Today's talented youth field hockey players, the stars of tomorrow?
Gemser, Marije

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Chapter VI

Psychological characteristics of talented youth athletes in field hockey, basketball, volleyball, speed skating, and swimming

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Abstract

To reveal the relationship between psychological skills and performance level within a talent group, 458 talented youth athletes (age 14.8 years, \(sd = 1.5\)) filled in the Dutch Youth Version of the Psychological Skills Inventory for Sports with scales for motivation, confidence, anxiety control, mental preparation, team emphasis, and concentration. A performance level (elite versus sub-elite) by type of sport (team sports versus individual sports) by gender multivariate analysis of covariance (2 X 2 X 2) with age as a covariate resulted in significant effects. Psychological skills distinguished between more and less successful talented athletes, especially in females. In general, psychological profiles differed between males and females and between team sport athletes and individual sport athletes. However, for discrimination of elite and sub-elite youth athletes, motivation and mental preparation were useful indicators that are independent of gender and type of sport.
6.1 Introduction

Elite athletes repeatedly have to perform under high pressure, and it is therefore not surprising that psychological characteristics often distinguish those successful at the highest standard from their less successful counterparts (Morris, 2000). Early research evidence already supported an association between psychological characteristics and sports performance (Morgan and Pollock, 1977; Morgan, 1979; May et al., 1985). Further research evolved with an emphasis in identifying psychological skills relevant to sport (Meyers et al., 1996). Mahoney et al. (1987) identified potential constructs assessing motivation, confidence, anxiety control, mental preparation, team emphasis and concentration. They developed an instrument that assesses a broad range of psychological skills possessed by athletes and moreover is sport-specific: the Psychological Skills Inventory for Sport (PSIS-R-5). Compared to non-elite athletes, elite athletes reported that they were more motivated to do well in their sport, were more self-confident, experienced fewer problems with anxiety, relied more on internally referenced and kinesthetic mental preparations, were more focused on their own performance than that of their team, and were more successful at deploying their concentration (Mahoney et al., 1987; Mahoney, 1989). So far, many other researchers have also distinguished successfully elite from non-elite athletes on the basis of their psychological skills. For example, Grossarth-Matichek et al. (1990) described psychological factors as determinants of success in football and boxing. Meyers and colleagues (1996) reported better scores for elite rodeo athletes than non-elite ones on motivation, confidence, anxiety control and concentration, whereas in a study on Chinese track and field athletes, Cox et al. (1996) found elite athletes outscoring collegiate level athletes on confidence and anxiety control.

It is not self-evident that the relation between psychological skills and performance level is similar for different types of sports or for males and females. Various studies have indicated, for example, that differences exist in psychological skills between individual and team sports (Feltz and Ewing, 1987; Mahoney et al., 1987; Cox and Liu, 1993) and between the genders (White, 1993; Chantal et al., 1996; Sewell and Edmondson, 1996; MacIntyre et al., 1998).

In addition, a relation between psychological skills and performance level has been found within the highest performance level, i.e. when elite and sub-elite athletes are compared to each other. Orlick and Partington (1988) reported that among physical, technical and mental characteristics, mental readiness provided the only statistically significant link with final Olympic ranking of Canadian Olympians. However, it seems that differences are smaller when elite athletes are compared to sub-elite athletes rather than to non-elite ones. In a study on equestrian athletes, elite athletes scored higher than sub-elite athletes on only two of six psychological skills from the PSIS-R-5 (Meyers et al., 1999) whereas Meyers and colleagues
(1994) found no differences in psychological skills between top-ranked (1 to 65), middle-ranked (75-180), and bottom-ranked (200+) female world-ranked tennis players.

So far, it is not yet clear whether the same psychological variables that distinguish elite from non-elite or elite from sub-elite athletes in adulthood are important for outstanding performance throughout the process of talent development (Morris, 2000). To assist young athletes in reaching elite level, it is important to gain insight into factors that influence the development of a successful sports career, such as their psychological skills. However, as far as the authors know, no studies have focused primarily on the relation between psychological skills and performance level within a talent group. Therefore, this study concentrates on athletes that have been identified as talent but who have not yet reached the top in adult elite sports. Two different performance-level groups within a group of all-talented athletes were compared on psychological skills. The goal of this study was to reveal the relationship between psychological skills and performance level with possible effects of type of sport and gender in talented youth athletes.

