The effect of psychopathic personality traits on loss aversion
Declaration

I hereby declare that this dissertation is the result of my own independent investigation under the supervision of my tutor. The various sources to which I am indebted are clearly indicated. This dissertation has not been accepted in substance for any other degree, and is not being submitted concurrently for any other degree.
Acknowledgements

Firstly, I would like to thank my supervisor for his continued support throughout this project, whose guidance helped me to complete this work.

I would also like to thank my family who have been my biggest supporters and have made this process a little more bearable. Thank you to my friends, especially my housemates who have put up with my constant moaning and for always being there for support, comfort and laughs.

Finally, I would like to thank everybody who took part in my study, who without which this project not be possible.
ABSTRACT

Though psychopathy has seen many definitions over time, recently it can be described as having a link to an emotional deficit and is a strong predictor of increased antisocial behaviour, displaying traits such as lack of remorse, deceitful and manipulative. Researchers have categorised these traits in a way that is easier to measure psychopathy. The Triarchic Psychopathy Measure (TriPM), has been found to be a worthy measure, focussing on three phenotypic sub groups, boldness, meanness and disinhibition. Research suggests that emotional dysfunction as well as abnormalities in attention control underlies the traits of psychopathy and also pays a contribution to loss aversion. The current study aims to study a topic where research is lacking, to determine whether there is a relationship between psychopathic traits in the general population and loss aversion. Data from 58 participants was collected through opportunity sampling. Participants completed both a TriPM questionnaire and a gambling task to measure loss aversion. Significant positive and negative correlations were found in relation to the boldness trait and gain and neutral trials. The findings are discussed with relevance to the current field of research into loss aversion and psychopathy and the present studies implications for psychopathic traits in the general population.
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**Introduction**

**Psychopathy**

With individuals presenting themselves as confident, charming and psychologically well adjusted, psychopathy is one of the most difficult disorders to spot. The idea of psychopathy has been around for a long time, and was once used to denote any type of mental illness (Hall and Leidig, 2006). Through the twentieth century, terms such as ‘constitutional psychopaths’ and ‘psychopathic inferiority’, were used very broadly to cover those who violated legal or moral expectations, or were in some way considered socially undesirable (Patrick, 2005). In 1930, Partridge identified a subgroup for those who had difficulty or refused to adapt to the norms of society, and named it ‘psychopathic personality’. Despite the lack of diagnostic consistency or clarity, the term ‘psychopath’ was used to label dangerous or persistent law breakers, throughout the 1900’s.

However, current research has suggested that psychopathy is a disorder which is linked to an emotional deficit and is a strong predictor of increased antisocial behaviour (Hare, 2003). In the book ‘The Mask of Sanity’ (p63), Cleckley (1955) described psychopathy as a ‘deep-rooted emotional pathology masked by an outwards appearance of robust mental health’. Notably, Cleckley did not believe that the characteristics of these individuals were violent and intentionally cruel, but rather their inability to feel empathy towards those whom they are inflicting harm.

Recently, in the media psychopaths are often presented as inhumane, emotionless serial killers, with roughly 15% of offenders showing psychopathic traits (Hare, 2003). However, the label psychopath can be used to describe a broad range of notorieties from those who commit murder, to political figures. Hare (1994) found many of these psychopathic traits can be found in successful business men and CEO’s, who obtained their roles by manipulation and unremorsefully insulting employees beneath them. Approximately 1% of the population would meet the criteria of a clinical psychopath, with predominantly more men than women receiving a diagnosis (Kiehl & Hoffman, 2011; Wynn, Høiseth & Pettersen, 2012).

**Traits of psychopathy**

Although the term ‘psychopathy’ has been used to classify a group of characteristics shown by an individual, psychopathy is often considered a multidimensional construct consisting of two categories; primary and secondary (Karpman, 1948; Skeem, Poythress, Edens, Lilienfeld, & Cale, 2003). Primary psychopathy refers to the unemotional, callous traits, with individuals showing a lack of remorse and empathy towards those they may have mistreated. Individuals with primary psychopathy are believed to have low anxiety, in contrast to those with secondary psychopathy who have higher anxiety and tend to be more
empathetic and guilt-prone towards others. Both primary and secondary psychopathy display antisocial behaviours, though with primary psychopathy, the actions are often premeditated, planned out and less impulsive (Vidal, Skeem, & Camp, 2010). These explanations of behaviours are further supported by DeMatteo and Edens (2006, p167), who defined secondary psychopathy as a set of traits such as “impulsivity, weak behavioural controls, irresponsibility and juvenile delinquency”, with individuals displaying unplanned and impulsive behaviours.

In addition to the dissimilarities between the traits of primary and secondary psychopathy, the origins from which they derive, also differ. While traits within primary psychopathy, such as manipulative, deceitful and arrogant are thought to have a biological background (Karpman, 1948; Mealey, 1995), secondary psychopathy traits are believed to result from a combination of environmental and genetic factors, namely adverse childhood experiences and insecure attachment types (Mealey, 1995; Craig, Gray, & Snowden, 2013; Sacco et al., 2016).

