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Intolerance of Uncertainty as a Predictor of Performance Anxiety and Robustness of Sport Confidence in University Student-Athletes

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A growing body of research has provided evidence for intolerance of uncertainty (IU)—a dispositional characteristic resulting from negative beliefs about uncertainty and its implications—as a possible transdiagnostic maintaining factor across a range of anxiety disorders. No studies have yet examined IU in performance anxiety in sport. The purpose of the present investigation, therefore, was to investigate the relationship between IU and performance anxiety in sport. Participants included 160 university athletes (51% female) who completed measures of IU, performance anxiety, and robustness of sport confidence. Regression analyses revealed that the inhibitory dimension of IU and robustness of sport confidence were significant predictors of performance anxiety. A simple mediation model was also tested and suggested indirect and direct effects of inhibitory IU on performance anxiety symptoms through robustness of sport confidence. Implications of these findings for researchers and practitioners and directions for future research are discussed.

Keywords: emotion, competitive sport, transdiagnostic

Over the past 30 years, the topic of performance anxiety has been widely investigated in the sport psychology literature (Jones, 1995; Mellalieu, Hanton & Fletcher, 2009; Woodman & Hardy, 2001). Research into performance anxiety in sport has tended to focus on investigating the "intensity" (i.e., level) and "direction" (i.e., interpretation of level as either debilitative or facilitative) of performance anxiety symptoms of sports performers (e.g., Franklin, Smith, & Holmes, 2015; Hanton, Neil, Mellalieu, & Fletcher, 2008; Jones, 1995; Woodman & Hardy, 2001), as well as the performance consequences of performance anxiety (Oudejans, Kuijpers, Kooijman, & Bakker, 2011; Woodman & Hardy, 2001).

Despite the plethora of performance anxiety investigations, research examining dispositional characteristics that may contribute to individual differences in the performance anxiety response of sports performers has received relatively

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little attention. The limited investigations have examined the relationship between performance anxiety response in sports performers and perfectionism (Koivula, Hassmén, & Fallby, 2002; Stoeber, Otto, Pescheck, Becker, & Stoll, 2007) and hardiness (Hanton, Evans, & Neil, 2003; Hanton, Neil, & Evans, 2013). Koivula et al.'s (2002) comparison of positive and negative patterns of perfectionism in elite athletes found that negative patterns of perfectionism were related to higher levels of performance anxiety and lower levels of self-confidence. In a related study, Stoeber et al. (2007) also found that negative patterns of perfectionism were associated with higher levels of performance anxiety across four samples of athletes (high school athletes, female soccer players, and two samples of university athletes).

Hanton et al. (2003) examined the effects of hardiness on the intensity and direction dimensions of performance anxiety and self-confidence intensity in both elite and nonelite athletes. Elite athletes high in hardiness reported lower performance anxiety levels, more facilitative interpretations of these symptoms, and higher self-confidence levels compared with their nonelite counterparts. These authors found similar results (Hanton et al., 2013) when they examined the effects of hardiness (high vs. low hardiness) on performers' responses to performance anxiety intensity and self-confidence levels. Results provide support for the resilient nature of hardiness; the performers high in hardiness generally reported lower levels of performance anxiety and higher levels of self-confidence than those low in hardiness. Taken together, the results suggest that further exploration of the relationship between personality dispositions and performance anxiety response and levels of self-confidence in sport performers is warranted.

