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Adolescent elite athletes and mental skills
A study of students in upper high school with sport profile

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Abstract

The aim of this study was to investigate mental skills use among adolescents practicing sports on elite levels at an upper high school education with focus on sports. Different education profiles, school years and gender were looked at in two different contexts to see whether they affect mental skills. The questionnaire PACE, investigating mental skills in 13 different scales such as process goal, self-confidence and relaxation, was administered to 163 upper high school students, 101 males and 62 females. The participants were distributed between two different education profiles “National Sport Education” and “Physical Education Specialization”, two different school years, year one and year two and the contexts investigated was either training or competition. A significant difference in mental skills was found between males and females in both practice and competition contexts. Females were found to report less self-confidence, lower outcome goal and less effective stress management, indicating the need for teachers and coaches to better address these issues. No significant difference was found between different education profiles in neither practice nor competition contexts. Also no significant difference was found between students in different school years, in neither of the two contexts. The upper high school athletes are training and competing in complex environments both at school and in their sport clubs. Since all types of environments and contexts influence mental skills it is suggested that both schools and sport clubs should try to find ways to improve females’ self-confidence and provide help to set realistic goals.

Keywords: adolescent, mental skills, upper high school elite athletes

Several researchers have tried to classify and assess characteristics and phenomena that make athletes achieve peak performance in their sport. One popular approach is psychological skills training (PST) in which mental skills affecting performance are identified, measured, and improved through training programs. Some commonly found mental skills used by high performing athletes are goal setting, imagery, self-confidence and the ability to focus on the performance (Orlick & Partington, 1988; Greenleaf, Gould & Dieffenbach, 2001; Gould, Dieffenbach & Moffett, 2002; Krane & Williams, 2010; Weinberg & Gould, 2011). This study aims to describe the report of use of mental skills among different groups of upper high school athletes.

Psychological skills training

The importance of regular physical practice is and has always been an obvious component in an athlete's life. Training of psychological skills on the other hand has not always been considered a natural element by athletes and coaches. During the late 1970's the interest for applied sport psychology and mental training grew stronger and the term "Psychological skills training" (PST) was coined (Vealey, 1988). The purpose of PST is to enhance mental skills which improve athletes' peak performance, increases enjoyment or achieves greater sport and physical activity self-satisfaction, often facilitated by a sport psychology consultant or coach (Frey, Laguna & Ravizza, 2003; Weinberg & Gould, 2011). According to Weinberg and Gould (2011) the original techniques and methods in PST formalized for sport psychology include self-regulation of arousal, confidence, attentional focusing, distraction control and goal setting. A specific PST program can focus on different aspects based on the athletes needs including skills like achievement drive, self-awareness, productive thinking, self-confidence, energy management, attentional focus, perceptual-motor skill, identity achievement, interpersonal competence, leadership, cohesion and team confidence (Weinberg & Gould, 2011). Over the years, different variations of PST programs have been developed, focusing on slightly different mental skills.

Model explaining psychological preparation for peak performance

Hardy, Jones and Gould (1996) claim the importance of understanding athletes' psychological whole and consider specific techniques as well as athletes' psychological foundation attributes, peak performance skills, adversity coping strategies and ideal performance states in PST. They presented a model explaining psychological preparation for peak performance (Figure 1) consisting of five components: 1) fundamental foundation

attributes including, among others, personal characteristics, motivational orientations and values of the athlete and referring to for examples the variables trait confidence, goal orientations and trait anxiety, 2) psychological skills and strategies such as goal setting, imagery and self-talk used as a help to achieve ideal performance states, 3) adversity coping strategies such as injury coping, goal setting and relaxation used to deal with different negative stressors, 4) task-specific ideal performance states with the purpose to lead to peak performance in elite athletes, 5) the physical, social, psychological and organizational environment (the area in the circle surrounding the triangle) which represent where the athletes train and perform. The components of the model interact and the holistic perspective helps elite athletes to achieve peak performance.