One way of clinically assessing psychopathy is by using the ‘Psychopathy Checklist Revised’ (PLC-R) created by Hare (2003). The PLC-R is a 20-item inventory of perceived personality traits which is used in a variety of clinical setting in order to assess psychopathy in adults. The PLC-R consist of a semi-structured interview, alongside a review of collateral information, such as official records, to create a clinical assessment of psychopathy (Hare, 2003). In order to define an individual’s behaviour, the PCL-R uses a design which uses two factors. Factor 1 is labelled "selfish, callous and remorseless use of others", and so focuses on interpersonal factors of an individual’s personality, whereas Factor 2 deals with the antisocial behaviours of psychopathy (Hare, 1991; Moss, 2010). Research has suggested that both factors are separate but are somewhat correlated to each other (Harpur, Hakstian & Hare, 1988).

Although large amounts of research point towards the PCL-R as being the best method to measure psychopathic traits, it does pose some limitations. Some researchers argue that the PCL-R is not based on sound theoretical framework (Rogers, 1995). Due to the PCL-R only using nine of the sixteen aspects Cleckley (1955) used to define psychopathy, it does not sufficiently capture the construct of psychopathy and therefore lacks content validity (Moss, 2010). Furthermore, Martens (2008) found a number of issues with the PCL-R, that checklist may not be as reliable as it was once believed, which could lead to the misuse of the measure. Martens (2008) came to the conclusion that the PCL-R was open to false conclusions and some of the principles were unmeasurable and vague, making them unsuitable to use outside of clinical settings and being misused within psychiatric setting.

A contemporary model for measuring psychopathy is the Triarchic Model (Patrick, Fowles, & Krueger, 2009) which was formulated in order to settle opposing conceptions of psychopathy and to merge historical conceptualisations of the disorder with empirical findings, to establish and implement good assessment for individuals (Patrick and Drislane, 2014; Patrick, 2010). The model proposes three phenotypic categories; boldness, which
relates to social dominance, emotional resiliency and daringness; meanness, which is defined as aggressive resource seeking without regard for others (disaffiliation); and disinhibition, which reflects a tendency toward problems with impulse control (Hall et al., 2014). The three groups have been used to create a 58 question self-report questionnaire called the Triarchic Psychopathy Measure (TriPM) (Patrick, 2010). Patrick, Drislane, and Strickland (2012) stated that although it is not a new or replacement theory, it captures some of the distinct constructs and elements that other models, such as the PCL-R, ignore.

Whilst the TriPM three-trait model seeks to compete with the PLC-R, it does display some similarities, with ‘Meanness’ and ‘Boldness’ traits resembling ‘Factor 1’ and ‘Disinhibition’ resembling ‘Factor 2’ (Hall et al., 2014). The TriPM has seen recent support for the analysis of psychopathic traits and the use of the measure in clinical settings. The TriPM has been found to show results of reliability and validity among a range of ages and education levels (Hall et al., 2014; Sica et al., 2015; Stanley, Wygant, & Sellbom, 2013); as well as large support for potential use in cross cultural research (Somma et al., 2016). In addition, a study by Pasion, Cruz & Barbosa (2016) produced supporting claims for the heterogeneity between Boldness, Meanness and Disinhibition. The ever growing support for the Triarchic Psychopathy Measure makes it a robust alternative to the PCL-R.

**Emotional and attentional dysfunction**

A variety of authors have suggested that an emotional dysfunction underpins the deficits seen in individuals with psychopathy (Frick & Viding, 2009; Blair, 1995; Patrick, Bradley & Lang, 1993). It is thought that the impairments are to do with emotional processing. For example, psychopaths have shown reduced autonomic responses to the pain and distress of others and a reduced recognition of emotional responses (Blair et al., 1997; Marsh & Blair, 2008; Dawel et al., 2012).

Fearlessness, shown in traits ‘boldness’ and ‘meanness’, can be explained using emotional concepts, according to Lykken’s ‘low- fear hypothesis’ (1995). The hypothesis suggests that those with innately low levels of fearfulness are harder to socialise, as they fail to experience fear or anxiety in the face of punishment. This lack of fear becomes a motivational deficit in those with psychopathy, in that they are not motivated by fear or the ‘tug of conscience’, that those without psychopathy may have. However, many have criticised this theory for being too general, as low fear and anxiety are only a few of the features which make up psychopathy (Hare, 1998). Patrick and Lang (1999) built upon Lykken’s work, and proposed that components such as emotional detachment and behavioural disinhibition, can be seen as two separate, but co-occurring entities, which are characterised by deficits in brain regions and functions. Furthermore, while the emotional detachment component of psychopathy likely results from the lack of fear response, impulsiveness and antisocialism can be better explained by a deficit in higher information
processing systems, which may interact with motive systems such as fear (Patrick and Lang, 1999).

