wellbeing

We would now like for you to indicate your general well-being: Over the past 2 weeks…

… I have felt cheerful and in good spirits [All of the time – Most of the time – More than half the time – Less than half the time – Some of the time – At no time]

… I have felt calm and relaxed [See answer scheme above.]

… I have felt active and vigorous [See answer scheme above.]

… I woke up feeling fresh and rested [See answer scheme above.]

… my daily life has been filled with things that interest me [See answer scheme above.]

Variable: Affect

Please choose one option per row below.

COVID-19 to me feels ... close to me [*] [*] [*] [*] [*] [*] [*] far away from me Spreading slowly [*] [*] [*] [*] [*] [*] [*] Spreading fast

Something I think about all the time [*] [*] [*] [*] [*] [*] [*] Something I almost never think about

Fear-inducing [*] [*] [*] [*] [*] [*] [*] Not fear-inducing

Media hyped [*] [*] [*] [*] [*] [*] [*] Not media hyped

Something that makes me feel helpless [*] [*] [*] [*] [*] [*] [*] Something I am able to combat with my own action

Stressful [*] [*] [*] [*] [*] [*] [*] Not stressful

Gottlieb & Rooney, (2004) and Nicholls et al., (2011) Coping Effectiveness scale (7-items).[13]

[12] Questionnaire items removed for copyright reasons.

[13] Questionnaire items removed for copyright reasons.

Steinberg et al., (2013). Barratt Impulsiveness Scale – Brief (8-items).[14]

Zhang et al., (2018). General Risk Propensity Scale (8-items).[15]

Variable: Prevention – own behaviours

During the last 7 days, which of the following measures have you taken to prevent infection from COVID-19?

Choose as many as apply

Frequently washed my hands with soap and water for at least 20 seconds Not at all [*] [*] [*] [*] [*] [*] [*] [*] Very much so / Not applicable [*]

Avoided touching my eyes, nose and mouth with unwashed hands [Answer scheme, see above]

Used disinfectants to clean hands when soap and water were not available [Answer scheme, see above]

Avoided a social event I wanted to attend [Answer scheme, see above]

Stayed at home from work/school [Answer scheme, see above]

Used antibiotics to prevent or treat COVID-19 [Answer scheme, see above]

Wore a mask in public [Answer scheme, see above]

Ensured physical distancing in public [Answer scheme, see above]

Disinfected surfaces [Answer scheme: see "Hand washing"]

Variable: Unwanted behaviour [*] Yes [*] No [*] Not applicable

Within the last 2 weeks, have you done the following…?

1. Avoided people that I thought might infect me, based on their ethnicity [See answer scheme above.]
2. Exercised less than I did before the pandemic [See answer scheme above.]
3. Drank more alcohol than I did before the pandemic [See answer scheme above.]
4. Ate more unhealthy food than I did before the pandemic [See answer scheme above.]
5. Smoked more than I did before the pandemic [See answer scheme above.]

[14] Questionnaire items removed for copyright reasons.
[15] Questionnaire items removed for copyright reasons.

6. Postponed vaccination for myself or my child [See answer scheme above.]
7. Avoided going to the doctor for a non-COVID-19-related problem [See answer scheme above.]
8. Bought drugs that I heard are good for treating COVID-19 [See answer scheme above.]

Variable: COVID-19 personal experience [Single choice] [Multiple choice for yes]

To your knowledge, are you, or have you been, infected with COVID-19? [*] No [*] Yes

If “yes”: Was it: [*] Mild [*] Severe Was it: [*] Confirmed by a test [*] Not confirmed by a test

Do you know people in your immediate social environment who are or have been infected with COVID-19 (suspected or confirmed)? [*] No [*] Yes

If “yes”: Do you know someone who died from COVID-19? [*] No [*] Yes

Appendix H: Factor Loadings of Pre-Checked Scales (Study 6)

Affect **Standardised factor loadings for final items**	
COVID-19 to me feels… close to me	**.64** [.10, .86]
Something I think about all the time	**.51** [-.14, .85]
Fear-inducing	**.49** [-.06, .79]
Media hyped	**.59** [-.01, .85]
Something that makes me feel helpless	**.50** [-.01, .81]
Stressful	**.59** [-.07, .86]

Preventative Behaviours **Standardised factor loadings for final items**	
Frequently washed my hands with soap and water for at least 20 seconds	**.41** [-.1, .76]
Avoided touching my eyes, nose and mouth with unwashed hands	**.55** [.06, .85]
Used disinfectants to clean hands when soap and water were not available	**.60** [.13, .90]
Wore a mask in public	**.52** [.07, .83]
Ensured physical distancing in public	**.57** [.07, .87]
Disinfected surfaces	**.55** [.05, .86]

Unwanted Behaviours **Standardised factor loadings for final items**	
Exercised less than I did before the pandemic	**0.3**
Ate more unhealthy food than I did before the pandemic	**0.65**
Smoked more than I did before the pandemic	**0.72**
Avoided going to the doctor for a non-COVID-19 related problem	**0.31**