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Journal of Screenwriting

10. Apr. 2024

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Abstract

Over the last twenty-five years, evolutionary science has reinvigorated not only the human sciences but also literary criticism and film theory. Drawing on models of human behaviour advanced by evolutionary psychologists Bernard et al (2005), Lövheim (2012) and Zuckerman et al (1991), we propose that the application of an evolutionary framework will illuminate our understanding of film protagonists and their associated audience appeal. We report the development of a new instrument to assess differences in film protagonists' emotions, motivations and character traits across 34 scales, the Assessment of Protagonists' Traits, Emotions and Motivations Questionnaire (APTEM- Q). The results of a preliminary study comparing protagonists in 100 popular, recent American and Chinese films indicate that the questionnaire is comprehensive and that four protagonist motivations and emotions predict whether a film is preferred at the American or Chinese box office. Using this four-factor model, we found cross-cultural consensus in the way these psychological attributes are perceived. These findings are consistent with evolutionary theories, which would suggest that screen characters' traits, motivations and emotions are writers' emulations of universal adaptations to evolutionary selection pressures, reshaped through aesthetic and cultural processes.

1. INTRODUCTION

The majority of contemporary screenwriting manuals are awash with guidance on how best to create compelling screenplay characters. With advice ranging from endowing protagonists with conscious desires and opposing unconscious desires (McKee 1997, p.138), through developing character complexity by creating 'layers' of traits (Iglesias 2005, p.51), these craft guides often stress the importance of creating universal character appeal so that a film may potentially engage with the widest audiences possible (Truby 2007, p.65). Since US films now make 72% of their ticket sales at the international box office (MPAA 2014), understanding whether universal character traits do in fact exist, whether they are linked with a film's appeal, and if so what they might constitute, are matters not only of academic interest, but also of fundamental industry concern. Screenwriting craft manuals usually attempt to explain the universality of certain character attributes in one of two ways. Proponents of the post-Jungian school, including Christopher Vogler, John Truby and Dara Marks, assert that basic patterns of shared behaviour are attributable to universal archetypes,

which reside in man's collective unconscious (Vogler 1998, p.29; Truby 2007, p.65; Marks 2005), a claim unsupported by contemporary neuroscience and personality research.

Proponents of the second camp, including Robert McKee, Linda Seger, Ken Dancyger, Syd Field, Karl Iglesias and Blake Snyder suggest that protagonists' motivations arise from the notional concept of our human nature. Robert McKee, for example, proposes that a character's 'essential nature' is revealed under pressure (1997, p.100). Meanwhile, Snyder argues that 'primal urges get our attention. Survival, hunger, sex, protection of loved ones, fear of death grab us' (2005, p.54). Ken Dancyger asserts that for films to have global appeal, they must include 'basic universal elements that transcend national boundaries', including relationships and the position of the individual in society (2001, p.218). In the sections that follow, we will investigate whether such 'primal urges' or 'universal elements' exist, and if so how they might be better defined.

Writing about the importance of ensuring that something is at stake for the protagonist, screenwriting manual author Linda Seger gets closest to ideas supported by contemporary researchers in psychology when referring to Abraham Maslow's hierarchy of needs. She states: 'Many successful films have spoken directly to these needs. Any one of these seven psychological stakes can be in jeopardy at various times in a film, and most good films will draw on more than one of them' (Seger 1994, p.125). In fact, Maslow (1943) lists only five sets of basic human needs: physiological, safety, love, esteem and 'self-actualization'. Whilst Maslow's ideas provided an important foundation for future psychological research on theories of motivation, they fail to include group survival, the primary "need" at stake in most blockbusters. Furthermore, debate continues over whether motivations are hierarchical, in the sense that those linked with group or personal survival will be attended to with most urgency (Bernard et al. 2005; Nettle 2005). Moreover, the

placing of self-actualization at the zenith of a hierarchy of motivations is unlikely to reflect the adaptive necessities shaping the human species (Alexander 1987).

Developing the idea that film protagonists' attributes are examples of instinctive psychological "needs", we propose that screen characters' motivations, emotions and personality traits are better explained as the writer's mimesis of selected human responses shaped by the interaction between adaptations to our ancestral environment during the Pleistocene period and our contemporary environment, and refined through the process of aesthetic mediation.