6.2 Methods

Participants
A total of 458 talented youth athletes (age 14.8 years, $sd = 1.5$), all of whom participate in high-level competitive sports in the Netherlands, filled in the Dutch Youth Version of the Psychological Skills Inventory for Sports (Appendix 6.1). Among them were 124 field hockey players (62 male and 62 female), 54 basketball players (30 male and 24 female), 121 volleyball players (59 male and 62 female), 72 speed skaters (41 male and 31 female) and 87 swimmers (52 male and 35 female). The participants were divided into 148 elite athletes and 310 sub-elite athletes based on their performance level. Feltz and Ewing (1987) suggest that an elite-level young athlete can be defined as one who has competed in national-level competitions and has participated in his/her sport for at least 2 years. In our study, all talented youth athletes met these conditions. In team sports, elite youth athletes distinguished themselves from sub-elite athletes by being part of an extra selection team (field hockey: national or district youth selection team; basketball: national youth selection team; volleyball: national youth selection team). In speed skating and swimming, elite youth athletes distinguished themselves from sub-elite athletes by being among the 12 best of their age category in the Netherlands.
Procedure
All athletes gave their informed consent prior to participation and completed the inventory individually in a group setting. Instructions were standardized, since obtained scores may be influenced by changing test instructions (Nideffer, 1987; Greenspan et al., 1988). To allow mutual comparisons between athletes of different ages, athletes were asked to compare themselves with top athletes in their age category. To avoid socially desirable answers, athletes were told that the results were being used solely for research purposes.

Instrument
The Psychological Skills Inventory for Sports (PSIS-R-5) consists of 5-point Likert type items that are distributed over 6 scales (Mahoney et al., 1987). The PSIS-R-5 has been translated into Dutch and subjected to psychometric testing (Bakker, 1995; Companjen and Bakker, 2003). The Dutch Youth Version of the Psychological Skills Inventory for Sports (PSIS–Youth) is based upon the Dutch version of the PSIS-R-5, but the formulation of questions is simpler. It contains 44 5-point Likert type items, distributed over the same 6 scales as the PSIS-R-5: Motivation (8 items), Confidence (8 items), Anxiety Control (8 items), Mental Preparation (6 items), Team Emphasis (7 items) and Concentration (7 items) (see Appendix 6.1). The answer almost never equates to 1, and almost always to 5. Items worded negatively (indicating a problem or concern) are transformed by reversing the aforementioned 1-5 format. In this way, a high score on each scale corresponds to the psychological skill being present to a large extent.

Psychometric characteristics
In a study at our Center on the psychometric characteristics of the PSIS-Youth, 381 youth field hockey and soccer players (age 14.7 years, sd = 1.7; 32% female, 68% male) filled in the questionnaire (Elferink-Gemser et al., internal publication 2002). Correlations between scales did not exceed 0.42, supporting the PSIS-Youth as a measure of six relatively independent constructs. Internal consistency estimates for each scale were acceptably high, ranging from 0.68 on the Team Emphasis scale to 0.81 on the Confidence scale. Apart from the Team Emphasis scale, Cronbach’s alpha was above 0.70, which is the minimum level recommended for research purposes (Nunnally, 1978). These internal consistency estimates are in line with other studies using the PSIS-R-5. White and Croce (1992) found Cronbach alpha reliability scores ranging from 0.69 to 0.77. White (1993) likewise showed good internal consistency with alpha coefficients ranging from 0.67 to 0.84, while Meyers et al. (1994), using discriminant analysis, successfully classified 84% of selected athletes into rank order using the results of the questionnaire. By contrast, Chartrand et al. (1992) did note internal consistency problems, with the exception of the confidence factor. This however was an
isolated result, which appears to stand opposed to most of the evidence (MacIntyre et al., 1998).