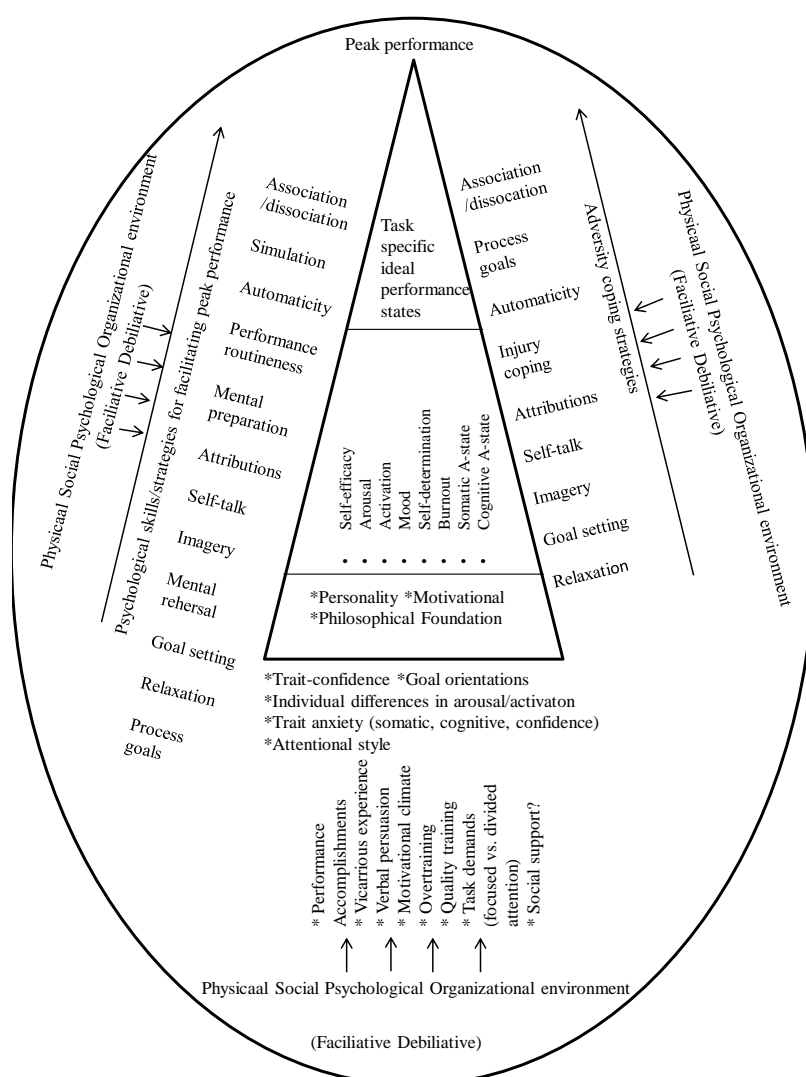


Figure 1. A model of psychological preparation for peak performance showing how trait confidence, goal orientations, trait anxiety, attentional style and individual difference variables influence arousal and activation. Adapted from "Understanding psychological

preparation for sport: Theory and practice of elite performers” by L. Hardy, G. Jones, and D. Gould, 1996, Chichester: John Wiley & Sons Ltd, p.242

Mental skills in PST

Hardy and colleagues (1996) claim that psychological skills could be divided into two categories: basic psychological skills (relaxation, goal setting, imagery and self-talk) and advanced psychological skills (self-confidence, motivation, arousal and activation, stress and anxiety, concentration and attentional control and coping with adversity). The definition of the basic psychological skills is that they are usually used (on their own or in combination) as a foundation for advanced psychological skills (ibid.).

Relaxation concerns the ability to cope with stressful environments. Relaxation techniques can be grouped into physical, for example progressive muscular relaxation (PMR), and mental relaxation, for example transcendental meditation, techniques (Hardy et al., 1996).

Goal setting means to set some goals that will be achieved within a specified unit of time. The unit of time could be; in near-time, such as at the end of the week or in a long-term perspective, such as by the end of the season or within a year (Gould, 2010). According to Weinberg and Gould (2011) there are three types of goals: outcome (focus on a competitive result of an event), performance (achieving standards independently of other competitors) and process (the actions an individual must engage in during performance to achieve success).

Imagery concerns the ability to systematically re-create experiences or to create new experiences in the mind. Furthermore, to learn to use these imageries in a productive and controlled manner, with the purpose of learning from previous performance mistakes, and to reprogram the mind and body as to perform optimally. Athletes could use two types of imagery: external imagery, meaning seeing the image from outside their bodies as if they were watching themselves, and internal imagery, seeing the image from inside their bodies the normal way (Vealey & Greenleaf, 2010).