Although contemporary screenwriting researchers and film theorists have emphasised local, cultural and historical levels of explanation, resisting any acknowledgement of pan-human universal behaviour as having at least some evolutionary, biological basis, the Standard Social Science Model is entirely compatible with Evolutionary Constructivism (David Sloan Wilson in Boyd et al. 2010). Since all evolved mechanisms require environmental cues for their activation, the impact of environment is key to an organism's development. This concept contributes to the dissolving of received ideas about the dichotomy of nature versus nurture, or biology versus culture. Furthermore, to address concerns that an evolutionary approach is necessarily reductionist and deterministic, the approach we advocate is "consilient" (Wilson 1999), as it views our adaptive biological limitations as just one step in a long causal chain that links biochemical to cultural, and aesthetic explanations and the sciences to the humanities.

1.1. Evolutionary Criticism

Over the last twenty-five years, evolutionary science has reinvigorated not only the biological and social sciences, but also literary criticism. Synthesis of knowledge from different specialised fields within the natural and human sciences has opened up exciting areas of new

research. Such evolutionary perspectives have produced new ways of thinking about the biological significance of the arts. For example, Miller (2001) emphasises the role of artistic display and sexual selection. Other approaches focus on the potential adaptive value of the artistic works themselves. Within the emerging field of Evolutionary Criticism, a handful of scholars including David Bordwell, Brian Boyd, Joseph Carroll, Ellen Dissanayake and Jonathan Gottschall have taken the first steps to reconcile cultural explanations of literature with the evolutionary sciences. In their early, influential works, Carroll (1995) and Dissanayake (1996) assert that the arts help organize the human mind, providing emotionally and aesthetically modulated models of reality, which allow individuals to gain better understandings of their own and others' motivations. More recently, Boyd (2009) argues that literature is a form of cognitive play, which serves the multiple functions of fostering social cohesion, developing creativity, raising the status of gifted artists and refining the cognitive abilities of our minds in sight and sound. Utilising evolutionary theories in his widely read film criticism, David Bordwell (in Boyd et al. 2010) argues that biological universals constrain stylistic conventions in filmmaking, which are specified through cultural norms.

Any evolutionary analysis of artistic content must address the fact that works with mass appeal, and which may best reflect psychological universals, are not necessarily the works which are critically-acclaimed and perhaps considered to reflect best artistic practice (Pinker 2007). For example, Johnson, Carroll, Gottschall and Kruger's (2008) analysis of main characters' motivations, emotions and personality traits in 19th Century British novels samples the 201 'canonical' novels of the period, which although critically-acclaimed, were often far less popular with the general public (eg Southam 2009). Thus, the conclusions the authors draw about how these novels' protagonists tend to differ from their antagonists may be unique to the kinds of narratives preferred by academics, and not the best place to search for the most broadly appealing narrative universals. It is for this reason that our research

instead applies evolutionary theory to thematic universals in box office hits, through analysis of the reception of psychological attributes of protagonists from the most popular, recent films in China and the US, in order to investigate whether pan-cultural narrative universals do in fact exist. This article is part of a larger body of work in which additional studies compare successful with less successful films at the box office, and also control for a film's budget, an important factor in determining a film's success.

Chinese and American films were chosen because these nations represent almost polar oppositional positions on several measurable cultural dimensions (Hofstede 2003). Furthermore, China has a strong national film industry, limits imports of foreign films to 34 (risen from 20 in 2012), and is set to become the world's largest film market by 2020 (Scott 2015) if not sooner. Since screenplays were not available for the majority of Chinese films included in this study, protagonist qualities in produced films were rated instead. Whilst this also introduces embodied and contextual factors relating to a protagonist's characterisation, including the director's crafting of character, the actor's performance, and cinematic cues that might influence a viewer's perception of character, it was felt that any conclusions about psychological character universals drawn from this exploratory study would be fully applicable to the analysis of protagonists as characterized in the screenplay.

The first stage of this research involved the development of a questionnaire that would allow a viewer to rate a screen protagonist's psychological attributes. Since the majority of screenwriting manuals place the protagonist's motivations at the heart of story design (e.g. McKee 1997, pp.138–139), and "primal" character motivations have been linked with a film's universal appeal (e.g. Snyder 2005, p.54) these were considered essential to the study. However, motivations alone cannot adequately explain character behaviour. Research on heroism and prosocial behaviour, for example, links impulsive, risk-taking behaviour, to

heroic acts (e.g. Midlarsky et al. 2005), while a 'good mood' increases the likelihood of altruistic behaviour (George 1991). For this reason, protagonists' traits, motivations and emotions were included as a triad of psychological attributes to survey in the design of the questionnaire.

