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**The Moderating Effect of Mental Toughness: Perception of Risk and Belief in the Paranormal**

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## **Abstract**

Research demonstrates that higher levels of mental toughness provide cognitive-perceptual processing advantages when evaluating risk. No previous research, however, has examined mental toughness in relation to perception of risk and paranormal belief (a variable associated with distorted perception of causality and elevated levels of perceived risk). Accordingly, the present paper investigated relationships between these factors. A sample of 174 participants completed self-report measures assessing mental toughness, general perception of risk and paranormal belief. Responses were analysed via correlations and moderation analyses. Results revealed that mental toughness correlated negatively with perception of risk and paranormal belief, whereas paranormal belief correlated positively with perception of risk. For the moderation effects, simple slopes analyses indicated that high levels of MT and sub-factors of commitment and confidence reduced the strength of association between paranormal belief and perceived risk. Therefore, MT potentially acts as a protective factor among individuals who believe in the paranormal, reducing the tendency to perceive elevated levels of risk.

**Keywords:** belief in the paranormal; mental toughness; moderation; perception of risk

## **Introduction**

James E. Loehr (1982, 1986), working with elite athletes, used the term mental toughness (MT) to denote stress tolerance and maximised performance (Earle, 2012). Explicitly, the ability to perform consistently towards the upper range of one's skills and talents regardless of circumstances (Loehr, 1994). Though MT originated within sports psychology, it has since developed into a pervasive psychological construct linked to performance success across a range of applied settings (education, occupation, health, etc.) (Clough & Strycharczyk, 2012).

Conceptually, MT refers to the possession of a set of inherent and evolved values, attitudes, emotions and cognitions that aid goal achievement (Gucciardi, Gordon, & Dimmock, 2009). These attributes influence the manner in which individuals approach, react to, and evaluate pressure, challenge and adversity. Thus, MT functions as a resistance resource linked to coping (Nicholls, Levy, Polman, & Crust, 2011). Concomitantly, the main characteristics of MT are the ability to manage adversity, persistence, resilience, self-belief, control, superior mental skills, and the capacity to thrive under pressure (Crust, 2008). At a practical level, these features provide potential psychological benefits. For instance, high levels of MT facilitate performance on objective measures (Crust, 2008; Loehr, 1986).

Although much research has focused on the role of MT in sporting settings, the influence and applicability of MT extends to other spheres. Hence, researchers now generally regard MT as a concept that can promote and maintain adaptation to challenging situations across a range of domains and populations (Coulter, Mallett, & Gucciardi, 2010). Illustratively, Gerber et al. (2013a) found that higher levels of MT, within high school and undergraduate students, were associated with reduced levels of depressive symptoms arising from high-stress situations. Moreover, high levels of MT predict resilience to stress, ward off depression and help to maintain life satisfaction (Gerber et al., 2013b). Other studies also link high levels of mental toughness to health benefits. For instance, higher levels of MT are associated with greater sleep efficiency, fewer post-sleep awakenings and deeper sleep (Brand et al., 2014). These factors help to negate sleep problems, such as insomnia, which can adversely affect well-being (Gaultney, 2010; Hershner, & Chervin, 2014).

Higher levels of MT can provide also the basis for more successful educational attainment and peer relationships. For example, St Clair-Thompson et al. (2015) reported positive associations between MT (particularly control) and academic attainment/attendance and between MT (confidence in abilities and interpersonal confidence) and adolescent

friendships. The moderating influence in relationships extends to the ability to cope with the difficult interpersonal styles of controlling others (Gucciardi, Stamatis, & Ntoumanis, 2017). Additionally, maintaining high levels of MT over the course of degenerative illnesses, such as multiple sclerosis may promote psychological and physical well-being (Sadeghi Bahmani et al., 2016).

The present paper draws on Clough, Earle, and Sewell's (2002) multidimensional definition of MT. This comprises four broad dimensions (commitment, challenge, control and confidence) (see Clough & Strycharczyk, 2012). Commitment refers to perseverance and the ability, despite problems/obstacles, to carry out tasks successfully. Challenge involves seeking opportunities for self-development. Control denotes influence over life and subdivides into life control (belief in being influential, not controlled by others) and emotional control (the ability to keep anxieties in check and not externally reveal emotions). Finally, confidence embodies levels of self-assurance, partitioned into confidence in abilities (belief in individual qualities, with less dependence on external validation) and interpersonal confidence (being assertive and less likely to be intimidated in social contexts).

These dimensions form the basis of the Mental Toughness Questionnaire (MTQ48) (Clough et al., 2002). The MTQ48 is one of the most prevalently used measures of MT and was pertinent to the present study because recent research links its conceptualisation of MT to enhanced perception of risk (Cowden, Clough, & Oppong Asante, 2017). Generally, the measure delineates MT as a resistance resource, or defence against the effects of stress (Crust & Keegan, 2010). From this perspective, MT acts as a stress moderator, whereby high scoring individuals possess the capacity to deal effectively with pressures and challenges (Clough et al., 2002). This delimitation of MT advances hardiness research, which depicts hardiness as a personality disposition that obviates the negative effects of stress and protects against related illness (Kobasa, Maddi, & Kahn, 1982).