Intolerance of uncertainty (IU) has recently been defined as "a dispositional characteristic that results from a set of negative beliefs about uncertainty and its implications and involves the tendency to react negatively on an emotional, cognitive, and behavioural level to uncertain situations and events" (Buhr & Dugas, 2009, p. 216). Individuals who are intolerant of uncertainty, therefore, experience uncertainty as emotionally upsetting and stressful, and they find it difficult to function in situations with an uncertain outcome (Dugas, Schwartz, & Francis, 2004). Originally, IU was thought to be specific to worry and generalized anxiety disorder (Koerner & Dugas, 2008). However, increasingly robust evidence indicates that IU is an important transdiagnostic feature associated with the development and maintenance of a number of anxiety disorders (e.g., social anxiety disorder, Carleton, Collimore, & Asmundson, 2010; health anxiety disorder, Fetzner et al., 2014; panic disorder, Carleton et al., 2014; and post traumatic disorder, Fetzner, Horswill, Boelen, & Carleton, 2013; and depression (e.g., Carleton, Mulvogue, et al., 2012). For a more comprehensive review of the construct of IU, see Carleton (2012).

IU has been conceptualized as having two dimensions—prospective IU (i.e., fear and anxiety about future events) and inhibitory IU (i.e., uncertainty inhibiting action)—and the two dimensions are associated with different anxiety disorder symptoms (Carleton, 2012; McEvoy & Mahoney, 2011). Results from recent research has indicated the discriminant validity of the two subscales; prospective IU is more strongly associated with worry and symptoms of obsessive-compulsive disorder and health anxiety, whereas inhibitory IU appears to be more strongly associated with symptoms of social anxiety, panic disorder, agoraphobia, and depression (Carleton, 2012; Fetzner et al., 2014; McEvoy & Mahoney, 2011).

No studies have yet examined the relationship between IU and performance anxiety in sport. It is conceivable that IU is associated with performance anxiety symptoms experienced by athletes. This would seem to be a potentially important relationship to investigate, as individuals who are intolerant of uncertainty are likely to experience a prolonged and heightened level of anxiety in situations with uncertain outcomes (Carleton, Sharpe, & Asmundson, 2007). The ability to tolerate the inherent uncertainty associated with competitive sport and to not react negatively on a cognitive (i.e., disruption to concentration), emotional (i.e., anxiety), or behavioral (i.e., "freezing") level may be a critical element in determining successful performance.

The purpose of the current study was to examine the relationship between IU, sport confidence, and performance anxiety among athletes. Specifically, the current study was designed to accomplish two goals: First, we wanted to replicate the previous findings of a relationship between IU and anxiety symptoms in a new population from a sport sample. It was hypothesized that IU would be positively associated with performance e anxiety. Sexond, we wanted to examine the nature of the interrelationship between IU, sport confidence, and performance anxiety in sport. Specifically, it was hypothesized that sport confidence would mediate the relationship between IU and performance anxiety in sport.

Method

Participants

The participants in this study were 160 university athletes (82 women, 78 men) enrolled at Newcastle University, United Kingdom, who participated in the following sports: hockey (90), rugby (509), volleyball (7), trampoline (4), netball (1), cross-country (1), karate (1), cheerleading (3), cycling (1), and rowing (2). The mean age of the participants was 19.75 years (SD = 1.67), and represented the university at first team (n = 55), second team (n = 36), third team (n = 35), and fourth team (n = 34).

Measures

Sport Confidence. The Trait Robustness of Sports-Confidence Inventory (TROSCI; Beattie et al., 2011) is an eight-item sport specific measure of trait robustness of sport confidence for use in competitive sport settings (e.g., "My self-confidence is stable; it does not vary very much at all"). Items are scored on a 9-point Likert scale ranging from 1 (*strongly disagree*) to 9 (*strongly agree).* The TROSCI had good psychometric properties in a sample of college athletes (Beattie, Hardy, Savage, Woodman, & Callow, 2011).

Performance Anxiety. The Sport Anxiety Scale-2 (SAS-2; Smith, Smoll, Cumming, & Grossbard, 2006) is a 15-item sport-specific measure of trait performance anxiety in sport situations. Each item is measured on 4-point Likert scale ranging from 1 (*not at all*) to 4 (*very much*). Participants rated five items related to worry (e.g., "I worry that I will not play well"), five items related to somatizations (e.g.,

"I feel tense in my stomach"), and five items related to concentration disruption (e.g., "It is hard to concentrate on the game"). The SAS-2 has demonstrated good psychometric properties in a sample of college athletes (Smith et al., 2006).