1.2. Motivations

The study of the psychology of motivation has been framed by many competing approaches, including biological (e.g. Gendolla et al. 2012), behavioural (e.g. Skinner 1963), and a multitude of cognitive perspectives (e.g. Carver & Scheier 1982). Bernard, Mills, Swenson and Walsh (2005) were the first to unify these approaches within an evolutionary framework, by viewing conscious, transconscious and nonconscious motivations as directed towards the end goal of increasing inclusive fitness, the ability of an organism to pass on its genes to the next generation. Bernard et al suggest fifteen motives, falling within five social domains in which they operate. By proposing that these motives act independently, an individual may be simultaneously motivated by conflicting motivations, cognitions and emotions. When applied to the film screenplay, this would explain internal conflict between the protagonist's often-conflicting goals. However, other researchers, including behavioural biologist, Daniel Nettle, suggest that a hierarchy of motivations, akin to Maslow's, better explains why stories featuring survival, mate choice and status competitions are inherently more attention-grabbing than those with lower stakes (2005).

Bernard et al's fifteen motives are:

Self-Protection Domain

1. Safety (avoiding danger)

2. Health (avoiding illness)

3. Aggression (intimidating others)

4. Curiosity (exploring the world)

5. Play

   Mating Domain

6. Dating / sex

7. Physical (displaying or improving one's physical skills)

8. Mental (displaying or improving one's mental skills)

9. Appearance (improving one's appearance)

10. Wealth (displaying or improving one's wealth)

    Relationship Maintenance and Parental Care

11. Affection (helping one's romantic partner or children)

    Coalition Formation

12. Altruism (helping relatives)

13. Conscience (helping unrelated others)

    Memetic Domain

14. Legacy (making the world better for future generations)

15. Meaning (understanding life's purpose)

In addition to these fifteen motives, we also included Seeking Revenge and Punishing Others as a further item within the questionnaire, due to the fact that moral aggression has long been understood to play an important place in human reciprocal altruism (Trivers, 1971).

1.3. Personality Traits

Psychological research into personality is dominated by the "Big Five" (Goldberg 1981), another five factor model which originated in lexical analysis. By contrast, the approach

which guided development of trait questionnaire items in this research is the "Alternative Big Five" theory (Zuckerman 1989; 1991), in which the five main personality traits have demonstrated psychophysiological correlates and high heritability, lending themselves to evolutionary explanations. The five factors are:

1. *Sociability*

A liking for social situations and an intolerance of social isolation.

2. *Neuroticism-Anxiety*

Worry, emotional upset, tension and sensitivity to criticism.

3. *Impulsive Sensation Seeking*

Lack of planning and a tendency to act without thinking as well as a need for novelty and excitement.

4. *Aggression-Hostility*

A readiness to express verbal aggression, as well vengefulness, a quick temper and impatience.

5. *Activity*

A need to keep active and busy, as well as a preference for challenging work.

1.4. Emotions

Advancing Darwin's (1998) observations that facial and vocal expression play a vital role in the communication of universal feelings, which are displayed in distinct ways in different cultures, Silvan Tomkins (1962) proposed nine biologically-based affects, related to those found in other animals. Nearly a decade later, Paul Ekman built on Tomkins research to provide evidence that six basic universal emotional expressions are interpreted cross-culturally in very similar ways (1971; 1992). When Ekman advised writer/director Pete

Docter on the development of emotions in Pixar's *Inside Out* (2015), Docter reduced these six emotions to five, as he found the visual expression of fear and surprise too similar (Gross 2015).

In this research, we base development of emotion-rating items in the APTEM-Q on Lövheim's psychobiological theory of universal emotions (2012), which develops Tomkins' affect theory. The eight emotions are:

1. Shame
2. Fear
3. Anger
4. Disgust
5. Surprise
6. Happiness (joy)
7. Sadness (distress)
8. Excitement

Recent research suggests that the moral emotions pride and guilt, along with romantic love, familial love and compassion towards (unrelated) others may also be considered as basic, evolved emotions (Buss 2014), and are thus included as additional emotion-items in the questionnaire.

As Murray Smith has noted, (in Boyd et al. 2010, chap.22) any understanding of screen characters' emotions also needs to take into account the approaches filmmakers take when "aesthetically reshaping" facial expressions into order to convey their artistic goals. While

some directors work with emotions in more naturalistic and transparent ways, others, for example the Chinese director Wu Ershan, craft stylised, occasionally opaque performances. Sometimes the audience is left to deduce the emotional meaning of an action from its context, as Kuleshov demonstrated in his film montage experiments (Pudovkin 1974, p.184). Whilst stylised approaches are likely to have culturally particularistic appeal, we would expect the world's most popular films, as sampled in this research, to show more naturalistic performances and characterisations that bear the closest resemblance to universally identifiable emotions.