The current paper examined whether the cognitive and psychological benefits of MT extended to perception of risk. Previous work in this area, though limited, acknowledges the presence of systematic risk-taking in high MT individuals and outlines potential performance advantages arising from controlled risk-taking. Cumulatively, research advocates that individuals high in MT possess a sophisticated appreciation of risk. Specifically, they make nuanced judgments facilitated by effortful and time-consuming thinking (Mahoney, Gucciardi, Ntoumanis, & Mallett, 2014). Correspondingly, decisions are more likely to result in positive behavioural outcomes, or maximise success (Cowden et al., 2017).

Illustratively, Bull, Shambrook, James, and Brooks (2005) undertook a qualitative examination of MT in elite English cricketers. They noted that the presence of tough character, attitudes and thinking, enabled participants to cope with external pressures. Willingness to take risks was a global theme within tough attitudes. Predominantly, risk-taking was systematic and instrumental; it represented a deliberate strategy to make things happen within cricket games. Similarly, players high in MT took career risks in order to achieve key vocational goals. Thus, not only was MT associated with a willingness to take calculated risks, but also a heightened appreciation of risk. A study by Coulter et al. (2010) supports this view. Using a personal construct psychology framework (PCP; Kelly, 1955/1991), Coulter et al. (2010) examined MT in the context of Australian Football. They reported that high MT players took risks (as opposed to being conservative) at crucial times during matches. Hence, awareness of risk was an important feature of effective performance.

More generally, Crust and Keegan (2010) explored the relationship between mental toughness and attitudes towards risk-taking using undergraduate student athletes. They found also that willingness to take risks was an important attribute of athletes high in MT. Particularly, Crust and Keegan (2010) noted positive relationships between MT (overall mental

toughness, challenge and confidence) and attitudes to physical risk-taking. However, only interpersonal confidence correlated with attitudes towards psychological risk.

Crust and Keegan (2010) concluded that this arose because their risk-taking measure (Attitudes Towards Risks Questionnaire; Franken, Gibson, & Rowland, 1992) was a general rather than sport specific scale. Physical risk-taking (disregard of danger, enjoyment of taking physical risks) is important within many sporting contexts, whereas psychological risk (willingness to engage in socially undesirable activities) is less essential. In a more general context, it is important to note that the physical risk-taking items were not sport specific and that recent work reports similar attributes in mentally tough non-athletes (Cowden et al., 2017).

Accordingly, previous research indicates that a potential psychological benefit of MT is enhanced appreciation of risk. Particularly, the ability to recognise when risk-taking is apposite and proportionate. This includes awareness of the fact that level of risk varies as a function of efficacy and circumstance. For example, Llewellyn and Sanchez (2008) reported that rock climbers only undertook supplementary risk, to challenge themselves, when they were confident in their ability to manage existing threats. Potentially, threat evaluation could be an important feature of risk assessment in high MT individuals. For example, sensitivity to punishing outcomes correlates with early detection of threatening information (Hardy, Bell, & Beattie, 2013). Such processing provides a basis for maintaining goal pursuit under pressure and possibly a more effective appreciation of risk under stressful situations.

Arising from this research is a growing body of evidence that is suggestive of the conclusion that high levels of MT enhance the capacity to evaluate risks. If correct, this inference applies in a domain general manner and should extend across a range of situations and fields beyond those involving sport. Indeed, Cowden et al. (2017) in a sample of South African youth found that higher levels of mental toughness were associated with positive perceptions of physical risk-taking and negative attitudes towards psychological risk-taking.

Hence, in the current study, which focuses on perception of risk in everyday situations, individuals high in mental toughness should more readily recognise that common routine situations, by definition are inherently benign and embody only modest levels of risk.

The degree to which MT interacts with belief systems associated with heightened perception of routine risk provides a useful index of the construct's psychological effectiveness. Accordingly, this paper included a measure of belief in the paranormal. Paranormal beliefs are prosaically held within modern society, persist across time and prove resistant to contrary evidence (Irwin, 2009). Importantly, empirical work establishes that high levels of MT counteract factors associated with higher levels of paranormal belief (i.e., lack of control, Watt, Watson, & Wilson, 2007; and anxiety, Roe & Bell, 2016).

The association between belief in the paranormal, lack of control and anxiety is consistent with the observation that magical thinking is likely to occur when individuals believe they lack control over external events (Frost et al., 1993, Ofori, Tod, & Lavallee, 2017). Indeed, researchers contend that paranormal beliefs represent an attempt to establish control (Roe & Bell, 2016) and serve an anxiolytic (anxiety reducing) function (Persinger, 1985). In this context, high mental toughness because it confers control and reduces anxiety should be associated with lower levels of paranormal belief.

Furthermore, belief in the paranormal is associated also with distorted perception of risk. Notably, Sjöberg and Wåhlberg (2002) found that belief in paranormal phenomena correlated positively with perceived level of technological risk (seriousness and demand for mitigation). Sjöberg and Wåhlberg (2002) postulated that new age beliefs, which encompass belief in the paranormal, increase perception of riskiness because they derive from a mistrust of science, realism, and objectivity (Sebald, 1984). Similarly, Kouabenan (1998) reported that beliefs and social practices (religious rites, sacrifices, mystical, or parascientific consultations, ritual, or initiation practices) influenced risk perception and the causal explanation of accidents.



