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The relationship between flow, mental toughness and subjective performance in triathletes

The current study examined the relationship between mental toughness, subjective performance and dispositional flow in high performing triathletes. A sample of 114 Iron men and triathletes (Mage=28.81 years, SD=3.45), taken from triathlon clubs, completed self-report questionnaires measuring mental toughness, subjective performance and dispositional flow. Pearson's correlations revealed a significant and positive relationship between global mental toughness and subjective performance rating ($r=0.62$, $p < 0.01$) and between global mental toughness and all dispositional flow subscales ($r= 0.67 - 0.81$, $p < 0.05$). Linear regression analyses found mental toughness subscales accounted for 64% of the variance in dispositional flow. Subjective performance rating did not add significantly to the model. Overall, the findings suggest that mental toughness may allow iron man competitors and triathletes to exert the cognitive and emotional control necessary to experience flow and therefore perform better. The findings are discussed in the context of competitive ironman and triathlon.

Introduction

Ironman is arguably one of the most physically demanding events in sport; successful performance requires proficiency in three different sports and are typically endurance based events. The training demands are varied and intense over prolonged periods and competitions can range from thirty minutes to several hours in length. Therefore, performers need to maintain focus during times of extreme physical and emotional stress. One characteristic that could be useful in dealing with the many challenges of competitive iron man is mental toughness (MT). This construct is thought to be a collection of cognitive, affective and behavioural qualities that allow a performer to stay in pursuit of their goals despite

experiencing setbacks and stressors (Gucciardi, Gordan & Dimmock, 2008). Research has showed that the three major components of mental toughness; control, constancy and confidence, are characteristic of successful performers (Meggs, Ditzfeld & Golby, 2014), that exhibit higher pain thresholds (Gucciardi, 2016) and the tendency to experience flow during competition (Crust & Swann, 2013). 'Flow' as an experience can be defined as an optimal performance state, characterized by fluid, autonomous movement, cognitive clarity and positive affect (Swann et al, 2012; Csikszentmihalyi, 2000, 2002).

There are nine dimensions of the flow experience (Csikszentmihalyi, 2000). The first three; challenge-skill balance, action-awareness merging, clear goals, are thought to allow for the optimal 'flow' conditions to occur (Nakamura & Csikszentmihalyi, 2002). The remaining dimensions of unambiguous feedback, concentration on task, sense of control, loss of self-consciousness and time transformation are proposed to be experiential aspects of flow. These flow factors are termed an autotelic experience (Csikszentmihalyi, 1975). Nakamura & Csikszentmihalyi, (2002) speculated that an autotelic personality may underlie the propensity to experience flow in sport. However, there has been no clear progress in research identifying what the aspects of this personality trait may be. Thus, a more thorough understanding of the individual differences underlying the flow experience is needed (Koehn et al, 2013).

Researchers have also suggested that flow has a dispositional component (i.e., the tendency of an individual to experience flow in various circumstances) and a state component (the extent to which an athlete experiences flow in that specific moment). Researchers have conceptualized individual differences in the frequency that people experience flow as dispositional flow (Jackman et al, 2016). Measures of dispositional flow have moderate correlations with individual differences such as athletic self-concept, perceived skill, and performance (Jackson, Thomas, Marsh & Smedhurst, 2001). However, a large amount of

variance in dispositional flow remains unexplained. Therefore, research that explores the psychological factors that underlie dispositional flow is necessary.

More recently, confidence has emerged as a major antecedent of dispositional flow (Crust & Swann, 2013; Jackson & Kimiecik, 2008; Koehn, Morris, & Watt, 2013; Koehn, 2013; Nicholls, Polman, & Holt, 2005). A collection of studies, (Koehn, 2013; Koehn, Morris and Watt, 2013; Stavrou & Zervas, 2004), have found trait sport confidence to be significantly correlated with dispositional flow compared to other variables (e.g., anxiety, imagery use and action control). The latter study found strong relationships between confidence and all measures of dispositional flow, aside from time distortion. Confidence is also a central component of several different mental toughness models, (e.g., Clough, et. al., 2002; Gucciardi, Gordon, & Dimmock, 2008) and therefore it could be reasoned that mental toughness may also be a strong predictor of flow.