2. METHODOLOGY

A new film survey instrument, the Assessment of Protagonist's Traits, Emotions and Motivations Questionnaire (APTEM-Q), was developed through an iterative process of item writing, testing and retesting on purposively selected, commercially successful films, through a series of pilot studies.

The APTEM-Q was then used in two experiments. Study 1 was designed to determine whether the 34 characteristics measured by the APTEM-Q are universal, through investigating the frequencies with which these items appear in recent, popular films in the American and Chinese markets. A binomial regression model was then used to find out whether protagonist qualities could be used to make predictions about whether a film would be preferred by the American or Chinese market, thus indicating strong cultural preferences.

Study 2 was designed to investigate whether protagonist traits, identified as being significant predictors of Chinese or American consumer preference in the first study, could be used to differentiate between British and Chinese viewers in a general, linear, mixed effects binomial regression analysis. A similar model was then used to determine if the first

author's protagonist ratings were typical of the study's British participants, which would suggest that the results of the ratings in Study 1 are more broadly generalizable.

2.1. Questionnaire design

Bernard et al's (2005) evolutionary theory of motivations guided development of the 17 motivation-related items. Consideration was given to whether any changes in a protagonist's motivations should be tracked, but we felt that such an analysis might be difficult for less film-literate participants and would require emotional distancing from engagement with the film. Furthermore, asking participants to look out for motivational change would likely bias them towards expecting a change of motivations, a character feature that was not always present in some of the Chinese films screened. For this reason, participants were required to identify the presence or absence of each of the 17 motives, rather than attempt to identify one that fits best with the main character's 'major goal'.

In order to compare the relative strengths of the main character's motivations, participants were asked to rate the degree by which the main character invests time, money, or other personal resources in each of the motive items on a 6-item Likert scale, where 0 represents no investment, and 5 represents a great deal of investment. Participants based their responses on observation of the behaviour or dialogue of the film's main character

The motivational items in the questionnaire are included in Figure 1, below.

Figure 1: APTEM-Q items assessing the protagonist's motivations

MOTIVATION	Degree of investment
Exploring the world	0 1 2 3 4 5
Avoiding illness	0 1 2 3 4 5
Avoiding danger	0 1 2 3 4 5
Asserting oneself / Intimidating others	0 1 2 3 4 5

Being playful	0 1 2 3 4 5
Improving one's appearance	0 1 2 3 4 5
Displaying mental skills or knowledge	0 1 2 3 4 5
Displaying physical strength or skills	0 1 2 3 4 5
Displaying wealth	0 1 2 3 4 5
Dating or having sex	0 1 2 3 4 5
Helping life partner or children	0 1 2 3 4 5
Helping relatives	0 1 2 3 4 5
Helping unrelated others	0 1 2 3 4 5
Seeking revenge or punishing others	0 1 2 3 4 5
Making the world better for future generations	0 1 2 3 4 5
Understanding life's purpose	0 1 2 3 4 5

Zuckerman's Alternative Five model of personality traits (1989; 1991) guided development of questionnaire items rating the protagonist's personality traits. These are shown in Figure 2, below.

Figure 2: APTEM-Q items assessing the protagonist's personality traits

TRAIT	Degree displayed
Sociability	0 1 2 3 4 5
Anxiety	0 1 2 3 4 5
Impulsiveness	0 1 2 3 4 5
Aggression	0 1 2 3 4 5
Active	0 1 2 3 4 5

Items assessing protagonists' emotions were guided by Lövheim's psychobiological model of emotions (2012), and are included in Figure 3, below:

Figure 3: APTEM-Q items assessing the protagonist's emotions

EMOTION	Degree experienced
Happiness	0 1 2 3 4 5
Sadness	0 1 2 3 4 5
Anger	0 1 2 3 4 5
Fear	0 1 2 3 4 5
Surprise	0 1 2 3 4 5
Disgust	0 1 2 3 4 5
Shame	0 1 2 3 4 5
Excitement	0 1 2 3 4 5
Pride	0 1 2 3 4 5
Guilt	0 1 2 3 4 5
Romantic love	0 1 2 3 4 5
Familial love	0 1 2 3 4 5
Compassion	0 1 2 3 4 5

For all the questionnaire items, participants were asked to consider only the protagonist's behaviour and dialogue so as to try to avoid ratings being made on inference alone.