Fatalistic participants possessed a limited knowledge of risks and accidents resulting in poor estimation of frequency. This manifested as the tendency to take greater risks. Kouabenan (1998) postulated this arose from the belief that rites would protect them, or alternatively they felt unable to prevent events from happening.

Although, there is a paucity of research assessing relationships between paranormal beliefs and perception of risk there exists significant related research. This reports that believers in the paranormal perform poorer on probabilistic reasoning tasks, especially those assessing perception of randomness, and that they place more emphasis on emotion-based reasoning (Irwin, Dagnall, & Drinkwater, 2012) and intuitive-experiential factors (Dagnall, Drinkwater, Parker, & Rowley, 2014). Both appraisal of evidence and an appreciation of probability are key tenets of accurate perception of risk.

Consistent with Sjöberg and Wåhlberg (2002), this study appraised the supposition that tendency to perceive heightened levels of risk within routine/everyday situations would correlate positively with belief in the paranormal. Additionally, because high MT promotes a sense of control and rational processing (Kaiseler, Polman, & Nicholls, 2009; Nicholls, Polman, Levy, & Backhouse, 2008) it was predicted that high MT would correlate negatively with belief in the paranormal and risk perception. Finally, the psychological attributes of MT suggested that MT would moderate (weaken) the risk-paranormal belief relationship.

## Method

### Participants

A convenience sample of 174 participants (42 men and 132 women, mean age 23.71 years,  $SD = 7.65$ , range 18–62) took part in the study. Recruitment of participants was via undergraduate and postgraduate health care courses (Nursing, Physiotherapy, Acupuncture, Speech Therapy, etc.) at a UK University, emails to university staff and students, and local businesses.

## Measures

### Mental Toughness

The Mental Toughness Questionnaire 48 (MTQ48) (Clough, Earle, & Sewell, 2002) comprises a series of statements assessing aspects of mental toughness (e.g., “I don’t usually give up under pressure”). Participants respond to each item by completing 5-point Likert scales (ranging from 5 strongly disagree to 1 strongly agree). As outlined in the introduction, the MTQ48 contains subscales measuring Commitment, Challenge, Control and Confidence. The measure typically takes between 10-15 minutes to complete (Crust & Clough, 2005).

The MTQ48 possesses established psychometric properties including excellent reliability (an overall test–retest coefficient of .90) and proven validity. With respect to construct validity, the MTQ48 correlates significant with self-efficacy, trait anxiety, self-image, optimism and life satisfaction (cf. Clough et al., 2002). Correlations with important psychological and physiological indices provide evidence of criterion validity (e.g., problem-focused coping, Nicholls et al., 2008; use of psychological strategies, Crust & Azadi, 2010; and pain tolerance/physical endurance, Crust & Clough, 2005). Measures of model fit (i.e., confirmatory factor analysis and exploratory structural equation modelling) indicate that the MTQ48 has factorial validity (Perry, Clough, Crust, Earle, & Nicholls, 2013).

### **Belief in the Paranormal**

The MMU Paranormal Scale (MMU-PS) (Dagnall, Parker, Munley, & Drinkwater, 2010a, 2010b) is a 50-item scale based on eight paranormal factors (hauntings, superstitions, religious belief, alien visitation, ESP, PK, astrology and witchcraft). These emerged from a principal component analysis of existing measures of paranormal belief (Dagnall et al., 2010a). Subscales are conceptually coherent, possess good face validity and are composed of items clearly related to the assigned factor label. MMU-PS items take the form of statements (e.g., ‘poltergeists exist’) and participants respond via a 7-point Likert scale (ranging from 1 strongly disagree to 7 strongly agree). Subscales and the overall measure possess good to excellent external reliability (Dagnall et al., 2010a). Potential scores range from 50-350. The MMU-PS correlates highly with established paranormal measures including the Australian Sheep–Goat Scale (ASGS) (Thalbourne & Delin, 1993),  $r = .81$ ; and the Revised Paranormal Belief Scale (Tobacyk & Milford, 1983),  $r = .90$ . The MMU-PS has featured in published studies (Dagnall et al., 2014); it was preferred because it embraces a broader range of paranormal beliefs than the ASGS and RPBS.

### **Personal Risk**

An adapted version of the Personal Risk Inventory (PRI) (Hockey, Maule, Clough, & Bdzola, 2000) evaluated perception of risk. The PRI assesses perception of risky behaviour via everyday scenarios, reflecting a range of situations (legal, health, financial, moral and social). Scenarios typify situations encountered by individuals in their normal lives, as identified by diary records. In total, there were 20 items. Instructions asked participants to rate items using a 5-point Likert scale (ranging from 1 less to 5 more); responses specified the degree of risk associated with each scenario outcome. Summation of risk choices produces an index of

everyday, routine risk (scores range from 20-100). The PRI has previously demonstrated an adequate level of internal consistency (Cronbach,  $\alpha = .74$ ) (Hockey et al., 2000).