Self-talk means internal self-statements and dialogues, concerning how athletes talk to themselves, what they say and/or think (Hardy et al., 1996).

Previous research

Elite athletes and performance enhancement. Already in 1977 Mahoney and Avener showed that more successful athletes used more psychological skills than less successful athletes did. Their study established that better gymnasts tended to be more self-confident and reported higher frequency of gymnastics dreams and saw themselves

performing successful. They also more often used some kind of self-talk and internal images compared to less successful gymnasts who more often used external images in training and competition situations.

In 1987 Mahoney, Gabriel and Perkins identified skills that differentiated elite athletes from their less exceptional peers, and compared the psychological profile of the elite athletes with predictions made by several well-known sport psychologists of the ideal athlete. The study included elite athletes who were identified through the national governing bodies (NGB), “pre-elite” athletes and non-elite athletes (from university athletic teams). The study showed that compared to non-elite athletes, elite athletes reported that they experienced fewer problems with anxiety, were more successful at deploying their concentration, were more self-confident, relied more on internally referenced and kinesthetic mental preparations, were more focused on their own performance than that of their team and were more highly motivated to do well in their sport. Compared to elite athletes, pre-elite athletes tended to more frequently report that their anxiety interfered with their performance, the negative impact of the anxiety increased with its intensity, their concentration was less consistent, coaches were important for their success and that they tended to use self-instructions while performing. The authors established the importance of several basic skills; anxiety, management, concentration, motivation, self-confidence and mental preparation. Indeed, in agreement with earlier studies, Durand-Bush, Salmela and Green-Demers (2001) found that elite athletes had more self-confidence, and indication that they reacted to stress in more positive ways and were more able to focus their attention and regain their focus when faced with distractions compared to their peers. A further study has shown that comparing to less successful athletes, successful athletes had in general highly developed techniques for coping with distractions (Krane & Williams, 2010). Greenleaf and colleagues (2001) found that one difference between athletes who met expectations and athletes who failed to meet expectations was the psychological category “attitude towards the games”. “Attitude towards the game” included focusing on achieving peak performance, keeping things in perspective and maintaining a positive attitude.

Medalists in Olympics showed greater emotional control and automaticity than non-medalists in competition situations, while they reported lower imagery than non-medalists. During practice medalists also showed greater emotional control and greater use of positive self-talk than non-medalists (Taylor, Gould & Rolo, 2008).

According to Thomas, Murphy and Hardy’s (1999) more successful athletes better used psychological skills and strategies for competition because they practiced their basic

psychological skills in training more frequently than less successful athletes or non-elite counterparts. It has also been established that more successful performances were based on the extent athletes adhere to their mental preparation plans and precompetition routines and on their level of coping strategies. Positive thinking and focus of attention were some of these possible coping strategies (Krane and Williams, 2010).

Not only individual athletes' psychological skills have been investigated, researchers have also investigated why some athletic teams are more successful than others. Gould, Guinan, Greenleaf, Medbery and Peterson (1999) investigated why some teams met or exceeded performance expectations, whereas others failed to accomplish performance goals during Olympic competition. Teams that met or exceeded performance expectations reported a resident program (lived and train together), crowd support, mental preparation (were mentally prepared to deal with stress and pressure and adhering to mental preparation routines), focus and commitment (sole performance focus, total commitment and ability to reframe negative events in a positive light) and family/friend support as factors which they experienced related to successful performance. Teams that failed to meet performance expectations reported the following factors that they experienced contributed to less successful performance: planning problems (lack of planning or failure to implement or follow through on plans), team cohesion concerns, lack of experience, traveling problems (either too much traveling or too little traveling), coach issues (negative attitudes toward the coach or poor athletes-coach communication) and problems with focus and commitment.

In summary, research has clearly showed that psychological factors are related to athletic competence. Some of the most reoccurring mental skills found in high performing athletes are: high self-confidence, ability to focus on the performance even when faced with set-backs, high degree of positive self-talk. They also practiced these mental skills more than less successful athletes.

Mental skills in different contexts. Research showed that a need for psychometrically testing of mental skills in order to monitor psychological profiles of athletes' mental skills in competition context remains important (Mahoney et al., 1987). More updated research established the value of mental skills used in more than one context and athletes tended to have a greater use of mental skills in competition compared to practice (Thomas et al., 1999; Frey et al., 2003).