2.2. Study 1

The objectives of this study were to investigate whether protagonists in recent popular films in the US and China display examples of the traits, emotions and motivation items of the APTEM-Q, and to determine whether ratings of these items could be used to predict whether a recent, top-ten, domestic box office hit is American or Chinese, based on the different frequencies of occurrence of these protagonist attributes. Ratings were taken from the first

(British) author's analyses of film protagonists using the APTEM-Q. There were no other participants.

Films

For this study, the first author viewed the 50 annual, top-ten grossing domestic, fictional feature film hits in the U.S. box office for the years 2009-2014, excluding 2011 (Box Office Mojo 2015a; 2015b; 2015c; 2015d; 2015f) and the 50 annual, top-ten grossing domestic, fictional feature film hits at the Chinese box office for the same years (Shaoyi 2015; SARFT 2015a; SARFT 2015b; Box Office Mojo 2015e). Films released in 2011 were excluded because of widely reported fraud at the Chinese box office (Lee 2011).

Since a film's box office success is not just a measure of overall audience appeal, but is also significantly impacted by factors including the film's marketing budget, its word-of-mouth appraisal, stars attached to the film, its release dates and the number of screens on which it opens (e.g. Gazley et al. 2011), we also recorded mean, user-generated audience and critic ratings for each film as further indices of each film's popularity. A strong positive correlation ($r_s = .723$, p<0.0001) was found between the sample films' mean user ratings, as recorded on IMDb and Chinese social media site Douban, and mean critic ratings, drawn from and film critic aggregator websites RottenTomatoes.com and Metacritic.com, indicating consensus between audiences and critics over the popularity of of the sample films. However, the sample films' annual, domestic box office success was only weakly correlated with IMDb user ratings ($r_s = .288$, p<0.05) and was not correlated with Douban ($r_s=-.29$, p>0.5) or critic ratings ($r_s=.161$, p>0.1), suggesting that the majority of the variance in predicting a film's box office success is accounted for by other factors.

2.3. Study 2

The aim of this study was to determine whether British and culturally-Chinese viewers perceive popular film protagonists in similar ways, and to investigate whether the first author's ratings of protagonist qualities are similar to the British participants in the sample.

Participants

The sample consisted of N=40 participants, ranging in age from 19 to 68 years old (M=40.7; SD=15.5). 15 participants were British (M=40 years; SD=13.3; 8 females). The other 25 participants were of Chinese heritage (age M=45; SD=17.6; 22 females). British participants responded to calls for participation at either the Met Film School, London, or though letters to parents of children attending the St John's C.E. School, Essex. All the culturally-Chinese participants were either Bangor University students who had either been studying in the U.K. for up to two years, or members of the Waltham Forest Chinese Cultural Community Centre, actively involved in Chinese cultural activities on at least a weekly basis, who spoke primarily Cantonese and had lived in the U.K for up to 30 years. Participants were paid £3 for every questionnaire they completed.

Films

The films screened in this study were the top-five, all-time grossing, American-produced films in the domestic US box office, and the top-five, all-time grossing, Chinese-produced films in the domestic Chinese box office as of October 2014 (Box Office Mojo). The US films were: *Avatar* (2009), *Titanic* (1997), *Marvel's The Avengers* (2012), *The Dark Knight* (2008) and *Star Wars: Episode I – The Phantom Menace* (1999). The Chinese films were *Ren zai jiong tu: Tai jiong / Lost in Thailand* (2013), *Xi you xiang mo pian / Journey to the West* (2013), *Sap ji sang ciu / Chinese Zodiac* (2012), *Hua pi 2 / Painted Skin: The Resurrection* (2012) and *Rang zi dan fei / Let the Bullets Fly* (2010).

Cantonese audio or traditional Chinese subtitled versions of the films were provided for the Chinese-heritage participants. In the few instances in which the Chinese version DVDs contained a different edit to the British DVD releases, bearing the hallmark of S.A.R.F.T. censorship, the distinctions were felt not to be significant in relation to the protagonists' personality traits, motivations or emotions.

The films were either screened to small groups, or viewed on DVD-players in the participants' homes. One potential concern in allowing some participants to watch films, unsupervised, was that they might not watch the full film, or pay attention to the narrative. It was anticipated, however, that participants who were less engaged with the films, would be picked up by an additional APTEM-Q item asking viewers to rate their enjoyment of the film. Furthermore, the statistical techniques employed in the analysis have the strength to detect outliers amongst the participants. It was also felt that the £3 payment for participation was not incentive enough to encourage students to lie about watching films that they had not viewed.

Procedure

Participants were first briefed about the procedure either in English or traditional Chinese as appropriate. The film was then screened with subtitles if required. Participants were required to complete the questionnaire immediately after watching the film and the APTEM-Q was provided in either English or traditional Chinese translation as fitting.