## **Procedure**

The study received ethical approval as part of a wider project examining relationships between anomalous beliefs and cognitive-perceptual measures. Prior to commencing the questionnaire respondents read the instructions. These stated that the study was concerned with personality, risk-taking and belief in the paranormal. Respondents who agreed to take part worked through the questionnaire booklet. This contained a participant information sheet, an informed consent form, a demographic questionnaire and the study measures. Counter-balancing of scale order prevented order effects. Overseen by a research assistant, completion of the questionnaires occurred in various quiet and comfortable locations.

## **Results**

### **Preliminary analysis**

Prior to analysis data screening occurred. There were no issues with multivariate normality, linearity, or multicollinearity (i.e., all correlations were below .9). Three data points possessed z-scores marginally greater than 3.25 and represented univariate outliers (Tabachnick & Fidell, 2001). Converting these data to the next highest score in the dataset limited their impact on the distribution of the means. No multivariate outliers existed; data values were greater than .001 relative to Mahalanobis Distance and chi-square distribution (Tabachnick & Fidell, 2001). Assessment of internal reliability, using Cronbach's alpha ( $\alpha$ ), found the Mental Toughness Questionnaire 48 (MTQ-48) ( $\alpha = .91$ ) and the Manchester Metropolitan University Paranormal Scale (MMU-PS) ( $\alpha = .96$ ) had excellent internal validity. Subscales of the MTQ-48 demonstrated acceptable to good internal reliability (Challenge,  $\alpha = .68$ ; Control,  $\alpha = .72$ ;

Commitment,  $\alpha = .78$ ; and Confidence,  $\alpha = .81$ ) (George & Mallery, 2003). The Personal Risk Inventory (PRI) demonstrated good internal reliability ( $\alpha = .87$ ). See table 1 for scale descriptive information.

INSERT TABLE 1 HERE

Pearson product-moment correlation revealed mental toughness (MT) correlated negatively with belief in the paranormal and perception of risk. Considering MT subscales, challenge, commitment and control correlated negatively with belief in the paranormal and perception of risk. Confidence was not significantly correlated with either belief in the paranormal, or perception of risk. Belief in the paranormal and risk perception correlated positively. All zero-order correlations were in the weak range (Cohen, 1988, 1992), see Table 2.

INSERT TABLE 2 HERE

### **Predictors of Risk**

Hayes PROCESS macro (model 1) for moderation analysis (Hayes, 2013) examined whether MT affected the strength and direction of the relationship between paranormal beliefs and risk perception. This macro runs a series of OLS regressions with the centred product term representing the interaction of specified predictor and moderator variables with a criterion variable. Initially, because mental toughness reflects a latent construct (Jones & Parker, 2017), analysis examined the interaction of paranormal belief and overall mental toughness (MT) as a predictor of the perception of risk. Next, since the sub-factors of MT account for discrete variance (Perry et al., 2013), a further series of OLS regressions assessed the moderating effect of each MT sub-factor (challenge, commitment, confidence, and control) sequentially while

treating other MT sub-factors as covariates. This approach is suitable when examining a series of moderating effects in order to control for potential misleading results (Nagel & dos Santos, 2017).

#### INSERT TABLE 3 HERE

Belief in the paranormal was a significant predictor of risk perception,  $b = .059$ , 95% CI [.030, .090],  $t = 3.902$ ,  $p < .001$  (see table 3). MT did not significantly predict levels of risk perception,  $b = -.059$ , 95% CI [-.121, .001],  $t = -1.917$ ,  $p = .056$ . There was a significant belief in the paranormal x MT interaction,  $b = -.021$ , 95% CI [-.002, -.001],  $t = -2.371$ ,  $p = .018$ .

Simple slopes analysis (see Figure 1) indicated that the relationship between belief in the paranormal and perception of risk varied as a function of level of MT. When MT levels were low, a significant relationship existed between belief in the paranormal and perception of risk,  $b = .093$ , 95% CI [.050, .136],  $t = 4.254$ ,  $p < .001$ . Similarly, at the mean value of MT, the relationship between paranormal beliefs and risk perception was significant,  $b = .059$ , 95% CI [.029, .090],  $t = 3.902$ ,  $p < .001$ . However, when MT levels were high there was a non-significant relationship between paranormal beliefs and risk perception,  $b = .026$ , 95% CI [-.012, .065],  $t = 1.375$ ,  $p = .170$ . With lower and mean levels of mental toughness, participants with higher levels of paranormal belief reported higher levels of risk perception, and participants with lower levels of paranormal belief reported lower risk perception. As levels of mental toughness increased, the relationship between paranormal belief and risk perception was weaker. This demonstrates that mental toughness interacted with paranormal belief; the higher the level of mental toughness, the weaker the relationship between paranormal belief and risk perception.

INSERT FIGURE 1 HERE

Further scrutiny of the MT sub-factors showed that for commitment, paranormal belief significantly predicted risk perception ( $b = .059$ , 95% CI [.027, .091],  $t = 3.664$ ,  $p < .001$ ). Additionally, commitment did not significantly predict risk perception ( $b = -.128$ , 95% CI [-.447, .191],  $t = -.792$ ,  $p = .429$ ); however, there was a significant commitment x paranormal belief interaction ( $b = -.010$ , 95% CI [-.011, -.001],  $t = -2.316$ ,  $p = .022$ ). Specifically, simple slopes analysis inferred that at low levels of commitment (Figure 2), a significant relationship existed between paranormal belief and risk ( $b = .094$ , 95% CI [.052, .135],  $t = 4.408$ ,  $p < .001$ ). This significant paranormal belief-risk perception relationship existed also at the mean level of commitment ( $b = .059$ , 95% CI [.027, .090],  $t = 3.66$ ,  $p < .001$ ), but not at high levels of commitment ( $b = .024$ , 95% CI [-.020, .090],  $t = 1.075$ ,  $p = .284$ ).