Other studies have suggested that rather than psychopathy being a problem with emotional responding, it is instead attentional abnormality which is central to understanding the disorder (Newman et al., 2010; Baskin-Sommers et al., 2011). Attentional control refers to an individual’s capacity to choose what they pay attention to and what they ignore. Data suggests that psychopathy is related to the heightened enrolment of the regions in the brain associated with attentional control (Mitchell et al., 2007; Pessoa & Ungerleider, 2004) and the more the regions are enrolled (as a function of psychopathy), the weaker the representation of threat relevant stimulus and in turn, weakens the emotional response.

The response modulation theory of psychopathy (Newman & Lorenz, 2003; Patterson & Newman, 1993) puts emphasis on the reallocation of attention in the context of goal related behaviour. According to this model, individuals with psychopathic disorder are not completely resistant to threat cues, but rather are less likely to switch their focus of attention to cues which are peripheral to their goal directed behaviour. Support for this theory is presented by Newman et al. (2010) who conducted an experiment examining fear potentiated startle under conditions which manipulated the relevancy of threat to goal-directed behaviour. Newman et al. (2010) concluded that abnormalities in attention related to psychopathy weaken sensitivity to threat related cues, specifically when they are outlying goal-directed behaviour.

**Loss aversion**

A concept that describes the way people choose between probabilistic alternatives that involve risk is called prospect theory (Tversky & Kahenman, 1992). The theory assumes that losses and gains are valued differently, and individuals will make decisions based on perceived gains rather than perceived losses. For example, Tversky and Kahenman (1987) presented individuals with a scenario whereby there is an outbreak of an Asian disease that was likely to kill 600 people in the US, unless action was taken. The participants were given a choice between choosing program A which would allow 200 people to be saved or program B which had a one-third probability of saving all 600 people, but a two third probability that no one would be saved. Over 72% of the participants favoured program A, even though if the programs were implemented several times, they would both lead to saving an average of 200 lives.

Tversky and Kahenman (1992) proposed that a loss has a more emotional impact on an individual than the equivalent amount of gain, so if the same choice was presented two ways, the individual will pick the choice with the perceived gain, even if the end results are the same. This idea that individuals are more sensitive to potential losses than potential gains can be described as loss aversion.
It has been suggested that losses may trigger increased activity in brain regions that process emotions, such as the insula and amygdala. Martino, Adolphs and Camerer (2010) studied two individuals with rare lesions on their amygdala. They found that neither of the individuals displayed loss aversion, suggesting that the amygdala plays a key role. Additionally, Canessa et al. (2013) studied brain regions associated with emotion further and found an increase in activity in the insula when potential loss was present. Both findings offer interesting insight into the role of emotion in loss aversion. Similarly, abnormalities in the amygdala have been found to play a role in psychopathy. Yang et al. (2009) found that individuals with psychopathy showed significant bilateral volume reduction in the amygdala, compared with controls. Significant correlations were also found between reduced amygdala volume and psychopathy scores, with correlations strongest for affective and interpersonal factors of psychopathy (boldness and meanness). Findings indicate that amygdala abnormalities contribute to emotional and behavioural symptoms of psychopathy and to reduced loss aversion, thus this area of the brain could be responsible for risky decision making in psychopaths.

Further studies raise questions regarding the cause and effect of the relationship between emotion and loss aversion. The Appraisal Tendency Framework (Lerner, 2006) suggests that emotions trigger a set of responses to help deal with problems or opportunities an individual faces (Lerner, Li, Valdesolo & Kassam, 2015). The framework emphasizes that different affective states will trigger certain cognitive styles and judgements, which will in turn shape how people prioritize and integrate information in the decision making process. For example, those who are unhappy view information about losses as more salient than those who are neutral. Alternatively, those in a good mood will display loss aversion as a way of maintaining happiness (Bless, Schwarz & Kemmelmeier, 1996). Although, it is unclear whether emotions are present before or after an individual is faced with a decision, it is clear that emotion does play a role in loss aversion and raises questions in relation to loss aversion and psychopathy.

Attentional control has also been found to play a role in loss aversion. Armel, Beaumel and Rangel (2008), stated that the amount of attention paid to an adverse choice option predicts its avoidance, suggesting that attentional bias towards outcomes which are potentially risky may cause individuals to favor alternatives which are perceived as safer. As those with psychopathy have been found to have an attentional dysfunction (Newman & Lorenz, 2003; Patterson & Newman, 1993, Newman et al., 2010), it could predict the link between psychopathy and loss aversion.

Summary and aims
There are multiple explanations to why psychopaths may partake in risky behaviour. It could be that because of heightened attentional goal directed control, their attention is not captured by threat (Newman & Lorenz, 2003; Patterson & Newman, 1993, Newman, 2010)
or alternatively because of emotional processing deficits, they do not represent threat or danger as saliently as those low in psychopathy trait (Frick & Viding, 2009, Lykken, 1995, Patrick and Lang, 1999).

