

## Summary of Project

### *Elite Athletes and their 'Mental Game': Cognitive Mechanisms Underlying Mental Toughness*

Mental toughness as a concept has been around for years and is generally considered an ability to persevere through adversity in the pursuit of a goal. Higher achievers across a range of domains (work, study and military) have repeatedly been found more mentally tough, and this is no difference when it comes to sport. For example, those who play at a national rather than state level report higher levels of mental toughness. As such, it could be said that when an athlete reaches the elite level of their chosen field, what may make the difference is their 'mental game'. In the pursuit of competitive advantage therefore, it is in understanding what contributes to levels of mental toughness that researchers have devoted their attention.

Although mental toughness could be considered a catch phrase in locker rooms and research halls alike, insights are less than convincing when one really starts to delve into the detail. Age is one of the few things that consistently varies with mental toughness such that maturity is beneficial but this in itself is closely related to years of sporting experience, something which has been largely neglected by researchers so the nuances remain unclear. It could be an attrition effect, generational effect (being that most studies include tight age ranges) or a confidence factor (given the reliance on self-reported mental toughness). In regards to males versus females on the topic of mental toughness, results are even less convincing here with inconsistencies across the current literature. Moreover, in regards to the sport an individual partakes in, there is simply not enough well designed evidence from which to draw firm conclusions and in fact the few studies probing this topic simply categorise athletes by team or individual sport rather than considering the specific sport.

Beyond the demographical associations to mental toughness, others have begun to consider the underlying cognitive mechanisms, though this is comparatively in its infancy and there is limited information relating specifically to athletes. Although research is minimal, there is some support for the suggestion that tendency to direct ones behaviours towards avoiding an aversive stimuli (e.g. a loss) or towards approaching a positive outcome (e.g. a win), considered to be reinforcement sensitivity, may be associated with one's levels of mental toughness. Others also speculate, that simply attending to either negative or positive stimuli, may be associated with mental toughness. The theory is that an athlete who attends to a threat will notice it earlier and therefore have more time to implement a remedial strategy; though currently this conclusion relies upon tenuous links between multiple (rather than a single) study.

Given this backdrop, the primary aim of this study was twofold, (i) identify associations of mental toughness with a range of athlete and sporting characteristics (age, gender, experience and discipline) and (ii) add to preliminary research regarding the speculations of the cognitive mechanisms that may underlie mental toughness. Concurrently, it was considered useful to include a standardised measure of performance to test the assumption that mental toughness is indeed associated with objective performance.

## **Method**

Forty-four athletes and three coaches participated in this study. Of the athletes, 25 were male hockey players whilst 19 were gymnasts (male and female), all of whom completed one questionnaire which explored reinforcement sensitivity and another which provided a self rating of their mental toughness. Coaches also rated the mental toughness of each athlete. Following this, athletes undertook a dot probe task involving the presentation of positive and negative valenced words relating to their sport to assess where they focus their attention (attentional bias). The performance measure included in this study was a standardized simple reaction time task which asked participants to respond as quickly as possible to presentation of visual stimuli.

## **Results**

Mental toughness appears to increase with an athlete's age and years of experience in their sporting discipline. Whether this reflects biological changes or learnings that occur remains to be understood but there is certainly a suggestion that a degree of mental toughness relies on maturity.

Male gymnasts rate their own mental toughness lower than female gymnasts do theirs. It is questionable as to why males have this perception but we wonder whether it is related to some social stereotype being that gymnastics might traditionally be considered a female dominated sport.

Hockey players reported higher levels of mental toughness than did gymnasts so perhaps certain sports attract or indeed require tougher individuals. However the hockey players were also older and had more years of experience than the gymnasts which may account for the observed differences in mental toughness.

Minimal support was shown for the cognitive mechanisms that could perhaps underlie mental toughness. Punishment sensitivity was able to predict a small amount of variance in athlete rated mental toughness beyond that of age and sporting discipline but beyond this, reward sensitivity and both negative and positive attentional bias did not associate. However given the limited research considering these two cognitive mechanisms in relation to elite athlete mental toughness, even the minimal significant findings should be of some interest.

Athlete results on the standardised reaction time task suggests that those higher in mental toughness make fewer errors, something that seems particularly relevant to a sports setting where performance tends to require accuracy. Given the particular task used can apply in a range of domains it could allow further generalisability of the assumption that better performance is associated with greater mental toughness.

## **Conclusion**

This study has been able to shed light on the athlete and individual characteristics, as well as the possible cognitive mechanisms that influence mental toughness in elite athletes. Collectively, the insights serve to guide athletes and coaches as they 'hunt' for the key areas on which to select talent and subsequently focus their training efforts on in the pursuit for improved performance.