INSERT FIGURE 2 HERE

For confidence, paranormal belief significantly predicted risk perception ( $b = .055$ , 95% CI [.022, .088],  $t = 3.281$ ,  $p = .001$ ). Confidence did not significantly predict risk ( $b = .011$ , 95% CI [-.275, .297],  $t = .076$ ,  $p = .939$ ), but a significant interaction existed between confidence and paranormal belief ( $b = -.003$ , 95% CI [-.010, -.001],  $t = -2.032$ ,  $p = .043$ ). Simple slopes analysis suggested that at low levels of confidence, the relationship between paranormal belief and risk was significant ( $b = .082$ , 95% CI [.036, .129],  $t = 3.495$ ,  $p < .001$ ). At the mean level of confidence, a significant paranormal belief-risk perception relationship existed ( $b = .055$ , 95% CI [.022, .088],  $t = 3.281$ ,  $p = .001$ ), but not for high levels of confidence ( $b = .028$ , 95% CI [-.010, .066],  $t = 1.448$ ,  $p = .149$ ). The results for confidence were unanticipated given the absence of a meaningful correlation with both risk and paranormal belief. The significant interaction is likely indicative of a crossover effect.

Figure 3 demonstrates that perception of risk is lower for individuals low in confidence and low in paranormal belief; perception of risk is markedly higher for individuals low in confidence and high in paranormal belief. Similar to the results for overall MT, the relationship between risk perception and paranormal belief is weaker among higher levels of commitment and confidence. The MT sub-factors of challenge and control did not significantly interact with paranormal belief in relation to risk perception. These results show that high levels of MT and sub-factors of commitment and confidence reduced the strength of association between paranormal belief and perceived risk.

INSERT FIGURE 3 HERE

## **Discussion**

Relationships were in the predicted directions. Higher mental toughness (MT) was associated (weakly) with lower levels of perceived risk and lower belief in the paranormal. Regarding perceived risk, correlations were consistent across MTQ48 sub-measures (challenge, commitment and control) with the exception of confidence, which was non-significant. Considering that confidence reflects (generally) internal self-assurance (abilities and interpersonal) rather than external task appraisal/orientation, this was not surprising. Collectively, the other MTQ sub-measures index the tendency to embrace/manage external variables and events. Due to sample differences (general university sample vs. athletes), it is difficult to compare present findings directly with those of Crust and Keegan (2010). More generally, the results concur with Cowden et al. (2017), who found relationships between high MT and perception of risk in a non-sports related sample. In this context, future studies need to consider the extent to which these findings generalise beyond the present sample and measures.



Importantly, the relationship between belief in the paranormal and perception of risk varied as a function of level of MT. Particularly, high levels of MT reduced believers tendency to heightened perception of risk. We cautiously interpret this as signifying a more sophisticated appreciation of risk. Potentially, high levels of MT lessen the tendency within paranormal believers to perceive greater risk (Sjöberg & Wählberg, 2002). Additional work is required because the current study used everyday scenarios. Though all scenarios involved an element of risk, the routine nature of the problems presupposed that perception of risk would not be high. This proved the case, with the mean risk score being located within the mid-scale range. It would be interesting to establish whether the observed relationships exist within more threatening, less unusual situations.

Analysis of the MT sub-factors indicated that commitment and confidence (but not challenge and control) interacted with paranormal belief in a similar way as overall MT. Specifically, higher levels of commitment and confidence lessened perception of risk among paranormal believers. Research supports the notion that individuals who demonstrate greater levels of general confidence possess lower perception of risk in a variety of domains (Siegrist, Gutscher, & Earle, 2005). In addition, qualities central to commitment, such as grit, act as a motivational resource for pursuing goals (Duckworth & Quinn, 2009). This degree of perseverance is less likely to associate with worry and concern over failure (Kern, Benson, Steinberg, & Steinberg, 2016), and hence with less concern over the probability that aversive conditions will ensue when confronted with a potentially risky scenario. It is likely, therefore, that MT and sub-factors of confidence and commitment offer resilience-type qualities which act as protective factors among individuals who believe in the paranormal, reducing the tendency to perceive elevated levels of risk. This notion of MT operating as a protective factor is consistent with Gucchiardi (2017).

The results for confidence, however, are counter-intuitive in the sense lower confidence related to lower perceived risk when paranormal belief levels were minimal. It is not clear why this pattern emerged. Possibly, a subgroup of individuals exist who possess both low confidence and low perceived risk, characterised by indifference (Rimal & Real, 2003). A section of the sample may fall into this category. This is more likely given the routine nature of the risk scenarios.