**Data analysis**

According to the six categories of psychological skills (motivation, confidence, anxiety control, mental preparation, team emphasis and concentration), mean scores and standard deviations were calculated for the eight different subgroups based on performance level (elite youth athletes and sub-elite youth athletes), type of sport (team sports and individual sports) and gender. To make mutual comparisons between scales possible, scores on each of the six scales are also presented as means on the 5-point Likert scale (minimum score = 1; maximum score = 5) ± standard deviation. Because of the nature of competition of speed skating and swimming in the Netherlands, in which an emphasis is placed on individual performance, the questions in the Team Emphasis scale are not valid for the individual sport athletes in this study (e.g., “I get very frustrated when a teammate is performing poorly”). Consequently, only athletes from team sports answered questions in this scale.

Data were analyzed using multivariate analysis of covariance (MANCOVA) general linear models (GLM) procedure. As part of the GLM procedure, least-squares means are calculated. For the MANCOVA, performance level, type of sport and gender served as the independent variables, while the categories of psychological skills served as the multivariate dependent variable. Age was considered as a covariate since the relationship between psychological skills and performance level may change with age. In this way, each variable was adjusted for age.

Univariate analyses of covariance (ANCOVA) with factors of performance level, type of sport and gender and with age as a covariate were carried out separately for each psychological variable, with follow-up analyses to clarify the source and nature of significant relationships. The ANCOVA for the Team Emphasis scale was conducted with scores of the team sport athletes only. An alpha of 0.05 was adopted for all tests of significance.

**6.3 Results**

A performance level by type of sport by gender multivariate analysis of covariance (2 X 2 X 2) resulted in significant main effects for performance level $[F_{(5,445)} = 5.18, p < 0.01]$; type of sport $[F_{(5,445)} = 23.90, p < 0.01]$ and gender $[F_{(5,445)} = 9.70, p < 0.01]$. Table 6.1 displays the means of the psychological skills for categories of performance level, type of sport and gender.
Table 6.1. Mean scores ($sd$) of the psychological skills as a function of performance level, type of sport, and gender ($N = 458$).

<table>
<thead>
<tr>
<th></th>
<th>Male athletes</th>
<th>Female athletes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Team sports</td>
<td>Individual sports</td>
</tr>
<tr>
<td></td>
<td>Elite $n = 60$</td>
<td>Sub-elite $n = 91$</td>
</tr>
<tr>
<td>Motivation (MV)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale score</td>
<td>36.74 (2.68)</td>
<td>34.95 (3.56)</td>
</tr>
<tr>
<td>5-point Likert Scale score</td>
<td>4.59 (0.34)</td>
<td>4.37 (0.45)</td>
</tr>
<tr>
<td>Confidence (CF)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale score</td>
<td>31.99 (4.80)</td>
<td>31.77 (4.80)</td>
</tr>
<tr>
<td>5-point Likert Scale score</td>
<td>4.00 (0.60)</td>
<td>3.97 (0.60)</td>
</tr>
<tr>
<td>Anxiety Control (AX)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale score</td>
<td>32.38 (4.42)</td>
<td>32.10 (4.53)</td>
</tr>
<tr>
<td>5-point Likert Scale score</td>
<td>4.06 (0.54)</td>
<td>4.01 (0.57)</td>
</tr>
<tr>
<td>Mental Preparation (MP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale score</td>
<td>14.70 (4.15)</td>
<td>14.40 (4.64)</td>
</tr>
<tr>
<td>5-point Likert Scale score</td>
<td>2.44 (0.69)</td>
<td>2.40 (0.77)</td>
</tr>
<tr>
<td>Team Emphasis (TM)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale score</td>
<td>24.45 (3.02)</td>
<td>25.11 (3.17)</td>
</tr>
<tr>
<td>5-point Likert Scale score</td>
<td>3.50 (0.43)</td>
<td>3.59 (0.45)</td>
</tr>
<tr>
<td>Concentration (CC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale score</td>
<td>24.68 (3.47)</td>
<td>24.57 (3.99)</td>
</tr>
<tr>
<td>5-point Likert Scale score</td>
<td>3.53 (0.50)</td>
<td>3.51 (0.57)</td>
</tr>
</tbody>
</table>
Performance level
In the relation of psychological skills and performance level we found significant main effects for motivation and mental preparation (Table 6.2). We also found significant interaction effects for confidence (performance level by type of sport), team emphasis (performance level by gender) and concentration (performance level by gender).