3. RESULTS

There were four main findings from our studies. Firstly, as a means of analysing protagonist traits, emotions and motivations for box office films, we found the questionnaire items comprehensive. Each of the personality traits, emotions and motivations were displayed in both American and Chinese-produced films. Furthermore, across the 110 films viewed in the

17

study, there were no cases where protagonist exhibited traits, emotions and motivations that could not be described by one or more of the items in the questionnaire. This is not to say that purely cultural motivations do not exist, but these were not motives of the protagonists of films in this study. There were, however, a handful of films in which protagonists displayed emotions or motivations, which were harder to categorize using the stated criteria.

Secondly, a 4-factor binomial regression model correctly classified whether 75.3% of the films were top-ten, domestic box office hits in the American or Chinese markets from perceived protagonist qualities alone. Box office hits where the protagonist displayed greater Fear, demonstration of Physical Skills and Helping Others were more likely to be popular at the US box office, while hit films in which the protagonist draws Meaning from the events of the narrative, were more likely to be popular in China.

Thirdly, a general, linear, mixed effects binomial regression analysis with the protagonist attributes Fear, demonstration of Physical Skills, Helping Others and Meaning, demonstrated no significant difference in the way that British and Chinese participants rated this suite of attributes in popular American and Chinese films. Fourthly, based on the s linear mixed effects regression analysis, the first author's ratings were typical of the British study participants.

3.1. **Challenging cases**

In a handful of films, protagonists displayed emotions or motivations, which were harder to categorize using the stated criteria. These included assessing opaque or impenetrable characters, for example the protagonist of the Chinese hit film *Hua pi 2 / Painted Skin: The Resurrection* (2012) displays and expresses very little emotion, and because of this it is more difficult for audiences to understand her motivations.

Assessing dual personality superheroes was also difficult. Bruce Wayne, for example, is far more sociable and less impulsive than his counterpart, Batman, in *The Dark Knight* (2008). Rating the questionnaire item Avoiding Danger was another challenge, as prosocial behaviour in films often involves simultaneously taking risks, whilst mitigating them. In *Skyfall* (2012), for example, James Bond frequently throws himself into danger while armed with a gun. Also tricky was rating non-human behaviour in fantasy or animated films. Taking the example of protagonist, Jake Sully, in *Avatar* (2009), when he initially helps Pandora's Na'vi community, he is helping unrelated others via his avatar. But when Sully transfers permanently into his avatar, he becomes their biological kin.

3.2. Study 1

Eleven American-produced films, which were hits in both the U.S. and China, were excluded from the study so as to avoid duplication across the two groups. Using SPSS version 22 (IBM Corp 2013), a binomial logistic regression was performed on the remaining 78 films in order to ascertain the odds ratio of a film being a Chinese hit from the protagonist's personality traits, emotions and motivations - the dependent (predictor) variables. Although Cook's distances for the remaining films were all < .5, suggesting that none of the cases exerted undue influence on the model (Cook & Weisberg 1982), the leverage value for *Xin hua lu fang / Breakup Buddies* (2014) was over three times the average (>0.192 for this dataset). Following Stevens' (2012) recommendations that cases with three times the average leverage values should be considered as having undue influence over the model, *Xin hua lu fang / Breakup Buddies* was excluded from the regression analysis. Furthermore, since just over 2% of the films had standardised residuals that lay outside ± 1.96, as would be expected within a normal population (Field 2013), none of the films were therefore considered to be outliers.

A backward-modelling approach resulted in a 4-item regression model which was found to be statistically significant: $X^2(4)=31.37$; $p<0.000$. The model explained 44.6% of the variance in film protagonists' psychological characteristics, and correctly classified 75.3% of the films. Sensitivity was 73.7% and specificity was 76.9%. Positive predictive value was 75.7% and negative predictive value was 75.0%. The four statistically significant items were Fear, displaying Physical Skills, Helping Others and Meaning. For each unit increase in the ratings of the degree to which the protagonist displays Fear, the odds of the film being Chinese are lowered by a factor of 0.505. Similarly, for each unit increase in the ratings of the degree to which the protagonist displays Physical Skills, the odds of the film being Chinese are lowered by a factor of 0.731, and for each unit increase in the ratings of the degree to which the protagonist Helps Others, the odds of the film being Chinese are lowered by a factor of 0.453. Conversely, for each unit increase in the ratings of the degree to which the protagonist creates meaning from the course of the narrative, the odds of the film being Chinese are raised by a factor of 1.797. All these findings were significant with ps <0.005 as shown in Table 1, below.