Generally, risk-related outcomes were consistent with previous research, advocating a link between MT and realistic appraisal of risk-taking behaviours. Particularly, the notion that participants high in MT view risks encountered in daily situations as less menacing (Coulter et al., 2010; Crust & Keegan, 2010). Risk perception/evaluation is a key feature of knowing when calculated risk-taking is apposite and likely to result in success. MT also correlated negatively with belief in the paranormal, indicating that higher levels of MT were associated with lower endorsement of paranormal beliefs. Findings mirrored those observed for risk perception; correlations across MTQ48 factors (challenge, commitment and control) were weak to moderate, with the exception of confidence, which was non-significant.

As anticipated, belief in the paranormal correlated positively with level of perceived risk. Whilst this was a weak correlation, the association reflected the tendency for perceived risk to increase as a function of belief in the paranormal. This finding corresponded with Sjöberg and Wåhlberg (2002), who reported that paranormal beliefs correlated positively with a range of risk taking measures (perceived level of risk, seriousness of risk and demand for risk mitigation).

The association between belief in the paranormal and increased perceived risk accords with research reporting correlations between paranormal belief and perceived lack of control over everyday life (Irwin, 2000). Particularly, the tendency to possess an external locus (Alprin & Lester, 1995; Dag, 1999; Groth-Marnat & Pegden, 1998). Indeed, studies have reported that

individuals with an internal locus of control take fewer risks (Salminen & Klen, 1994), and that workers involved in accidents (vs. accident-free workers) demonstrate a more external locus of control (Jones & Wuebker, 1985).

Elements of MT, since they place an emphasis on developing internal control and entail managing/controlling external events, should be adversative to this aspect of paranormal belief. This notion is consistent with definitions that link risk and control. For example, Brun (1994) delineated risk as insufficient controllability. In this respect, evidence within the present study was uncertain. Despite correlating negatively, only high levels of MT reduced the strength of the perceived risk. This may be because paranormal beliefs are persistent across time and resistant to contrary evidence (Irwin, 2009).

In this context, on occasion belief in the paranormal actually might undermine properties of MT. For example, ingrained superstitious behaviours and beliefs are likely to prove difficult to change. Thus, if MT represents a trainable set of related psychological traits, as suggested by Clough et al., (2002), established paranormal beliefs may frustrate the beneficial effects of MT training. Clearly, future work via causal modelling needs to consider more fully the relationship between paranormal belief and MT.

The authors acknowledge limitations within this research. Firstly, the study was cross-sectional; collecting data at one point in time prevents the inference of causal links within models. Subsequent studies may wish to conduct longitudinal studies for this reason. These would facilitate better understanding of the relationship between mental toughness, perception of risk and beliefs via the testing of complex models. Secondly, the measures were self-report and therefore reliant upon participant honesty and introspection. Subjective interpretative factors are potentially problematic when assessing perception of risk. For example, there is no direct correspondence between intention and actual behavior. Hence, when faced with an actual situation risk perception may alter. Relatedly, asking questions about potential threats and risks

lacks salience. Without context, it is often difficult to assess risk accurately; therefore, subsequent papers should vary scenario importance and consequences.

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**Table 1** Descriptive data for mental toughness, risk-taking and belief in the paranormal

	<i><math>\alpha</math></i>	<i>M</i>	<i>SD</i>	<i>Range</i>
Mental Toughness	.91	160.83	21.07	97–204
Challenge	.68	27.99	4.18	14–39
Commitment	.80	38.63	6.23	23–51
Control	.72	44.56	6.86	23–58
Confidence	.81	49.66	8.16	29–66
Belief in the paranormal	.96	163.99	51.50	57–278
Perception of risk	.87	49.48	11.02	28–93

**Table 2** Pearson Product Moment Correlations between mental toughness, attitudes to risk-taking and belief in the paranormal