Table 6.2. Summary of univariate F-Ratios calculated using Type III sums of squares with Hypothesis df = 1 and Error df = 449 for MV, CF, AX, MP, CC and Error df = 294 for TM (General Linear Model).

<table>
<thead>
<tr>
<th>Psychological Skills</th>
<th>MV</th>
<th>CF</th>
<th>AX</th>
<th>MP</th>
<th>TM</th>
<th>CC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance level (P)</td>
<td>23.06**</td>
<td>0.62</td>
<td>1.55</td>
<td>3.56*</td>
<td>1.24</td>
<td>0.95</td>
</tr>
<tr>
<td>Type of sport (T)</td>
<td>6.36**</td>
<td>4.15*</td>
<td>6.22**</td>
<td>56.95**</td>
<td>15.65**</td>
<td></td>
</tr>
<tr>
<td>Gender (G)</td>
<td>1.73</td>
<td>26.28**</td>
<td>10.04**</td>
<td>4.98*</td>
<td>0.17</td>
<td>0.63</td>
</tr>
<tr>
<td>P X T</td>
<td>1.87</td>
<td>3.92*</td>
<td>0.47</td>
<td>0.01</td>
<td>1.66</td>
<td></td>
</tr>
<tr>
<td>P X G</td>
<td>0.89</td>
<td>0.73</td>
<td>0.57</td>
<td>0.01</td>
<td>7.33**</td>
<td>5.81**</td>
</tr>
<tr>
<td>T X G</td>
<td>0.93</td>
<td>1.37</td>
<td>0.94</td>
<td>0.37</td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>P X T X G</td>
<td>0.15</td>
<td>1.83</td>
<td>0.26</td>
<td>2.53</td>
<td>0.23</td>
<td></td>
</tr>
</tbody>
</table>

Note: * p < 0.05. ** p < 0.01.

Elite athletes scored higher than sub-elite athletes on motivation and mental preparation, irrespective of gender or type of sport. Regardless of gender, elite athletes also scored higher than sub-elite athletes on confidence, but this can only be applied to team sports (p < 0.01). No significant differences between elite and sub-elite athletes were found in individual sports (p > 0.05). On team emphasis, female elite athletes had better scores than female sub-elite athletes (p < 0.01), but male elite and sub-elite athletes had similar scores (p > 0.05). On concentration, again female elite athletes scored better than female sub-elite athletes (p < 0.01), whereas male scores of elite and sub-elite athletes did not differ significantly (p > 0.05). These results can be applied to both team and individual sport athletes.

Type of sport
In the relation of psychological skills and type of sport, we found significant main effects for motivation, confidence, anxiety control, mental preparation and concentration (Table 6.2). Irrespective of performance level or gender, team sport athletes had higher scores than individual sport athletes on motivation and anxiety control, whereas on confidence, mental preparation and concentration individual athletes outscored team sport athletes. We also found
a significant interaction effect for confidence (type of sport by performance level). Among elite athletes, team sport athletes had scores similar to individual sport athletes \((p > 0.05)\), whereas among sub-elite athletes individual sport athletes outsored team sport athletes \((p < 0.01)\). This can be applied to males as well as females.

**Gender**

In the relation of psychological skills and gender, we found significant main effects for confidence, anxiety control and mental preparation (Table 6.2). Regardless of performance level or type of sport, male athletes outsored female athletes in all these psychological skills. We also found significant interaction effects for team emphasis and concentration (both gender by performance level). Among elite athletes, females and males had similar scores on team emphasis \((p > 0.05)\), but in the sub-elite group male athletes scored better than female athletes \((p < 0.01)\). Elite female athletes outsored their male counterparts on concentration \((p < 0.05)\), while no significant differences based on gender were found among sub-elite athletes \((p > 0.05)\). These results can be applied to both team and individual sport athletes.