Table 1: Binomial ordinal regression results predicting the odds ratios of whether a box office hit is Chinese from protagonist attributes

	B	S.E.	Wald	Df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Fear	-.683	.220	9.673	1	.002	.505	.329	.777
Helping Others	-.793	.300	7.003	1	.008	.453	.252	.814
Physical Skills	-.313	.182	2.964	1	.050	.731	.512	1.044
Meaning	.586	.189	9.646	1	.002	1.797	1.241	2.600
Constant	3.844	1.421	7.321	1	.007	46.706		

In order to confirm the reliability of the analysis, the data was then split randomly, into two halves. For both split files, the same 4-factor regression model was found to be statistically significant. In split file 1(N=38): $X^2(4)=13.77$; p=0.008. The model explained 40.6% of the variance and correctly classified 68.4% of the films. The sensitivity was 70.0% and the specificity was 66.7%. Split file 2 (N=39) produced similar results: $X^2(4)=25.59$; p<0.000. The model explained 62.5% of the variance of protagonists' psychological attributes and correctly classified 76.9% of the films. The same 4-factor model was then applied to each calendar year's films. The results confirmed that the same 4-factor model is statistically significant (p<0.0001) in all 5 analyses, in each instance correctly classifying at least 74.2% of the films. As an additional check, the same 4-factor model was run with all 78 films, including the influential case, *Xin hua lu fang / Breakup Buddies.* The results once again confirmed the model is statistically significant $X^2(4)=30.83$; p<0.000, explaining 43.5% of the variance and classifying 75.6% of the films.

3.3. Study 2

We used the statistical packages R (2015) and lme4 (Bates et al. 2015) to perform a general, linear, mixed effects binomial regression analysis in order to ascertain whether the 4-factor model derived from Study 1 could be used to predict whether a participant's cultural heritage is Chinese or English. We included participants' ratings of protagonists' Fear, Physical Skills, Helping Others and Meaning as fixed effects, and intercepts for participants and films as random effects. A likelihood ratio test of the full 4-factor model against a model containing only the random effects was run in order to obtain p-values. The results demonstrate that when considered together as a 4-factor model, ratings of a protagonist's

Fear, Physical Skills, Helping Others and Meaning did not significantly differ between the Chinese and English participants: $X^2(4)=0.118$; $p>0.5$.

In the second part of the study, we ran a further general, linear, mixed effects, binomial model using data from just the British participants and first author in order to determine whether the same 4-factor model could be used to differentiate the participants from the first author. In other words, we were interested in whether the first author's results were typical of British audiences. Following the technique developed by Huber et al (2015) in order to compare a single case with a control group, we coded our data with a new First Author/Participant, binary dependent variable. As before, we included participants' ratings of protagonists' Fear, Physical Skills, Helping Others and Meaning as fixed effects, and intercepts for participants and films as random effects. For each of these four dependent variables, our ratings were compared with the group of participants' ratings, and p-values for the Satterthwaite approximation method for the Researcher/Participant variable were calculated. A likelihood ratio test of the full 4-factor model against a model containing only the random effects was run in order to obtain p-values. When considered together as a 4-factor model, ratings of a protagonist's Fear, Physical Skills, Helping Others and Meaning did not significantly differ between the first author and the study's British participants: $X^2(4)=0.004$; $p>0.5$.

4. DISCUSSION

An evolutionary framework is a promising avenue for guiding future research in film theory and academic screenwriting research. We also propose that the APTEM-Q is a useful instrument for film industries attempting to produce popular and profitable films. Each of the 34 motivations, traits and emotions surveyed by the APTEM-Q were identified in the most

popular recent films in China and the US, but displayed with different frequencies in the main characters of films preferred by the two cultures. Protagonists displaying Fear, Physical Skills and Helping Unrelated Others, motivations linked to heroic behaviour, predicted that a top ten film would be more popular in the US, whilst a protagonist who draws Meaning from the narrative would be most popular in China. In other words, we demonstrated significant cross-cultural differences in consumer preferences for psychological attributes of film characters, or for the kinds of films that these types of characters appear in.

The second part of our study demonstrated that the first author's ratings of the four predictors in our regression model were not significantly different from those of the British participants, which allows us to make cautious generalisations about the results of our first study to the wider British population. Furthermore, the study's British and culturally-Chinese participants showed no evidence of perceiving Fear, Physical Skills, Helping Unrelated Others and Meaning in different ways, suggesting cross-cultural and possibly universal consensus in the way these particular psychological attributes are assessed. Thus, the differences that we found in American and Chinese consumer preferences for these four emotions and motivations are more likely to be due to cultural preferences for these psychological characteristics in screen characters, rather than to any significant difference in the way they are received.