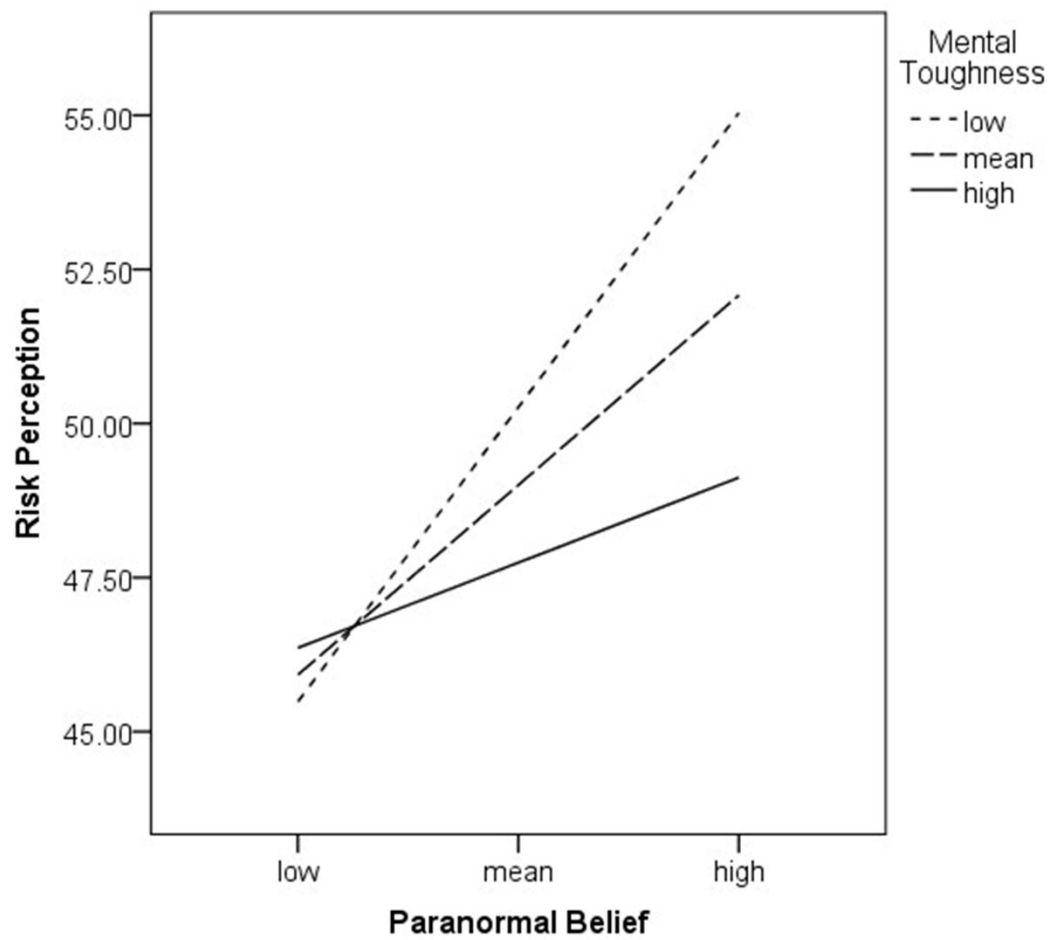
	Belief in the paranormal (95% CI)	Perception of risk (95% CI)
Mental toughness	-.28** (-.41, -.14)	-.20* (-.34, -.05)
Challenge	-.25** (-.38, -.10)	-.23** (-.37, -.08)
Commitment	-.28** (-.41, -.14)	-.19* (-.33, -.04)
Control	-.36** (-.48, -.22)	-.19* (-.33, -.04)
Confidence	-.08 (-.23, .07)	-.09 (-.23, .06)
Belief in the paranormal		.29** (.15, .42)
Perception of risk	.29** (.15, .42)	

*Note.* \*  $p < .05$ , \*\*  $p < .001$

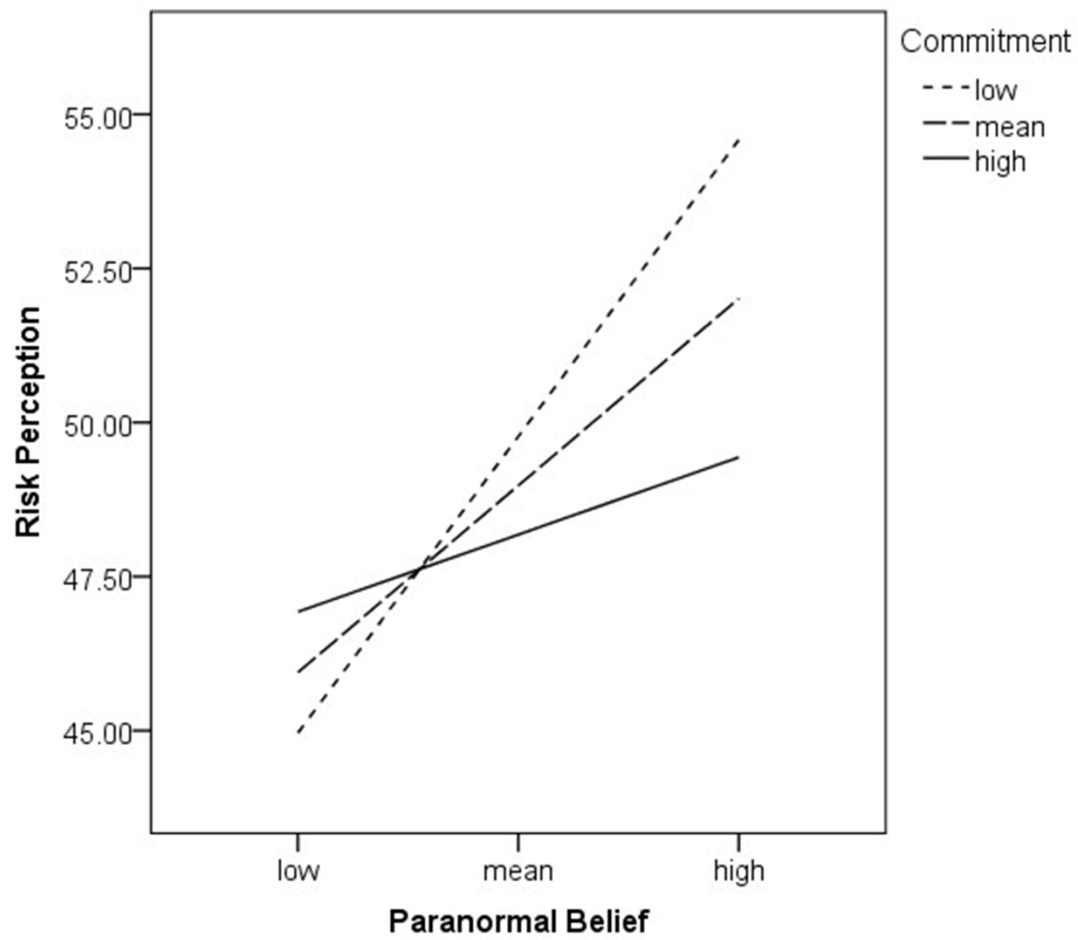
**Table 3** Linear model of predictors of risk perception