Intolerance of Uncertainty. The Intolerance of Uncertainty Scale–short form (IUS-12; Carleton, Norton, & Asmundson, 2007) is a 12-item short form of the original 27-item Intolerance of Uncertainty Scale (Freeston, Rhéaume, Letarte, Dugas, & Ladouceur, 1994) that measures reactions to uncertainty, ambiguous situations, and the future (e.g., "The smallest doubt can stop me from acting"). Items are scored on a 5-point Likert scale ranging from 1 (*not at all characteristic of me*) to 5 (*entirely characteristic of me*). The IUS-12 is composed of two subscales: prospective IU, relating to anticipation of uncertainty (seven items; e.g., *"Unforeseen events upset me greatly"*), and inhibitory IU, relating to inaction in the face of uncertainty (five items; e.g., *"The smallest doubt can stop me from acting"*). The IUS-12 has excellent psychometric properties (Carleton, Norton, & Asmundson, 2007).

Procedure

Ethical approval for the study was granted by the University Research Ethics Committee. Coaches from each team were contacted to obtain permission to approach their athletes for participation in the study. The athletes' participation was voluntary, written informed consent was obtained from each individual before data collection, and the athletes' anonymity was ensured.

Analyses

Cronbach's α and descriptive statistics for all study variables were obtained, and then correlations between the variables were calculated. A hierarchical regression analysis was performed with SAS-2 total score as the dependent variable and IUS-12 subscale (i.e., prospective IU and inhibitory IU), TROSCI scale, and demographic variables as independent variables. In Step 1, gender (male = 1, female = 2), age, and university team (first team = 1, second team = 2, third = 3, fourth = 4) were entered as control variables. In Step 2, IUS-12 subscales (prospective and inhibitory IU) were entered. Finally, the TROSCI scale was entered in Step 3. Mediation analysis, applying the recommendations of Hayes (2013), was used to test for mediation effects. Only the IUS-12 subscales that were statistically significant predictors in the hierarchical regressions were included in the mediation analyses. Mediation models were tested by placing either IUS-12 subscale as the independent variable, TROSCI scale as the mediating variable, and SAS-2 total score as the dependent variable.

The PROCESS macro for SPSS (Hayes, 2013) was used to test for mediation effects. This program provided direct, indirect, and total effects along with bias-corrected and accelerated confidence intervals (CIs). Mediation occurs when the 95% CI of the indirect effect estimated from the 10,000 bootstrap samples procedure excludes zero (Hayes, 2013). The mediation analysis with bootstrapping conducted on the current study was preferred over the causal step strategy (Baron & Kenny, 1986) because it increases power, reduces Type I error, and accounts for nonnormality of the sampling distribution (Hayes, 2013).

Results

Data Screening

Before analyses, distributions of all continuous data were checked. Generally, scores were normally distributed; all items demonstrated acceptable levels of skewness and kurtosis (≤ |1|). Cases were then screened for univariate and multivariate outliers. One case was identified as a univariate outlier using standardized item scores that exceeded 3. The same case was also identified as a multivariate outlier using Mahalanobis distance and a chi-square cut-off of 22.258 (six variables, p = .001). This case was removed for subsequent analyses, resulting in a final total of 159 participants.

Descriptive Statistics and Internal Consistency

The lower part of Table 1 shows the means, standard deviations, and reliability estimates for all study measures. All measures had adequate internal consistency (Cronbach's α >.70; Nunnally, 1978). The mean scores for the IUS-12 scale and the prospective IU and inhibitory IU subscales in the current sample were similar to those reported in Carleton, Mulvogue, et al.'s (2012) student sample (total IUS-12: M = 27.52, SD = 9.28; prospective IU: M = 17.51, SD = 5.68; inhibitory IU: M = 10.00, SD = 4.30). The mean score for the SAS-2 scale in the current sample was similar to that reported in Smith et al.'s (2006) college athlete sample (M = 28.83, SD = 8.05).