Since the sample sizes in this study were relatively low, and the sample of culturally-Chinese participants female-biased with an expressed preference for the screened films as measured by their higher ratings of enjoyment, our findings need to be replicated and extended to nations more isolated from Hollywood's far-reaching touch before any firm conclusions are drawn. However, our finding of an absence of cross-cultural differences in ratings of Fear, Physical Skills, Helping Unrelated Others and Meaning, lends further weight to the argument that these particular psychological protagonist qualities are universal in both

expression and reception. They are therefore most likely based on evolutionary adaptations and exaptations, modulated through interaction with today's contemporary environment as well as cultural and aesthetic processes. Furthermore, as Bernard et al (2005) note, the list of motivations included in this research should be considered exploratory rather than definitive. Advances in research into human evolutionary psychology may grow or diminish the list of universal emotions, motivations and personality traits. Analysis of less popular films is likely to reveal protagonist motivations beyond those included in this study that are purely cultural, and therefore with particularistic appeal.

It would seem, then, that the majority of protagonists in the most popular contemporary American and Chinese films are driven not just by two conflicting 'desires' as posited by authors of screenwriting manuals including Robert McKee (1997, p.138), but by up to fifteen primary motivations, which we examined in this study. In every one of our sample films, protagonists demonstrated substantial conflict between two or more of these motivations. While Bernard et al's evolutionary model of motivations (2005) suggests that motivations acting across all social domains have equal "weight", an alternative possibility is that motivations act within hierarchically structured social domains (eg Nettle 2005). Lending some support to this theory, we note that films dominating the American and Chinese box office in our study tended to feature protagonists whose primary motivation was to ensure survival of the group, which suggests that a film's popularity may be related to the social domain of the protagonist's primary motivation. In other words, if films with protagonists set on ensuring group or personal survival dominate the top of the box office, while films with protagonists motivated by memetic or cultural motivations tend to fall at the bottom of the box office, this would contribute evidence towards the organisation of motivations into a hierarchy of urgency with which they must be addressed, through the social domains in

which they act. Thus, we propose that a revised and validated version of the APTEM-Q may also make a contribution towards the accuracy of film financial forecasting models that attempt to predict a film's box office success from the screenplay. Such models currently exclude detailed analysis of the film's protagonist or the social domains on which their primary evolutionary motivations act.

Psychological theories of motivation, including Bernard et al's (2005) evolutionary model, remind us that motives are inextricably linked with personality traits and emotions. In our analysis of screen character's traits using Zuckerman's Alternative Five (1989;1991), we found the model both comprehensive and useful in differentiating between characters. We suggest, therefore, that psychological models of personality, including the Alternative Five, may be used as practical tools for screenwriting academics and practitioners both during the analysing and crafting of screen characters. As such, they define the basic 'layer' of traits espoused by a number of authors of screenwriting manuals (eg Iglesias 2005, p.5). Similarly, we found Lovheim's model of emotions provided a seemingly complete way of categorising all the protagonists' emotions found in the sample films. We propose, therefore, that contemporary psychological models of human emotion may prove useful to writers, literary theorists and screenwriting academics when creating and discussing characters.

As research into this field advances, we note cognitive critic Alan Richardson's cautions against over-simplistic, retrospective mapping of evolutionary universals to fictional narratives (2000). While fictional worlds relate to reality in a variety of ways, in all 110 of the films viewed in this study, the protagonists' motivations, personality traits and emotions appeared to be close imitations of real human responses. Furthermore, the vast majority of actors' performances in these films were naturalistic, suggesting that close approximation of

human behaviour, both in writing screen characters and crafting performances, may be requisite for a film's universal appeal. Thus it could be argued that the more a film, or narrative, subverts our fundamental psychological realities, the less it resembles life as we know it, and the more reduced its appeal.

In conclusion, we propose that through understanding film characters' traits, motivations and emotions as writers' emulations of our evolutionary adaptations to problems of inclusive fitness, modulated by the environment as well as aesthetic and cultural processes, researchers will gain valuable insights into the psychology of screen protagonists and their associated, cross-cultural audience appeal. These approaches should not be considered as reductive in nature, but consilient - capable of joining explanations of human behaviour from the biochemical and molecular, to the cultural and aesthetic, through a series of unbroken causal chains. Only by understanding our origins can we fully comprehend the utilisation of Pleistocene protagonists so prevalent on our contemporary screens.

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