### 6.4 Discussion

The goal of this study was to reveal the relationship between psychological skills and performance level with possible effects of type of sport and gender in talented youth athletes. To accomplish this purpose, two different performance level groups within a group of all-talented athletes were compared on psychological skills.

The relation between motivation and performance level, i.e. that elite youth athletes outsord sub-elite ones is in general congruence with studies examining differences between elite and sub-elite players in adulthood (e.g., Smith and Christensen, 1995; Chantal et al., 1996). It is however unclear whether athletes perform better because of their high motivation or whether they are more motivated because of their high performance level. The relation between mental preparation and performance level favoring elite athletes in contrast to sub-elite ones was also found in a study on golf players in which skilled golfers reported greater mental preparation than less skilled ones (Thomas and Over, 1993).

The relation between psychological skills and performance level is different in male than in female athletes. Male elite athletes outsord sub-elite athletes on motivation and mental preparation only, female elite youth athletes distinguish themselves from their sub-elite counterparts by their higher scores on four of six psychological skills as measured with the PSIS-Youth (motivation, mental preparation, team emphasis and concentration). In team sports, confidence can be added to this list.
The relation between psychological skills and performance level is also different in team sport and individual sport athletes. In team sports, elite youth athletes outscored the sub-elite athletes on confidence, whereas all individual sport athletes scored relatively high on this scale, taking the highest possible scores into account. Weinberg and Gould (1999) stated that less confident athletes doubt whether they are good enough or whether they have what it takes to be successful. Positive feedback about their performance is thought to build confidence. Duda and Nicholls (1992) also stated that confidence plays an important role in beliefs regarding success in sports. In individual sports, the athlete gets feedback individually most of the time as opposed to team sports, in which feedback is mostly presented to the team as a whole. Only the best performers get positive feedback individually, which may be an explanation for the difference in confidence scores between elite and sub-elite team sport athletes found in this study. In addition, team sports are characterized by a lack of objective performance measurements, making it hard to give feedback. Unlike individual sports, in which there is a unidimensional performance criterion like time or distance, a performance in team sports depends on the combination of numerous mini-performances of the player and his teammates (Régnier et al., 1993).

Comparably to our study, Cox and Liu (1993) found that those athletes exhibiting the highest levels of mental preparation were the individual sport athletes. They concluded that this might be due to the fact that individual sport athletes do not have the luxury of being able to rely on their teammates. Another explanation could relate to the character of the individual sports in this study. Speed skating and swimming are cyclic sports in which the same movement pattern is repeated frequently. During mental preparation, this movement pattern can be practiced in one’s head. In team sports like field hockey, basketball and volleyball, environmental characteristics change constantly, which makes mental preparation more difficult.

Noise and sounds during training and competition are distracters that can complicate an athlete’s concentration. These distracters are part of most team sports, whereas more quiet environments are expected for most individual sports (Weinberg and Gould, 1999). Individual sport athletes may therefore have better environmental circumstances to concentrate. This is in congruence with the results obtained in our study, in which team sport athletes tended to report significantly lower concentration than individual sport athletes. Thus it seems logical that concentration and mental preparation are related to each other (Weinberg and Gould, 1999), supporting our findings that individual sport athletes outscore team sport athletes in both concentration and mental preparation.

Average motivation scores of all athletes were very high in that they surpassed 4.0 on a 5-point Likert scale. Hence all talented athletes have a relatively high motivation related to
sports. Before reaching the top, an athlete has to invest many years in training. According to Ericsson et al. (1993), only those who are committed to their sport can persist in deliberate practice. Therefore athletes have to be highly motivated if they are to have a chance of becoming elite athletes. This supports what has been reported in other research with talented children in disciplines other than sports (e.g., Bloom, 1985).