Bivariate Associations

Table 1 also presents the Pearson product-moment correlations among the main study variables. All correlations were significant and in the expected direction. Specifically, as predicted, IU was positively associated with performance anxiety

Table 1 Correlations and Descriptive Statistics

	1	2	3	4	5
1. IUS-12 total score	—				
2. IUS-12 prospective IU subscale	.89**	—			
3. IUS-12 inhibitory IU subscale	.84**	.49**	—		
4. SAS-2 total score	.39**	.24**	.45**	—	
5. TROSCI total score	–.33**	–.27**	–.31**	–.41**	—
Mean	28.62	18.89	9.73	27.99	36.18
SD	7.40	4.64	3.93	7.30	10.00
Cronbach's α	.84	.76	.81	.89	.80

Note. IUS-12 = Intolerance of Uncertainty Scale-12; SAS-2 = Sport Anxiety Scale-2; TROSCI = Trait Robustness of Sports-Confidence Inventory.

**Correlation is statistically significant (p < .01, two-tailed).

and negatively associated with robustness of self-confidence. Further, robustness of self-confidence was negatively associated with performance anxiety.

Regression Analysis

Comprehensive results for the hierarchical linear regression with performance anxiety (i.e., SAS-2 total score) as the dependent variable are presented in Table 2. There were no indications of problems with multicollinearity (i.e., all tolerances > .30 and all variance inflation factors < 5.00), problems with outliers, problems with normality, or problems with homoscedasticity (Tabachnick & Fidell, 2013). In Step 1, there was no evidence that any of the demographic variables were statistically significant predictors of performance anxiety. In Step 2, results supported a statistically significant negative relationship for inhibitory IU and performance anxiety but not for prospective IU and performance anxiety. Robustness of sport confidence and inhibitory IU in Step 3 had significant positive and negative regression coefficients, respectively, to predict performance anxiety. In summary, the regression results indicated a robust relationship between robustness of sport confidence and performance anxiety, as well as between inhibitory IU and performance anxiety. There was, however, no support for a relationship between prospective IU and performance anxiety, when controlling for inhibitory IU; accordingly, prospective IU was not considered further in the analyses.

Mediation Analysis

A simple mediation analysis was conducted by estimating robustness of sport confidence from inhibitory IU as well as performance anxiety from both robustness of

Table 2 Summary of Hierarchical Linear Regression Analysis Predicting SAS-2 Scores

	Competitive Anxiety (SAS-2)					
	R^2	ΔR^2	β	$t(x)$	p	Partial r
Step 1						
control variables[a]	.023	.023	–0.127	–1.48	.14	–.124
			–0.090	–1.12	.26	–.087
			–0.111	–1.30	.20	–.126
Step 2	.223	.200				
IUS-12 inhibitory IU subscale			0.443	5.34	.001	.379
IUS-12 prospective IU subscale			0.019	0.23	.82	.018
Step 3	.313	.090				
TROSCI			–0.319	–4.40	.001	–.300

Note. IUS = Intolerance of Uncertainty Scale; SAS-2 = Sport Anxiety Scale-2; TROSCI = Trait Robustness of Sports-Confidence Inventory.

[a]Control variables included age, gender, and university team.

sport confidence and inhibitory IU. Results provided evidence of direct and indirect effects for inhibitory IU on performance anxiety. IU was positively related to performance anxiety, path *c'*: $b = 0.657$, $SE = 0.133$, $p < .001$, and negatively related to robustness of sport confidence, path *a*: $b = -0.790$, $SE = 0.193$, $p < .001$. In turn, robustness of sport confidence was negatively associated with performance anxiety, path *b*: $b = -0.219$, $SE = 0.052$, $p < .001$. A bias-corrected bootstrap confidence interval for the indirect effect ($ab = 0.173$) based on 10,000 bootstrap samples was entirely above zero, [0.066, 0.319], which provided evidence for the indirect effect of inhibitory IU on performance anxiety through robustness of sport confidence, consistent with partial mediation.