Mental skills and age. Correlational studies of sport psychological mental skills with different age groups are limited and the distinctions found between age groups have been limited. Differences in mental skills tended to be observed mostly when the age difference

was large. For instance Bebetos and Antoniou (2003) reported that older athletes (25 years and older) tended to better cope with adversity compared to younger athletes (13-18 years), while no differences were detected between the intermediate age group (19-24 years) and the two other groups. The authors did find significant difference in coachability between all three groups (ibid.). Similarly, Géczi, Tóth, Sipos, Fügedi, Dancs and Bognár (2009) found that older elite athletes reported higher trait anxiety when the youngest age group (16-year-olds) was compared to the oldest age group (20-year-olds), while the middle age group (18-year-olds) showed no differences compared to the other two groups. Munroe-Chandler, Hall, Fishburne, Murphy and Hall (2012) investigated young athletes' imagery use and demonstrated that younger athletes (9-10 years) could see and feel image easier than older athletes (13-14 years). The study also indicated that younger athletes reported using imagery more frequently than older athletes. Just as Munroe-Chandler and colleagues (2012) reported, Thomas and others (1999) found that older athletes used less imagery than young athletes but it was also reported that older athletes used less activation strategies and more automaticity than the younger ones. The study contained three age groups, younger than 17 years, 17-19 years and 20 years and older. In contrast to Thomas and colleagues (1999), Taylor and others (2008) reported that younger athletes (18-28 years) reported greater automaticity than older athletes (29-45 years) in competition situations and older athletes reported higher imagery than younger ones in competition situations; however in practice situations no significant difference between ages was found. In conclusion, research has been able to show differences in some mental skills between younger and older athletes if the age difference was sufficiently large. It is noteworthy, however, that the results in different studies were partially contradictory, making it difficult to reach strong conclusions and indicating that more research on this topic is needed.

Mental skills and gender. Varying results have been reported related to mental skills and gender. Mahoney and colleagues (1987) found differences in mental skills between males and females across sports within a non-elite group: females tended to report lower self-confidence than males. They also used more self-talk during their performances, and reported more frequent anxiety problems. However, these differences did not emerge when a separate analysis was run comparing male and female elite athletes. Similarly, Taylor and colleagues (2008) found that mental skills in relationship to gender showed significant differences in competition situations but not in practice situations. In competition situations females reported more positive self-talk than males, however in practice situations no significant difference related to gender was found. Other research studies found differences in relation to

context, for example Thomas and colleagues (1999) reported that males scored lower on goal setting, activation and attentional control than females did in the practice context. In contrast, in the competition context males scored higher on automaticity but lower on imagery than females did. In 1993, Weinberg, Burton, Yukelson and Weigand investigated goal setting in competitive sport and found that results indicated that males scored higher on outcome goals than females. In general males tended to be more oriented toward winning, competition and social comparison than females who were more oriented toward their own personal standards and performance goals. To sum up, several studies have reported differences between male and female athletes in relation to the use of psychological skills, but there is no consensus which makes it difficult to draw strong conclusions. However, researchers underline the importance of taking the context into consideration when studying gender differences. More research on this topic is warranted.

Mindfulness and acceptance-based approach. A tendency to question this PST approach has arisen of late. In contrast, a mindfulness and a acceptance-based approach, which descend from the CBT approach, has been presented in order to achieve a state of greater awareness and acceptance, and also to enhance athletes flow (Gardner & Moore, 2006; Gardner & Moore, 2012; Gardner & Moore, 2004; Birrer, R othlin & Morgan, 2012; Aherne, Moran & Lonsdale, 2011). However, research on the effectiveness of PST shows that the influence of PST on athletes performance had a positive impact (Sharp, Woodcock, Holland, Cumming & Duda, 2013 & Sheard & Goldby, 2006).

Upper high school education with focus on sport in Sweden

Research related to mental skills and upper high school athletes is limited and comparisons between different educational profiles in relation to mental skills even more uncommon. The Swedish school system contains nine years of compulsory school starting from the age of seven and it is followed by a volunteer upper high school education (normally three years). The upper high school education offer 18 national electable programs but the students could also choose education profiles that deviates from the national program structure, one such an example is "National Sport Education" which is an education profile focused on sport (*Upper secondary school*, n.d.). In year 2011, one tenth of the Swedish students in upper high school attended some of the several sport profile programs (Ferry & Olofsson, 2011).

