Psychological skills, mental toughness and anxiety in elite handball players

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ABSTRACT

The objectives of this study were: to analyse psychological skills, mental toughness, and anxiety in elite handball players as functions of category (age group) and sex, and to develop a multivariate model explaining handball performance from a psychological perspective. One hundred and seventy four handball players (18.8 ± 3.5 years), components of the national teams, participated in the study. They were classified into official categories (age groups). Three questionnaires were used: the Test of Performance Strategies Questionnaire, the Sport Mental Toughness Questionnaire, and the Sport Anxiety Scale-2 questionnaire. A one-way ANOVA with Bonferroni post-hoc correction was used to examine differences between teams for each sex. A discriminant analysis was performed for each team to classify the participants into two groups according to their performance level (starters and non-starters). The results showed there to be no differences in the variables studied as a function of age. However, men reported lower anxiety than women. The discriminant analysis correctly classified high percentages of the players (65.2% to 100%). In the younger players, the variables selected were related to mental toughness and anxiety. For the men's and women's A Teams the most discriminating variables were emotional control in practice and relaxation in competition, respectively.

1. Introduction

Handball (also known as team handball) is a high-intensity, body contact, team sport in which performance is a combination of many factors: physical fitness, constitution-disposition, nutrition, cognition, tactics, and social and other external influences (Wagner, Finkenzeller, Würth, & von Duvillard, 2014). In the current literature, there are many studies on the physical factors that affect handball performance, but not on the psychological factors involved.

Psychological skills (PS) are a set of trainable psychological abilities that help sportspersons to enhance their performance. The basic PS includes imagery, goal-setting, relaxation, self-talk, emotional control, and self-confidence (Weinberg & Gould, 2015). Several studies have shown that successful sportspersons report greater self-confidence, have more task-oriented thoughts and lower levels of anxiety, and use more positive imagery and self-talk then their less successful counterparts (Gould, Eklund, & Jackson, 1993; Neil, Mellalieu, & Hanton, 2006). A study by Taylor, Gould, and Rolo (2008) found differences in PS between Olympic medallists and non-medallists using the Test of Performance Strategies (TOPS) (Thomas, Murphy, & Hardy, 1999). In

particular, it found that imagery, emotional control, and automaticity contributed most to a discriminant function at the competition subscale, while self-talk and emotional control made the most significant contributions to the separation between groups. In this sense, in one review (Gould & Maynard, 2009) it was found that successful performance at the Olympics was associated with numerous psychological or emotional states and attributes (confidence, concentration, emotional control, and automaticity), cognitive and behavioural strategies (self-talk, imagery, and goal setting), and personal dispositions (optimism). Relevant PS is seen in the highly valued attribute of mental toughness (MT). Researchers have been unable to agree on a common definition of MT, but the different definitions usually refer to the sportsperson's ability to concentrate, rebound from failure, cope with pressure, and face adversity, as well as mental resilience, commitment, and confidence (Bull, Shambrook, James, & Brooks, 2005). A recent quantitative review of MT in sports (Cowden, 2017) reported findings of significant differences in total MT, or at least in one MT sub-scale, in the vast majority of studies examined. In all cases sportspersons participating at higher levels had greater MT than those participating at lower levels. That review also found that approximately 90% of studies which

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had examined the relationship between MT and performance reported that sportspersons with higher levels of MT tend to perform better than those with lower levels.

Another important psychological skill for sportspersons is to be able to cope with pressure and to control anxiety both before and during competition. A high level of competitive anxiety, both cognitive and somatic, can have a considerable impact on performance (Wilson, Wood, & Vine, 2009). The relationship between anxiety and performance can be described as having the form of an inverted U, with both low levels and high levels negatively affecting performance, but optimal performance being achieved when the sportsperson experiences a moderate level of anxiety (Landers & Arent, 2010). Also, a study of golfers (Hayslip, Petrie, MacIntire, & Jones, 2010) found that cognitive anxiety (worry) predicted poorer performance in amateur golf tournaments, and that the most skilled golfers reported significantly less worry then moderately and less skilled golfers. Nevertheless, another study (Jones & Swain, 1995) found no difference in anxiety between elite and non-elite sportspersons, but did find that the former seem to interpret competition anxiety as better facilitating good performance than the latter do.

There have been a few studies on PS, MT, and competition anxiety among handball players. One of them (Sosa Gonzalez, Oliver Coronado, & Alfonso Rosa, 2013) found, for young elite women handball players, that those who were more experienced scored higher on the mental skills sub-scale than the less experienced players. Another study (Kajtna, Vuleta, Pori, Justin, & Pori, 2012), however, found no differences in anxiety and concentration between successful and less successful goalkeepers. With regard to MT in handball players, only one work has studied this (Ragab, 2015). It showed that an eight-week intervention program had positive effects on coping skills and shooting effectiveness among adult men players. Finally, with regard to anxiety, it has been found that male handball players reported less performance worries then their female counterparts (Abrahamsen, Roberts, Pensgaard, & Ronglan, 2008), and these results were confirmed in a later study (Rokka, Mavridis, Bebetsos, & Mavridis, 2009) in which junior men handball players scored lower on cognitive anxiety then junior women players.