Crust and Swann (2013) found support for this claim in showing that the mental toughness subscale of confidence is the strongest predictor of dispositional flow, although commitment and challenge were also significant predictors. When examining the reciprocal relationship between the variables, they found that the flow subscales of challenge-skill balance and control were significant predictors of MT. These findings indicate that the development of confidence, and by extension mental toughness, increases the likelihood of dispositional flow by motivating individuals to reach an optimal skill-challenge balance.

However, the nature of this relationship may depend to some extent on the activity (training or competition) and skill level of the participants (Koehn & Morris, 2014). Jackson et al (1998) originally proposed that the importance of flow may vary between sports. It is important to note that these previous studies have either neglected the relationship between performance and dispositional flow (e.g Crust and Swann, 2013) or have amalgamated diverse sporting samples (e.g Jackson et al, 1998). Iron man is one of the most physically and

mentally demanding of all endurance events and empirical data may give additional insight into the psychological factors underlying flow in this performance context. Flow state has previously been found to predict performance ratings in cycling, (Jackson, Thomas, Marsh & Smethurst, 2001) which is an event in iron man and triathlon. Stavrou et al, (2007) also found positive associations between athlete's flow measures and their performance states.

Therefore, it can be reasoned that individuals who have higher trait mental toughness and global trait flow scores are more likely to report higher subjective performance scores.

Also, one of the major differences between iron man and regular triathlon is the event duration. The longer duration of iron man may predispose these athletes toward a less frequent flow experience as flow is related to rhythmical, long duration endurance events (Carter & Sachs, 2012). Carter and Sachs (2012) found that as the duration of the run increased fatigue, negative mood states also increased and this tended to reduce the frequency of the flow experience. However, further study is needed to examine the extent to which mental toughness may accurately predict dispositional flow in unique events such as ironman.

Therefore, the current study had three aims. The first aim was to explore correlations among mental toughness, subjective performance ratings and dispositional flow. It was predicted that those with high trait mental toughness would have higher dispositional flow scores and that those with high levels of subjective performance ratings would report higher dispositional flow. The second aim was to explore whether trait mental toughness and subjective performance ratings can predict global dispositional flow in high performing triathletes. It was predicted that subjective performance ratings would explain additional variance in global dispositional flow over and above that explained by mental toughness. The third aim was to examine differences in dispositional flow and mental toughness between iron man athletes and triathletes.

Methodology

Participants

Data was collected from 114 high performing iron man and triathletes from clubs across England. Of these 114, 12 were ironmen and 36 were half iron-men and the rest were standard-distance triathletes. They were all currently competing in triathlon events and had experience ranging from 8-25 years ($M_{\text{experience}} = 12$; S.D. = 4.57). All athletes trained between 9-13 hours per week ($M_{\text{training}} = 10.23$, S.D. = 2.59).

Measures

Mental toughness: An 18-item Mental Toughness Questionnaire (MTQ18; Clough et al., 2002) was used to assess this construct. The MTQ18 assesses global mental toughness (MT). The items are rated on a 5-point Likert scale anchored at 1 = *Strongly disagree* to 5 = *Strongly agree*. The MTQ18 has adequate reliability and validity properties as assessed by recent studies (Clough et al., 2002; Gerber et al., 2012, 2013).