National Sport Education. National Sport Education (in Swedish, Nationell idrottsutbildning, NIU) is an upper high school education with focus on sports - an alternative

for students having a national elite sport career as a goal (“Nationellt godkända idrottsutbildningar”, n.d.). National Sport Education started in the autumn of 2011 and targets youth who want to combine their elite sport career with studies at an upper high school level (*Centrum för idrottsforskning* [Gih], 2012). The education profile includes a subject entitled Special sports, with the purpose of improving knowledge and ability related to performance enhancement (“Nationellt godkända utbildningar”, n.d.) The courses in National Sport Education involve applied elements as well as more theoretical ones. Admission tryouts to the profile are done in consultation with the specialized sports federations (in Swedish *specialidrottsförbunden*) (Polhemskolan, n.d.). The subject Special sports aims to give students the chance to develop knowledge about how the body works in training and competition situations based on sport psychology-, sport medicine- and nutrition theory knowledge, also the subject includes knowledge about aspects that affect physical and psychological performance. The psychological parts concern, among other things, human behavior from an individual- as well as a group perspective, sport psychological factors that affect sport performances and the quality of different training methods for example mental training (*Ämne-Specialidrott (Gymnasieskolan)*, n.d.).

Physical Education Specialization. “Physical Education Specialization” (in Swedish, *Idrottsfördjupning*) is a local upper high school education with focus on sports where students have a chance to immerse themselves in their sport of choice, as long as their sport is connected to the Swedish Sports Confederation (in Swedish *Riksidrottsförbundet*, RF). The students are able to choose courses that enable practicing of their sport during school time as a part of their schedule and the admission tryouts take part at the school. Compared to National Sport Education, Physical Education Specialization is not described as having the same elite athletic focus and they are not entitled to take the subject Special sport (*Idrottsutbildningar*, n.d.) The students take only half the amount of credits in sports and in general have fewer hours of practice on their school schedule. Also the courses are only running during year one and two (Polhemskolan, n.d.).

Aim of the study

The conclusion drawn from previous research in relation to mental skills among adolescents is that there is a need of more research studies targeting adolescents, specifically regarding different education profiles, age and gender. The aim of the present study was to describe the use of mental skills among upper high school athletes. More specifically, to

compare the education profiles National Sport Education and Physical Education Specialization, school year one and two as well as gender.

Based on previous research the following hypotheses were formulated: a) Students in National Sport Education are likely to use more mental skills than students in Physical Education Specialization, b) There is a significant difference in mental skills between students in school year one and students in school year two, and c) There is a significant difference in report of mental skills use between males and females.

Method

Participants

Students from the two education profiles National Sport Education and Physical Education Specialization at an upper high school with sport profile in the southern part of Sweden served as participants. A total of 163 students representing four different sports: soccer (48 males and 16 females), handball (46 males and 29 females), swimming (6 males and 9 females) and basketball (1 male and 8 females), participated in the study. Their year of birth ranges from 1995 to 1997. Exceptional cases were one participant who was born 1993 and two participants who had missing data. Based on the time when the study was performed the estimated mean age was 17.37 ($SD= 0.54$). The National Sport Education group consisted of 83 participants (46 males and 37 females) and The Physical Education Specialization group included 80 participants (55 males and 25 females). Participants were distributed between school year one and two, 108 in year one and 55 in year two.

Measures

The present study had a quantitative approach. A self-reported questionnaire, PACE (Performance And Competition Evaluation) was used. The questionnaire is developed, based on TOPS and OMSAT, and tested by the business Master Sverige AB measures sport psychological skills with the purpose of identifying an athlete's mental skills capacity. The athlete's mental skill profile form the basis for coaches and psychological consultants in their work to improve the athlete's mental skills and in the extension, performance development (Master Sverige AB, 2013). Although it has been used by The Swedish Olympic Committee (SOK) in their work with Swedish athletes (Master Sverige AB, 2013), it has not thoroughly examined in scientific literature. As of now, no research studying the mental skills of upper high

school elite athletes using PACE has been performed. The questionnaire consisted of two parts: a demographic part and a part with questions concerning mental skills.

The Demographics part was designed to obtain specific descriptions of the participant sample, including: age, gender, sport discipline, years in the discipline, sport position, years on elite level and mental skills training experience.