Although there is research showing the association between psychopathy and risky behaviour (Hosker-Field, Molnar & Book, 2016, Hunt et al, 2005), there are no current studies on psychopathy and loss aversion specifically. Furthermore, most of the research conducted is on clinically diagnosed psychopaths, and does not take into account those living with psychopathic traits in the general population. Therefore, the aim of this study is to look at this topic where research is lacking, through the use of a decision making task and a modern psychopathy measure.

Though there is no current evidence of the connection between psychopathic traits and loss aversion, the studies on clinical psychopathy, suggesting that those diagnosed with psychopathy will take more risks in a gambling task than those without (Hosker-Field, Molnar & Book, 2016, Hunt et al, 2005), allow a prediction of the results of the current study. Taking this information into account, it is expected there will be a negative relationship between levels of psychopathic traits and levels of loss aversion, with a greater number of psychopathic traits related to less loss aversion.

Furthermore, due to heightened emotional resilience which has been associated with loss aversion and daringness, which involves taking risks, seen in the boldness trait (as described in the TriPM, Patrick, Fowles, & Krueger, 2009 ), it can be predicted that higher scores in boldness will be related to lower loss aversion, compared to meanness and disinhibition.
Method

Participants
The sample consisted of 58 participants, who were recruited through an opportunity sampling method, via communal areas within a university, and also friends and family. All of the participants who took part in the study were over the age of 18 and the sample mainly consisted of undergraduate students from universities in South Wales, though some participants were personal contacts.

Design
The study examined the effect of psychopathic traits in an individual on loss aversion. The design used will be a within groups design. The dependent variable of this study will be the loss-aversion task score, with the independent variable being the three sub-scales of the TriPM (Boldness, Meanness and Disinhibition).

Materials
Psychopathic traits questionnaire
To measure psychopathic traits in individuals the ‘Triarchic Psychopathy Measure’ (TriPM), developed by Patrick, Fowles and Krueger (2009) was used, which the participants filled out on a hard copy. The questionnaire consists of 58 questions including statements which are used to describe participant’s selves, with 17 out of 58 questions being reverse scoring items. The TriPM measures three levels of psychopathic traits within an individual Boldness, Meanness and Disinhibition. The questions were answered using five choices on the Likert scale, which represents whether the participant agreed or disagreed with the statement. The choices were 1-strongly disagree, 2-somewhat disagree, 3-neither agree nor disagree, 4-somewhat agree and 5-strongly agree. Sellbom and Phillips (2013) supported the use of the TriPM, finding that Boldness, Meanness, and Disinhibition to be related in distinct and expected ways to psychopathy-relevant criterion variables. Further support comes from Stanley et al (2013) who reported validity of the TriPM predicting personality traits relating to psychopathy, significantly better than other measures, such as the PCL-R, that are in place.

Loss aversion task
The dependent variable for the study was the loss aversion task, which was and adaptation of Kahneman and Tversky loss aversion task (1992). The task for the current study followed the same concept, but in a way that allowed the participant to visualise the gamble on the computer screen in front of them. On each trial, participants were presented with a gamble which had a 50/50 chance of either winning or losing money. Participants then had to
decide whether they would accept or reject the gamble, and how strongly or weakly they would accept or reject. Participants were asked to press the number on the computer keypad corresponding to the decision they made (see fig below).

![Figure 1. Example of loss aversion trial](image)

Each trial began with a 500ms screen getting the participant ready for the next gamble. The task consisted of 133 trials displayed in a random order with losses ranging from -£5 to -£20 and gains ranging from £10 to £40. According to loss aversion theory, responses to losses are stronger than those towards equivalently sized gains. Typically, the minimum gain that people need to balance an equal chance of losing money is approximately twice the size of the loss (Kahneman & Tversky, 1979). Therefore, if the trial displayed a gain which was more than the double the loss, it would be a perceived gain, double the loss would be neutral and anything below would be a perceived loss. When analysing the data the scores for the gain trials were divided by scores for the loss trials to arrive at an overall loss aversion score. The higher the score, the more loss averse an individual is. The loss aversion task was created on OpenSesame v.3.1.

**Procedure**

At the beginning of the study, participants were given an information sheet telling them about the study they were about to take part in and informing them of their rights. Participants were then asked to sign a consent form, which meant they agreed to take part. At this stage the participants were given an opportunity to ask any questions before starting. The participants were seated in front of a computer in a quiet area, by themselves. The participants were asked to read the instructions at the beginning of the loss aversion task, about how to respond, before pressing any button as instructed to start the task. The participants were required to respond to four practice trials before the real trial began, to ensure they understood the task they were carrying out. Once the real trials started, the
participants were given a short 500ms pause between each trial to prepare them for the
next. Participants were able to respond to the task in their own time, with no time
restraints. Once the trials were finished, the participants were shown a message, thanking
them for taking part. The responses were automatically saved by OpenSesame.