Discussion

The current study was designed to examine the relationship between IU, robustness of sport confidence, and performance anxiety among athletes. Specifically, this study had two goals. The primary goal of the current study was to replicate the previously demonstrated relationship between IU and various types of anxiety symptoms with data from a sport sample. The second goal of this study was to examine the nature of the interrelationships between IU, sport confidence, and performance anxiety in sport.

The results of the correlation analyses demonstrated significant interrelationships between all of the variables of interest and in theoretically congruent directions. Specifically, IU was positively correlated with performance anxiety and negatively correlated with robustness of sport confidence; performance anxiety and robustness of sport confidence were negatively correlated. A similar pattern of correlations were observed, and both the inhibitory and prospective subscales of the IUS-12 were positively correlated with performance anxiety and negatively correlated with robustness of sport confidence.

The hierarchal regression analysis results indicated a robust relationship between inhibitory IU and performance anxiety; however, prospective IU was not significantly related to performance anxiety when controlling for inhibitory IU. These results are consistent with previous research findings that prospective IU is more strongly related to worry and obsessive-compulsive symptoms (i.e., anticipation of uncertainty), whereas inhibitory IU is more strongly related to social anxiety symptoms, including fear of performance situations, such as public speaking (Carleton et al., 2010; McEvoy & Mahoney, 2012).

Results from the mediation analysis also supported the robust relationship between inhibitory IU and performance anxiety. Specifically, inhibitory IU was found to indirectly influence performance anxiety through its effect on robustness of sport confidence. The relationship between inhibitory IU, robustness of self-confidence, and performance anxiety in the current study corresponds with other research indicating that personality dispositions, such as negative perfectionism, are also related to higher levels of performance anxiety and lower levels of sport confidence in athletes (Koivula et al., 2002; Stoeber et al., 2007).

There are several limitations to the current study. First, we focused on the relationship between IU, robustness of sport confidence, and performance anxiety, and we did not investigate athletic performance. Second, the cross-sectional design precludes any conclusion about causality (Maxwell and Cole, 2007). Thus,

the degree to which IU is causally related to the development and maintenance of robustness of sport confidence and performance anxiety awaits further examination; however, the results provide some empirical justification for future research using prospective and experimental designs that can make causal inferences.

Despite the limitations, the current results extend prior theory and research (Carleton, 2012; McEvoy & Mahoney, 2011) with evidence that inhibitory IU is associated with symptoms of performance anxiety in sport. Indeed the inability to tolerate the inherent uncertainty associated with competitive sport situations may be an important element in the development and maintenance of performance anxiety in sport (Weinberg & Gould, 2015). If future studies show that IU is causally related to performance anxiety in sport, it would suggest that increasing tolerance for uncertainty may be a very important target for athletes experiencing debilitating levels of performance anxiety symptoms and issues with confidence. There is some evidence that cognitive behavioral interventions for anxiety disorders, such as social phobia (Mahoney & McEvoy, 2012) and generalized anxiety disorder (Dugas et al., 2010), that directly target IU have been successful in reducing overall severity of core anxiety symptoms and improving global functioning in patients. Treatment protocols typically involve the development of increased tolerance for and acceptance of uncertainty through psychoeducation about the role of IU in anxiety, self-monitoring and awareness training, as well helping individuals to develop effective coping strategies when faced with uncertain situations (Dugas & Robichaud, 2007; Ladouceur et al., 2000). Findings from clinical research suggest that targeting IU in athletes with already established treatment protocols adapted for use with athletes in sport-specific settings may hold benefit in reducing symptoms of performance anxiety.

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