The main part of the questionnaire addressed the use of mental skills. The questionnaire consisted of 52 statements, (e.g. “When I really want to show something for others, I perform worse than normally”, “I make myself relax more if I reach too high on my arousal level”) in the contexts “training” and “competition” respectively. The participants responded to the statements on a 7-point Likert scale from “Never” to “Always” and were required to answer each question before they could move forward in the test. The answers resulted into a subscale of 13 mental skills: Process goal, Outcome goal, Relaxation, Activation, Stress management, Visualization, Positive inner dialogue, Control of negative thoughts, Concentration, Self-confidence, Constructive evaluations, Reframing and Mental preparation (see Appendix A for description).

Procedure

Researchers from the Department of Psychology at Lund University had previously established contact with the principal and the teachers at the school and who agreed to collaborate. All participants were informed by teachers and researchers a while in advance that their school would cooperate with the university and a scientific study would take place in the near future. The participants were informed that participation was voluntary and parental information sheets were sent out (Appendix B and C). An email with a link to the online test was sent from one of the researchers of the study to each student’s email account with instructions of where and when the students should answer the questionnaire. The students filled in the online test in a classroom at their school during a one hour scheduled occasion. At this occasion, a researcher first informed the participants of the structure of the questionnaire as well as the importance of filling in the questionnaire truthfully and individually and to answer in their own speed; that all answers would be analyzed for the whole group and never on individual level; and that the participation was voluntary and anonymous. Participants were also informed that if they had any questions during the test they were required to raise their hands and wait for help. The questionnaire started with information about the test, what PACE meant, and how mental skills are used. The participants were also instructed on how to fill in the questionnaire and how long the test was

expected to take. The next part of the test was the demographic questionnaire followed by the mental skills questionnaire. After finishing the test the participants were allowed to leave the room. During the test, researchers were available to answer questions about the questionnaire and possible issues and ambiguities regarding the meaning of the questions. The author of this study attended the two occasions of data collection and took an active part in the process.

Screening the data file. Data was analyzed through IBM SPSS statistics 20. A strict check for errors was made and frequencies analysis, descriptive analysis and exploratory analysis were utilized to evaluate the possible errors. Through the analyses it was discovered that seven participants had missing values for all variables in the questionnaire (three in training situations and four in competition situations). Since participants who had missing data only lacked one part of two in the questionnaire, their answers could still contribute to the study and it was decided to retain the participants with missing values.

Exploratory analysis was used to identify univariate outliers. Nine variables in training situations and ten variables in competition situations showed outliers. Univariate outliers in more than three variables independent of in practicing or in competition situation attain to seven. The online questionnaire did not allow for a question to remain unanswered or for the answer to fall outside of the scale, two otherwise common sources of univariate outliers. The answers from participants with many outliers were inspected to see if the participants had answered according to some simple system (such as always answering the highest value) which would result in several outliers. However, it was established that no such systematic answering existed, thus no participants were excluded from the study due to univariate outliers.

A test on multivariate outliers was made and were detected by examining Mahalanobis' Distance a method based on the chi-square distribution. Based on a critical value of $\chi^2(13, N=163)=34.528, p<.001$, five cases showed multivariate outliers (Tabachnick & Fidell, 2007). Two of the cases were in competition situations, three in practicing situations and one of these cases figured in both univariate and multivariate analysis. Univariate outliers and multivariate outliers thus resulted in totally 11 cases. To investigate the outliers possible influence on the outcome of the study, two data files were constructed (one including the outliers and one excluding the outliers). Both of the data set was then analyzed by Explorer analysis which showed very little differences concerning mean, normal distribution and test of normality of distribution of scores between the two data files. To further investigate the outliers' possible impact on the outcome, independent-samples T-tests were made on both of

the two data files. The results showed no significance difference between the groups (National Sport Education and Physical Education Specialization) in either of the data files (including and excluding the outliers). Therefore the decision was made to retain all the cases in the dataset, since they did not tend to impact the results.