Once the loss aversion task was completed, the participants were then asked to move onto
the self-report questionnaire. Participants were required to read the instructions at the top
of the questionnaire to ensure they understood how they answered using the Likert scale.
Once both tasks had been completed, the participants were verbally debriefed and were
free to leave. With a break between the loss aversion task and filling out the questionnaire,
the study did not take more than twenty minutes to complete.

**Method of analysis**

The method of analysis used for this study was a multiple linear regression. This method of
analysis was used because it involved one interval data criterion variable (loss aversion) and
three predictor variables (boldness, meanness and disinhibition). The analysis will establish
whether there is a relationship between the independent and dependent variables.

**Ethical considerations**

Before any data was collected by the researcher, the current study was approved by the
Cardiff School of Heath Sciences Ethics Committee. All of the participants were briefed on
their right to withdraw from the study, and that all of their data would be confidential and
anonymous. Although no adverse effects to the participant were expected from the study,
details for where participants could seek support were given as part of their debriefing.
Results

Descriptive statistics

Table 1 shows the differences in means for gain trials, loss trials, neutral trials and total loss aversion scores. According to the loss aversion theory, for trials with higher perceived gain, participants were predicted to choose 3 or 4 (accept strongly or accept weakly), for trials with more perceived loss, 1 or 2 (reject strongly or reject weakly) and for neutral trials, participants would be expected to be somewhere around the middle. The descriptive statistics concurred with these predictions. Furthermore, the descriptive statistics suggest that participants are likely to weakly reject gambles (1.7180), no matter the trial.

Table 1.

<table>
<thead>
<tr>
<th></th>
<th>Gain trials</th>
<th>Loss trials</th>
<th>Neutral Trial</th>
<th>Loss aversion Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.0970</td>
<td>1.8675</td>
<td>2.5878</td>
<td>1.7180</td>
</tr>
<tr>
<td>SD</td>
<td>.65318</td>
<td>.54670</td>
<td>.73966</td>
<td>.34040</td>
</tr>
</tbody>
</table>

Table 2 shows the theoretical range for the subscales of the TriPM, boldness, meanness and disinhibition. The higher the TriPM score, the more psychopathic traits the participant has. All scores were within the theoretical range, proving that it worked. The mean scores show that on average participants scored highest on boldness, being the only trait which was closer to the theoretical maximum score than to the theoretical minimum. The theoretical TriPM score and the actual TriPM score ranges are similar.

Table 2.

<table>
<thead>
<tr>
<th></th>
<th>Boldness</th>
<th>Meanness</th>
<th>Disinhibition</th>
<th>TriPM Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>19</td>
<td>18</td>
<td>19</td>
<td>56</td>
</tr>
<tr>
<td>Max</td>
<td>95</td>
<td>90</td>
<td>95</td>
<td>280</td>
</tr>
</tbody>
</table>

Table 3.

<table>
<thead>
<tr>
<th></th>
<th>Boldness</th>
<th>Meanness</th>
<th>Disinhibition</th>
<th>TriPM Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>57.2931</td>
<td>39.2069</td>
<td>41.9483</td>
<td>138.4483</td>
</tr>
<tr>
<td>Median</td>
<td>58.0000</td>
<td>37.0000</td>
<td>37.0000</td>
<td>132.0000</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>10.30586</td>
<td>12.28857</td>
<td>11.83130</td>
<td>27.73570</td>
</tr>
<tr>
<td>Min</td>
<td>26.00</td>
<td>19.00</td>
<td>26.00</td>
<td>89.00</td>
</tr>
<tr>
<td>Max</td>
<td>78.00</td>
<td>65.00</td>
<td>76.00</td>
<td>208.00</td>
</tr>
</tbody>
</table>
Correlations

Table 4 shows that loss aversion scores are significantly correlated to loss trials \( (p = -.609) \), but are not significantly correlated with gain trials \( (p = .077) \) or neutral trials \( (p = -.177) \). Loss aversion scores are negatively correlated to loss trials, predicting that on trials with more perceived loss, participants are less likely to accept the gamble.

![Figure 2. Scatterplot showing negative correlation between loss aversion score and loss trials](image)

All the TriPM subscales (boldness, meanness, and disinhibition) are weakly to moderately correlate to each other. Although TriPM total scores are not significantly correlated with loss aversion, they are positively correlated with gains, losses and neutral trials (participants are more likely to gamble on all trials as TriPM scores increase).

![TriPM Total Score vs. Loss, Gain, and Neutral Trials](image)
Figure 3. Scatterplot showing positive correlations between TriPM scores and loss, gain and neutral trials

Table 4.