In contrast to their high motivation scores, all athletes had relatively low mental preparation scores in comparison to the other scales. This confirms a statement of Reilly (1996), who notes that “an increasing minority of soccer players are now paying attention to psychological preparation”. In their study on professional sport psychology in Ireland, MacIntyre et al. (1998) also reported low levels of mental preparation in top athletes. Since mental preparation distinguishes elite from sub-elite athletes, it seems valuable to give more attention during training to developing this psychological skill in talented youth athletes.

To provide them with an external reference point, all participants were told to compare themselves with top athletes in their age category. Although this may be difficult, we think it is easier than comparing themselves with adult elite athletes. Because of this age-bound external reference point, we did not draw conclusions for different age groups. It is also interesting to gain insight into the development of psychological skills though. This is possible only when all athletes are provided with the same external reference point, e.g. the absolute top in adult sports.

Researchers who focus on talent development in sports often acknowledge that a world-class performance is the result of several factors (e.g., Deshaies et al., 1979; Régnier et al., 1993; Reilly et al., 2000; Elferink-Gemser et al., 2004). Accordingly, it is recommended to relate the described relationships between psychological skills and performance level to other performance characteristics, such as an athlete’s physiological, technical and tactical characteristics. Only by adopting a multidisciplinary design can the relative contribution of psychological skills to performance level be made clear. Nonetheless, from this study it becomes clear that psychological skills can distinguish between more and less successful talented athletes, especially among females. Psychological profiles differ between males and females, and between team sport athletes and individual sport athletes. However, for differentiation purposes between elite and sub-elite athletes within a talent group, motivation and mental preparation are useful indicators that are independent of type of sport and gender.
References


Appendix 6.1. Items distributed over the six scales of the PSIS-Youth.

**Motivation**
- I am very motivated to do well in my sport.
- I sometimes lack the motivation to train.
- Winning is very important to me.
- Right now, the most important thing in my life is to do well in my sport.
- My sport is my whole life.
- I want to train hard to belong to the top in my sport.
- In my sport, I want to bring out the best in myself.
- I want to succeed in my sport.

**Confidence**
- In most competitions, I go in confident that I will do well.
- It doesn’t take much to shake my self-confidence.
- A minor injury or a bad practice can really shake my self-confidence.
- I have frequent doubts about my athletic ability.
- When I begin to perform poorly, my confidence drops very quickly.
- I can usually remain confident even through one of my poorer performances.
- My self-confidence jumps all over the place.
- I have faith in myself.

**Anxiety**
- I am more tense before I perform than I am during the performance.

**Control**
- I am often panic-struck during those last few moments before I begin my performance.
- I spend a lot of energy trying to stay calm before a meet.
- I get nervous, because I want to start performing.
- I am anxious to perform in strange places.
- Before a meet, I worry if I will do well.
- Before important meets, I feel intense anxiety.
- The period right before a performance feels unpleasant.
Mental Preparation  
I often dream about competition.  
I often “rehearse” my performance in my head before I perform.  
When I mentally practice my performance, I “see” myself performing—just like I was watching a videotape.  
When I am preparing to perform, I try to imagine what it will feel like in my muscles.  
When I close my eyes, I can imagine what my muscles feel like.  
I prepare for a meet by making mental representations of my performance.

Team Emphasis  
I get very frustrated when a teammate is performing poorly.  
I concentrate more on my own performance than on the performance of the team.  
I think team spirit is very important.  
When my team loses, I feel badly—no matter how well I did as an individual.  
I think the performance of the team is more important than my individual performance.  
If my teammates don’t exert themselves to the utmost, I get angry.  
If I decline the performance level of the team, I have to be replaced.

Concentration  
I often have trouble concentrating during my performance.  
I experience frequent “hot streaks” in which my performance is unusually good.  
When I am performing poorly, I tend to lose my concentration.  
During my performance, I am incommmoded by comments of people surrounding 66 me.  
At the beginning of my performance, I have trouble forgetting things I was doing before.  
During my performance, others distract me.  
I can concentrate better on a difficult meet than on an easy one.

Note: Items were rated on a 5-point scale, using anchors of 1 = almost never and 5 = almost always, while comparing oneself with top players in the same age category.