Although one can say that PS, MT, and competition anxiety are important for sport performance in general, there is a lack of research on these variables among handball players. The objectives of the present study were therefore: (i) to analyse psychological skills, mental toughness, and anxiety in elite handball players according to their category (age group) and sex; and (ii) to develop a multivariate model explaining handball performance from a psychological perspective.

2. Material and methods

2.1. Participants

One hundred and seventy four handball players of the Icelandic national teams (18.8 ± 3.5 years) participated in the study. Eighty seven were men (19.2 ± 3.7 years) and 87 women (17.9 ± 4.1 years). The men were classified into their official categories (age groups): the A team ($n = 27$; 25.1 ± 4.7 years), under-21 National Team ($n = 12$; 20.0 ± 0.4 years), under-19 National Team ($n = 20$; 18.2 ± 0.6 years), and under-17 National Team ($n = 28$; 16.5 ± 0.6 years). The women were classified into the A team ($n = 20$; 22.4 ± 3.2 years), under-19 National Team ($n = 16$; 18.3 ± 0.7 years), under-17 National Team ($n = 25$; 16.3 ± 0.8 years), and under-15 National Team ($n = 26$; 14.2 ± 0.7 years). All the players selected for the national teams in the 2016/17 season were invited to participate, and 90.63% of them accepted. In a normal week, all participants trained for at least five 90-minute sessions. The study was approved by the Ethics Committee of Reykjavik University, and respected the principles of the Declaration of Helsinki. It was also approved by the Icelandic Handball Federation

(HandknattleikssambandÍslands – HSÍ).

2.2. Measurement procedures

All the participants completed a battery of three questionnaires. The questionnaires were presented in their Icelandic versions during training camp prior to a match or tournament during the 2016/17 season. All players were informed of the objective of the study and that their participation was voluntary. It was also made clear that there were no "correct" or "incorrect" answers, and that they should respond to the items sincerely. The three questionnaires were the following:

The Test of Performance Strategies Questionnaire (TOPS) (Thomas et al., 1999) is used to measure the skills and strategies used by sportspersons in competition and practice. There are eight sub-scales: goal setting, relaxation, automaticity, activation, imagery, self-talk, emotional control, and attentional control (concentration). The participants responded to the items on a Likert scale from (1) "never" to (5) "always". The total score for each sub-scale was taken to be the mean of the responses to its items. A high score indicates greater use of that skill or strategy except for negative thinking for which a higher score indicates more problems in that sub-scale. The psychometric properties of the English version of the questionnaire are known to be good (Thomas et al., 1999), and, while those of the Icelandic version of the questionnaire are unknown, the test's internal consistency was acceptable in this study (Cronbach's alpha = 0.85).

The Sport Mental Toughness Questionnaire (SMTQ) (Sheard, Golby, & van Wersch, 2009) is used to measure mental toughness. There are three sub-scales: confidence (6 items), constancy (4 items), and control (4 items). The participants responded to the items on a Likert scale from (1) "not at all true" to (4) "very true". The psychometric properties of the English version of the questionnaire are known to be good (Sheard et al., 2009), and, while those of the Icelandic version of the questionnaire are unknown, its internal consistency was acceptable in this study (Cronbach's alpha = 0.82).

The Sport Anxiety Scale 2 questionnaire (SAS-2) (Smith, Smoll, Cumming, & Grossbard, 2006) is used to measure cognitive and somatic anxiety in sport performance. There are three sub-scales: worry, somatic anxiety, and concentration disruption with 5 items each. The participants responded to the items on a Likert scale from (1) "not at all" to (4) "very much". The total score for each sub-scale was taken to be the mean of the responses to its items. A higher score indicates more anxiety. The psychometric properties of the English version of the questionnaire are known to be good (Smith et al., 2006), and, while those of the Icelandic version of the questionnaire are unknown, its internal consistency was acceptable in this study (Cronbach's alpha = 0.82).

2.3. Data analyses

All the variables satisfied the tests of homoskedasticity (Levene's homogeneity test) and normality (Kolmogorov-Smirnov test). The basic descriptive statistics (mean and standard deviation) were calculated. A one-way ANOVA was used to examine differences between teams for each sex. The Bonferroni post-hoc test was used to compare means. A one-way ANOVA was also used to examine differences between the sexes for each team. The effect sizes of the differences were calculated (Cohen, 1988), interpreting them in accordance with the recommendations in the literature (Hopkins, Marshall, Batterham, & Hanin, 2009): > 0.1 small, > 0.3 moderate, > 0.5 large, > 0.7 very large, and > 0.9 nearly perfect. A discriminant analysis was performed for each team and the whole sample. Participants were classified by the sample-splitting method into two groups according to their performance level (starters and non-starters). This information was given by each National coach. The criterion used to determine whether a variable entered the model (i.e., the discriminant function) was Wilks's lambda, a measure of the deviations within each group with respect to