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gain</td>
<td>-</td>
<td>.720**</td>
<td>.914**</td>
<td>.077</td>
<td>.498**</td>
<td>.357**</td>
<td>.258</td>
<td>.455**</td>
</tr>
<tr>
<td>2. Loss</td>
<td>.720**</td>
<td>-</td>
<td>.819**</td>
<td>-.609**</td>
<td>.349**</td>
<td>.434**</td>
<td>.327*</td>
<td>.480**</td>
</tr>
<tr>
<td>3. Neutral</td>
<td>.914**</td>
<td>.819**</td>
<td>-</td>
<td>-.177</td>
<td>.461**</td>
<td>.380**</td>
<td>.272*</td>
<td>.457**</td>
</tr>
<tr>
<td>4. Loss aversion score</td>
<td>.077</td>
<td>-.609**</td>
<td>-.177</td>
<td>-</td>
<td>-.004</td>
<td>-.113</td>
<td>-.141</td>
<td>-.112</td>
</tr>
<tr>
<td>5. Boldness</td>
<td>.498**</td>
<td>.394**</td>
<td>.461**</td>
<td>-.004</td>
<td>-</td>
<td>.531*</td>
<td>.261*</td>
<td>.718**</td>
</tr>
<tr>
<td>6. Meanness</td>
<td>.357**</td>
<td>.434**</td>
<td>.380**</td>
<td>-.113</td>
<td>.531**</td>
<td>-</td>
<td>.598**</td>
<td>.896**</td>
</tr>
<tr>
<td>7. Disinhibition</td>
<td>.258</td>
<td>.327*</td>
<td>.272*</td>
<td>-.141</td>
<td>.261*</td>
<td>-.598**</td>
<td>-</td>
<td>.788**</td>
</tr>
<tr>
<td>8. TriPM total score</td>
<td>.455**</td>
<td>.480**</td>
<td>.457**</td>
<td>-.112</td>
<td>.718**</td>
<td>.896**</td>
<td>.788**</td>
<td>-</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the .01 level (2-tailed)
*. Correlation is significant at the .05 level (2-tailed)

Regression

Four multiple regression analysis were conducted. Each included the TriPM subscales (boldness, meanness and disinhibition) as predictors. The criterion variable in each regression was loss aversion, loss trials, gain trials and neutral trials.

Loss aversion

The first data were analysed by regressing the predictor variables boldness, meanness and disinhibition onto the criterion variable loss aversion. The regression model explained 3% of the variance of loss aversion ($R^2 = -.031$) but the overall model was not significant, $F(3, 53) = .447$, MSE = .119, $p > 0.05$.

Table 5.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>t</th>
<th>Sig. (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boldness</td>
<td>0.002</td>
<td>0.005</td>
<td>0.069</td>
<td>0.433</td>
<td>0.667</td>
</tr>
<tr>
<td>Meanness</td>
<td>-0.002</td>
<td>0.005</td>
<td>-0.087</td>
<td>-0.455</td>
<td>0.651</td>
</tr>
<tr>
<td>Disinhibition</td>
<td>-0.003</td>
<td>0.005</td>
<td>-0.107</td>
<td>-0.637</td>
<td>0.527</td>
</tr>
</tbody>
</table>

None of the TriPM subscales (boldness, meanness and disinhibition) produced a significant positive correlation ($p > 0.05$).
Gain

The second data were analysed by regressing the predictor variables boldness, meanness and disinhibition onto the criterion variable gain. The regression model explained 22% of the variance of gain trials ($R^2 = .226$) and the overall model was significant, $F(3, 53) = 2.133$, MSE = .330, $p < 0.05$.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>t</th>
<th>Sig. (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boldness</td>
<td>0.028</td>
<td>.009</td>
<td>.438</td>
<td>3.149</td>
<td>.003</td>
</tr>
<tr>
<td>Meanness</td>
<td>.003</td>
<td>.009</td>
<td>.060</td>
<td>.359</td>
<td>.721</td>
</tr>
<tr>
<td>Disinhibition</td>
<td>.006</td>
<td>.008</td>
<td>.110</td>
<td>.756</td>
<td>.453</td>
</tr>
</tbody>
</table>

Boldness was the only subscale with a significant positive correlation ($p<0.05$) in relation to gain. Those with higher boldness scores were more likely to gamble on trials with higher perceived gains.
The data were analysed by regressing the predictor variables boldness, meanness and disinhibition onto the criterion variable loss. The regression model explained 19% of the variance of loss trials ($R^2 = .194$) and the overall model was significant, $F(3, 53) = 5.485$, $MSE = .241$, $p < 0.05$.

### Table 7.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE(B)</th>
<th>$\beta$</th>
<th>t</th>
<th>Sig. (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boldness</td>
<td>.013</td>
<td>.007</td>
<td>.238</td>
<td>1.678</td>
<td>.099</td>
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<tr>
<td>Meanness</td>
<td>.010</td>
<td>.008</td>
<td>.231</td>
<td>1.360</td>
<td>.180</td>
</tr>
<tr>
<td>Disinhibition</td>
<td>.006</td>
<td>.007</td>
<td>.131</td>
<td>.878</td>
<td>.384</td>
</tr>
</tbody>
</table>

None of the subscales had a significant correlation in relation to loss trials ($p>.05$). However, while the boldness trait did not produce a significant result ($p=.099$), its p value did come close to significance.