Dispositional-Flow:

The Dispositional Flow Scale (DFS-2) (Jackson, Martin & Eklund, 2008) was used to assess the athlete's tendency to experience flow (Jackson & Eklund, 2002). The underpinning model is based on the nine dimensions of flow (Csíkszentmihályi, 1990). The scale has 36 items (e.g., "*I am challenged, but I believe my skills will allow me to meet the challenge,*" "*Things just seem to happen automatically,*" "*My attention is focused entirely on what I am doing,*" "*I have a sense of control over what I am doing,*" "*I really enjoy the experience*"), to which respondents provide answers on a 5-point Likert-type scale, from 1 (never) to 5 (always). The DFS-2 consists of nine factors (four items for each factor) that made reference to the dimensions leading to the flow state or lack thereof (i.e., challenge-skills balance, action-awareness merging, clear goals, unambiguous feedback, concentration on the task at hand, sense of control, loss of self-consciousness, transformation of time, and autotelic

experience). It also led to a global score for dispositional flow using the scores obtained from all the items, which was used in this study. The scale has received support in terms of construct validity (Jackson, Martin & Eklund, 2008) and internal consistency (Jackson & Kimiciik, 2008).

Subjective performance

Immediately following their respective competitions (within 10 minutes of the competitive race), triathletes were asked to rate their performance on a scale anchored from 1(my poorest performance)-100 (my very best performance).

Procedure

Following ethical approval from the University ethics committee, all questionnaire data was collected online. An email requesting volunteers for a psychological study on Triathletes was initially sent out to potential participants. The email was sent to triathlon clubs via social media websites. Those individuals who expressed an interest were emailed a pack with the information sheet, consent form, two questionnaires and subjective performance rating scale on the day of their respective event. The two questionnaires - mental toughness, dispositional flow scale - and subjective performance were completed in counterbalanced order.

Data analysis

Pearson's correlation and linear regression were performed for aims one and two respectively, to examine the relationships between the dispositional flow subscales, MT and global flow. Data was checked for normality and homeodasticity and the assumptions were accepted after visual inspection of the data. Independent t tests were performed to examine differences between iron man and triathletes in global flow subscales.

Results

Findings showed a significant, strong positive correlation between all dispositional flow subscales (apart from unambiguous feedback) and mental toughness; $r = .67-.801$, $p < 0.05$. There was also a significant, strong positive correlation between mental toughness and performance; $r = .72$, $p < 0.01$. Moreover, there was a significant, moderate positive association between dispositional flow and subjective performance rating; $r = .615$, $p < 0.01$ (see Table 1).

Table 1 (insert here): *Correlation matrix for all measured variables*

The second aim was to explore whether trait mental toughness and performance rating can predict global dispositional flow. Multiple regression analysis was conducted to examine whether trait mental toughness and subjective performance rating can predict global dispositional flow. Mental toughness was a significant predictor of global flow; $t(112) = 14.13$; $\beta = 1.96$; 95% CI (1.68, 2.30). Mental toughness accounted for 64% of the variation in global flow scores; showing that the model has explanatory power. However, subjective performance rating did not add any additional variance to global dispositional flow.

The third aim was to examine differences between iron man and half-ironman athletes and standard distance triathletes in the dispositional flow subscales and MT. Table 2 shows the means and standard deviations for these variables.

Table 2: Means (SD) in MT and flow subscale scores between iron man and standard distance triathletes.

Independent t tests showed that the iron man athletes were significantly higher than the standard distance triathletes in MT and all flow subscales (see Table 3).

Table 3: Iron man and triathlete differences for mental toughness and flow

Discussion

The primary aim of the study was to explore correlations among mental toughness, subjective performance ratings and dispositional flow in the overall sample of ironmen and standard distance triathletes. The correlational findings included significant, positive relationships among most dispositional flow subscales, global mental toughness and subjective performance ratings. First, the correlations between dispositional flow subscales and MT were moderate-strong in magnitude. These results support the contention that confidence (a central component of mental toughness) is critical to the frequent experience of flow. The strongest correlation was that between mental toughness and the loss-of-consciousness subscale, closely followed by the transformations of time subscale and the action-awareness factors. The first two of these factors are both experiential and trait aspects of flow while the third is one that is thought to facilitate flow. These findings indicate that the frequency with which an individual experiences these aspects of flow is positively related to mental toughness in triathletes. Therefore, the performance advantage of mental toughness could lie in both an ability to experience flow and an ability to facilitate achieving that experience better than less mentally tough triathletes (i.e., mental toughness is associated with the traits that make flow a more likely experience for sports people and also components that facilitate that experience when it does happen). Jackson, et. al. (1998) argues that different sports will bring about different degrees of flow state. Therefore, these three factors could be the most central to experiencing flow in endurance triathlon events. Other research (e.g Stavrou & Zervas, 2004; Koehn et al, 2013) has found that trait confidence (conceptually similar to mental toughness) has a strong positive relationship with all measures of dispositional flow (except time distortion) and state flow.