Model	<i>b</i>	<i>SE B</i>	<i>t</i>	<i>p</i>	<i>R</i> <sup>2</sup>
<u>Model 1 (overall mental toughness)</u>					.121**
Paranormal beliefs	.059**	.015	3.902	<.001	
Mental toughness	-.059	.031	-1.917	.056	
Paranormal beliefs x mental toughness	-.021*	.001	-2.371	.018	
<u>Model 2 (challenge)</u>					.116**
Paranormal beliefs	.053*	.017	3.037	.002	
Challenge	-.036	.338	-1.074	.248	
Paranormal beliefs x challenge	-.004	.005	-.730	.466	
<u>Model 3 (commitment)</u>					.135**
Paranormal beliefs	.059**	.016	3.663	<.001	
Commitment	-.128	.161	-.792	.429	
Paranormal beliefs x commitment	-.006*	.002	-2.316	.022	
<u>Model 4 (confidence)</u>					.128**
Paranormal beliefs	.055**	.016	3.280	.001	
Confidence	.011	.145	.076	.939	
Paranormal beliefs x confidence	-.003*	.002	-2.032	.043	
<u>Model 5 (control)</u>					.120**
Paranormal beliefs	.054**	.017	3.235	.002	
Control	.042	.222	.191	.848	
Paranormal beliefs x control	-.003	.002	-1.338	.182	

*Note.* \*  $p < .05$ , \*\*  $p < .001$

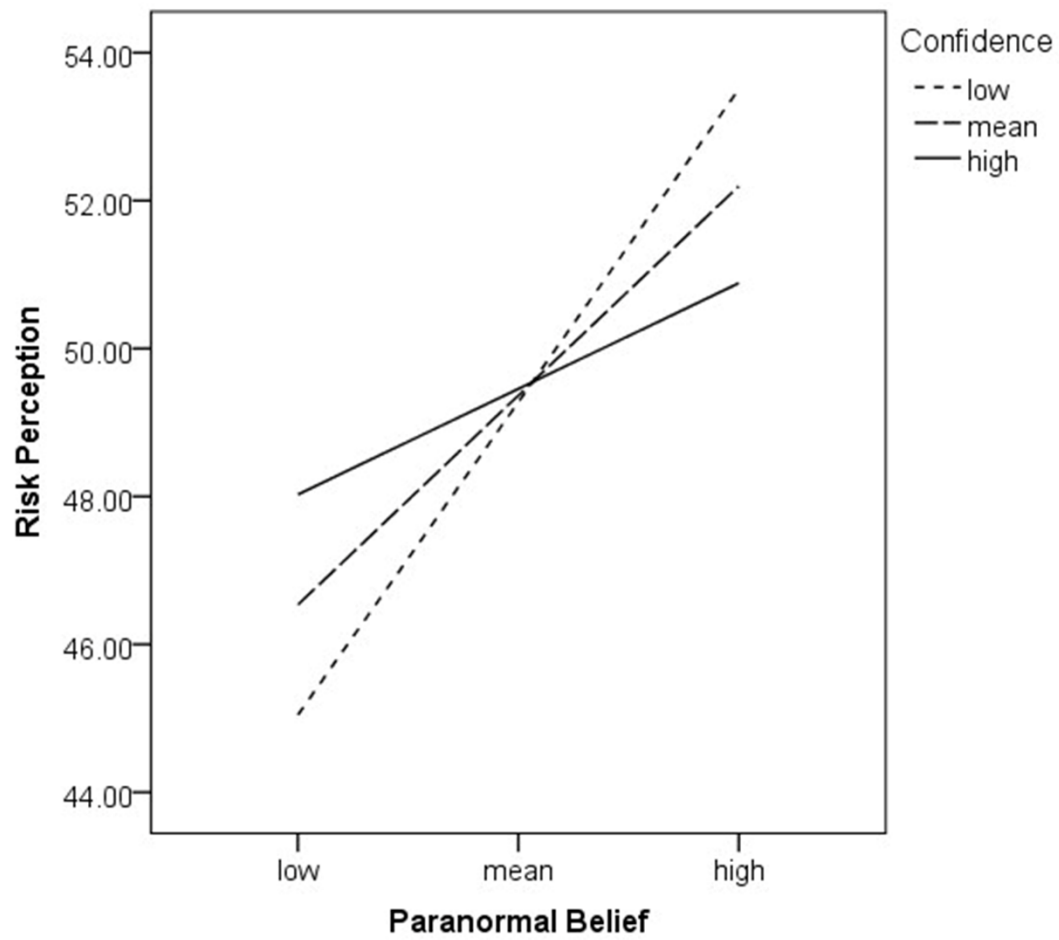


**Fig 1** Paranormal belief x mental toughness predicts risk perception



**Fig 2** Paranormal belief x commitment predicts risk perception





**Fig 3** Paranormal belief x confidence predicts risk perception