Figure 5. Scatterplot showing positive correlation between boldness and gain trials
Neutral

The data were analysed by regressing the predictor variables boldness, meanness and disinhibition onto the criterion variable loss. The regression model explained 20% of the variance of neutral trials ($R^2 = .202$) and the overall model was significant, $F(3, 53) = 5.735$, MSE = .436, $p < 0.05$.

Table 8.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE(B)</th>
<th>$\beta$</th>
<th>t</th>
<th>Sig. ($p$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boldness</td>
<td>.026</td>
<td>.010</td>
<td>.369</td>
<td>2.611</td>
<td>.012</td>
</tr>
<tr>
<td>Meanness</td>
<td>.007</td>
<td>.010</td>
<td>.112</td>
<td>.721</td>
<td>.474</td>
</tr>
<tr>
<td>Disinhibition</td>
<td>.007</td>
<td>.009</td>
<td>.106</td>
<td>.719</td>
<td>.476</td>
</tr>
</tbody>
</table>

Again, boldness was the only subscale which had a significant correlation on the neutral trials ($p<.05$). Those who scored higher on boldness were more likely to gamble on neutral trials.
Figure 7. Scatterplot showing positive correlation between boldness and neutral trials
Discussion

Introduction

The current study sought to examine the relationship between loss aversion and psychopathic traits, specifically focusing on the three subscales of psychopathy as explained in the TriPM, boldness, meanness and disinhibition (Patrick, Fowles, & Krueger, 2009). Though previous studies had established a link between clinical psychopathy and risky behaviour (Hosker-Field, Molnar & Book, 2016), there was no evidence of research into the area of loss aversion and psychopathic traits in the general population. For the study a multiple linear regression was used to analyze the gambling task scores together with the results of the TriPM, and some interesting findings were discovered.

Main findings

The results of the first set of analysis examined the validity of the gambling task for measuring loss aversion. Loss aversion theory (Tversky and Kahneman, 1992) predicts that people are more likely to reject gambles with more perceived loss than gain and vice versa. The outcome of this analysis were consistent with loss aversion theory and verifies that the paradigm works; individuals, in general, are sensitive to both losses and gains.

Overall loss aversion scores were found to be significantly correlated to loss trials, but are not significantly correlated with gain trials or neutral trials, suggesting that loss aversion is directly related to perceived losses rather than gains. This concurs with loss aversion theory (Tversky and Kahneman, 1992), the idea that individuals are more sensitive to potential losses than potential gains.

Results of the analysis showed that TriPM total scores are not significantly correlated with loss aversion as once predicted. However, it was found that total TriPM scores were positively correlated with gain, loss and neutral trials, as participants are more likely to gamble on all trials as TriPM scores increased. The results support the concept of attentional control, whereby those with higher psychopathic traits are less likely to switch their focus of attention from a task to cues which peripheral to it (Newman & Lorenz, 2003; Patterson & Newman, 1993). Therefore, those with a greater amount of psychopathic traits will display more goal-orientated behaviour and consequently will gamble on every task, even on trials which have higher perceived loss than gain, as the threat will not capture their attention. Similarly, the representation of the threat stimulus (loss trial) in those with higher psychopathic traits will be weakened due to heightened enrolment of the regions in the brain associated with attentional control (Mitchell et al., 2007; Pessoa & Ungerleider, 2004), which could explain why participants who had higher TriPM scores are less averse to loss.

Lack of interest and boredom are examples of traits which are found in people with psychopathy (Cleckley, 1955). These characteristics could explain why those who scored high on the TriPM, were more inclined to gamble on every trial, whether it was a gain, loss or neutral trial. With the loss aversion task having 133 trials, participants with more
psychopathic traits would be likely to find the task tedious and uninteresting and as a result, gambled on every trial to end the task sooner.

The third analysis used four multiple regressions to look at the three separate subscales of psychopathy (boldness, meanness and disinhibition) and their relationship with loss aversion, gain trials, loss trials and neutral trials. Although no significant correlation was found in regard to loss aversion and the three subscales of psychopathy, boldness was significantly positively correlated with gain trials and neutral trials, with a near significant negative correlation with loss trials. This shows that individuals who score highly on boldness were more likely to gamble, regardless of whether the trial was a loss, gain or neutral trial. The significant results found for gain trials over loss trials, suggest that those higher in boldness are more sensitive to gains than they are losses.

Emotional resilience being a characteristic of the boldness trait could be a contributing factor to why individuals with more psychopathic traits are likely to gamble on loss, gain and neutral trials. Emotional dysfunction found in individuals with psychopathy is associated with abnormalities in the amygdala, as is displaying a lack of loss aversion (Blair et al., 1997; Marsh & Blair, 2008; Dawel et al., 2012). This suggests that reduced loss aversion shown in psychopathic individuals could be due to the abnormalities in the brain in the same region that causes emotional dysfunction, thus forming a link between the two. Boldness also holds features such as daringness and fearlessness, which could play a key role in loss aversion. The motivational deficit linked with low fearfulness (Lykken, 1995) acts as a barrier for conscience and so the fear associated with a potential loss will not be present. The reduction in fear for those higher in boldness, could be used to explain why these individuals are more insensitive to losses than gains.