Another key finding was that performance shared the strongest relationships with mental toughness ($r = .62, p < 0.01$), loss of consciousness ($r = .62, p < 0.01$) and transformation of time ($r = .61, p < 0.01$). These findings could indicate that mentally tough athletes have the resources to become immersed in an endurance activity and experience a loss of consciousness and unique experience of time. These aspects of flow would appear to be particularly beneficial for endurance athletes to cope with the physically demanding challenge over prolonged periods of time. For these athletes, a state of mind wherein they experience a rapid passage of time and disassociate from their physical sensations would likely increase their ability to perform at a high intensity for longer periods. This suggestion is congruent with previous research; Schumacher, Becker & Wiersma (2015) found that long distance channel swimmers tend to remain disassociated from their expectations and maintain mindfulness focus to self-regulate emotion and pain.

The second study hypothesis investigated whether trait mental toughness and subjective performance rating can predict global dispositional flow in high performing triathletes. The results highlighted a significant amount of shared variance among mental toughness and dispositional flow. However, subjective performance rating did not improve the model. The findings regarding the strong relationship between mental toughness and global flow, is consistent with previous findings that examined confidence as an antecedent of flow (Crust & Swann, 2013; Jackson & Kimiecik, 2008; Koehn, Morris, & Watt, 2013; Koehn, 2013; Nicholls, Polman, & Holt, 2005). As confidence is related to MT it may also be reasoned that both these variables are antecedents of flow. Future research could include an attribution based performance measurement (e.g Coffee & Rees, 2008) as this may be more sensitive to how individual performance evaluations (perceived controllability) explain additional variance in global flow over and above mental toughness.

The third hypothesis examined differences between iron man and half iron-man athletes and standard distance triathletes in the dispositional flow subscales and MT. The iron man group were found to be significantly higher than the triathletes in MT and all the flow subscales. These findings indicate that the iron man group have more frequent experience of antecedents of flow (e.g., challenge-skill balance) and experiences of flow (e.g., concentration on task, sense of control). This finding is somewhat surprising given that the prediction was that due to the longer duration of iron man, and increased likelihood of fatigue and discomfort, that this would decrease the frequency and experience of flow relative to triathletes. The findings that iron man competitors scored higher in terms of mental toughness than standard distance triathletes may make sense in terms of the increased demands of the sport. However, as this is a correlational study, it cannot determine the extent to which this MT difference between the two groups is a consequence of taking part in the event or real dispositional antecedents. Higher MT scores of the iron man group may also account for some of the flow subscale differences between the two groups. (e.g., sense of control and loss of self-consciousness were both strongly correlated with MT in the whole sample)

The findings of this study provide support for the importance of mental toughness in attaining optimal performance states and successful performance in iron man and triathlon. However, a number of methodological limitations should be noted. The study is cross-sectional in nature and therefore cannot determine the stability of these relationships over time and across contexts. Future research may wish to explore the strength and nature of the relationship between mental toughness and dispositional flow in other sports and also the stability of such relationships over multiple competitions.

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Table 3: Iron man and triathlete differences for mental toughness and flow

	MT	CS	AA	CG	UF	Conc	Cont	LC	TT	AE
	t(112)= 8.43, p < 0.001	t(77.4)=7.9 13, p < 0.001	t(112) =7.16 6, p < 0.001	t(87.1)=5.5 8, p < 0.001	t(95.5 3)=6. 07, p < 0.001	t(92.2 7)=5. 50, p < 0.001	t(112) =6.54, p < 0.001	t(112) =5.43, p < 0.001	t(112) =6.47, p < 0.001	t(112) =5.69, p < 0.001