These findings offer strong support for the contention that boldness is regarded as a key feature of classical psychopathy (Berg, Lilienfield & Sellbom, 2017), supporting the TriPM as a sound framework predicting psychopathy and the role boldness plays in loss aversion.

Considerations

Currently, as far as it is known, the present study is the only one to look into the three subscales of the Triarchic Model of Psychopathy (boldness, meanness and disinhibition), in relation to loss aversion. Due to the significance of the methodology and the results of the study, a deeper understanding of loss aversion and its relationship with psychopathy has been established. Furthermore, the adapted loss aversion task has been proven to be a strong paradigm for measuring loss aversion and can be taken forward for use in future research.

The present study found significant effects of high psychopathic traits in the general population, and not just in clinical samples, as is seen in most previous research to do with psychopathy. The results of the study found significant relevance to the boldness trait in the data, suggesting that contradicting theories where boldness is disregarded (Karpman, 1948;
Skeem, Poythress, Edens, Lilienfeld, & Cale, 2003), may not be a suitable measure of psychopathy.

The loss aversion task raised some methodological issues. Participants were unable to see the outcome of their gambles, which resulted in a lack of incentive and motivation to carry out the task. Furthermore, the task consisted of over 130 trials which were very repetitive, causing participants to become disinterested and not complete the task to the best of their ability, causing unreliable data to be collected. Although it was found that the loss aversion paradigm did work, developments for further research could see that the task is more engaging and should be able to account for these extraneous variables.

There is concern over the use of the TriPM as a self-report measure for psychopathy, given the nature of the individuals being tested. Given that maladaptive functioning and untruthfulness are some of the main behaviours of psychopathy (Grieve, 2012; Hare, Forth & Hart, 1989), it would be fair to question the reliability of answers obtained. Therefore, it would be advisable for further research into a more objective measure for psychopathy and its traits.

The exact cognitive functions that are involved in the current study are not within the measurements of the methodology; although the study can be used to support further research into this area. It is unknown whether lack of loss aversion in individuals with higher psychopathic traits, is due to a lack of fear response caused by emotional deficits, or goal directed behaviour due to abnormalities in attentional control. Further research could use brain scans to look at the amygdala in the brain, associated with both emotion and attentional control, to be able to pinpoint an exact cause why some individuals are less loss averse than others. The outcomes for this research could provide vital information for treatment into individuals who may have received trauma to these related regions of the brain.

**Conclusion**

To conclude, the present study provided research which showed interesting findings for loss aversion, which can be predicted within the general population through psychopathic boldness scores. More specifically, results show significance for gain and neutral trial, and how those high in the boldness trait are more sensitive to gains than losses. Due to the lack of previous research into this topic area, the current study provides the first look into loss aversion and psychopathic traits in the general population. The significance of these results can provide support for further research into psychopathy and loss aversion, specifically with focus on neural mechanisms, emotion and attentional control.
REFERENCES


Mealey, L. (1995). Primary sociopathy (psychopathy) is a type, secondary is not. Behavioral And Brain Sciences, 18(03), 579. http://dx.doi.org/10.1017/s0140525x00040024


R.D. Hare


The Hare Psychopathy Checklist-Revised by Robert D. Hare, 1991. Multi-Health Systems, 908 Niagara Falls Blvd, North Tonawanda, New York, USA, 14120-2060


Title of Project: Psychopathy and Loss aversion

Participant information sheet

The study

The study is looking at the relationship between loss aversion and psychopathic traits in the general population. Loss aversion is the idea that individuals are more sensitive to potential losses than potential gains, and so if the same choice was presented two ways, the individual will pick the option that is less risky. This study will research whether those with psychopathic traits, a disorder which is linked to an emotional deficit, will have different risk behaviour than those without.

What would happen if you agree to participate?

If you agree to participate in this study you will be asked to fill in a personality questionnaire, which will assess traits of your personality. You will then be asked to complete a loss aversion task, which will measure whether you are loss averse. Your data will then be collected and used to establish whether there is a relationship between psychopathic traits and loss aversion.

Exclusion criteria

You will be unable to take part in this study if you are under 18 years of age.

Potential Risk

You may experience some emotional distress if asked about some aspects of your personality when completing the TriPM. If you have/have had issues in the past to do with gambling, the loss aversion task could trigger these issues and behaviours.
Potential benefits

The benefits of taking part in this study is the contribution you make to understanding risky behaviours and whether they are linked to an individual having psychopathic traits.

Withdrawal, anonymity and confidentiality

If you choose to take part in this study your anonymity and confidentiality can be guaranteed. Your names will not be used when collecting the data to ensure anonymity of your results and all data will be kept on a password protected computer in a locked room.

As the information is anonymous, you have the right to withdraw from the study in the data collection stage, and your results will not be used in the final outcome.

If you have any questions about the study, please contact:
WORD COUNT

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Signed: ______________________________

Date: ______________________________