Preliminary assumption testing for MANOVA was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices and multicollinearity. Multicollinearity was checked by running a correlation, and no correlation exceeded .90 or higher (Tabachnick & Fidell, 2007). A regression analysis was run to ensure no violation to the assumption. Even though the result showed one condition index greater than 30 and one variable with variance proportion greater than .50, the criteria for multicollinearity are suggested for at least two different variables with variance greater than .50 (Tabachnick & Fidell, 2007). Based on this criterion, it was suggested that the data could be used without any serious complications. Remaining assumptions had no serious violations noted. The dependent variables of the MANOVA were the 13 mental skills measured by the questionnaire. When MANOVA was performed to investigate the influence of gender on the 13 mental skills in training context Levene's test showed violation to the assumption of equality of variance for one variable, outcome goal. In this case, a more conservative alpha level of .01 was used (Tabachnick & Fidell, 2007). This means that when the results for the dependent variables were considered separately, in a between-subject study, two Bonferroni adjusted alpha level was used, one at .001 for the outcome goal and one at .004 for the rest of the variables. Also when MANOVA was performed to investigate the influence of gender on mental skills in competition context was made Levene's test showed violation to the assumption of equality of variance for four variables: outcome goal, relaxation, activation, constructive evaluation. In these cases, a more conservative alpha level of .01 was used. This means that when the results for the dependent variables were considered separately, two Bonferroni adjusted alpha level was used, one at .001 for the four variables that violated Levene's test and one at .004 for the rest of the variables (Tabachnick & Fidell, 2007).

Results

Demographic overview

To get an overview of demographics of the participants earlier experiences, a descriptive analysis show the distribution of the number of years the participants have practiced their sports and the level of earlier sport psychology experience.

Number of years practiced sport. In the entire group ($N=163$) the number of years in the sport ranged from a minimum of 2 to a maximum 14 ($M=9.43$, $SD=2.26$). An independent sample T-test was conducted to compare the number of years the students have practice their sports for National Sport Education and Physical Education Specialization. There was no significant difference in scores for National Sport Education ($M=9.30$, $SD=2.32$) and Physical Education Specialization ($M=9.56$, $SD=2.20$ conditions; $t(161)=-.75$, $p=.45$, two-tailed). The magnitude of the differences in the means (mean difference $=.27$, 95% CI $[-.43, .97]$) was small (eta squared $=.003$) (Pallant, 2010). These results showed that there was no difference in how many years students in National Sport Education have practiced their sport compared to students in Physical Education Specialization.

To compare the number of years the students had practiced their sports for school year one and school year two, an independent sample T-test was conducted. There was a significant difference in scores for year one ($M=8.84$, $SD=2.27$) and year two ($M=10.58$, $SD=1.77$) conditions; $t(134.42)=-5.39$, $p<.001$, two-tailed). The magnitude of the differences in the means (mean difference $=-1.74$, 95% CI $[-2.38, -.110]$) was large (eta squared $=.15$) (Pallant, 2010). These results indicated that students who were in their first year of education had practiced their sports on average almost two year less than students in their second year of education.

Earlier experience of sport psychology. The reported earlier sport psychology experience was: none $N=60$, little $N=70$, some $N=30$, a lot $N=2$. Crosstabs was made to compare the level of reported earlier experience of sport psychology for National Sport Education and Physical Education Specialization. Earlier experience was distributed between National Sport Education and Physical Education Specialization presented in table 1. These results showed that there was small difference between the two education profiles in their earlier experience of sport psychology and that most students had non or little earlier experience.

Table 1
Earlier experience of sport psychology

	None	Little	Some	A lot
National Sport Education	31	34	16	2
Physical Education Specialization	29	37	14	0

The use of mental skills

To get an overview of the participants' use of mental skills a descriptive analysis was made. The result showed that among all participants, outcome goal had the highest mean score in training situations (Table 2) as well as in competition situations (Table 3) indicating that upper high school elite athletes use the mental skill outcome goal to a great extent. Second highest scored skill was process goal in training context and self-confidence in competition context. The mental skills that had the lowest mean score was mental preparation in training situation (Table 2) and relaxation in competition situation (Table 3), indicating that upper high school elite athletes use the mental skills mental preparation and relaxation to a lesser degree compared to the remaining mental skills. Second lowest scored skill was positive inner dialogue in training context as well as in competition context.

Table 2
Mental skill scores for upper high school elite athletes in training situation (N=160)

Mental skill	Minimum	Maximum	<i>M</i>	<i>SD</i>
Outcome goal	0.50	6.00	4.77	1.03
Process goal	2.00	6.00	4.40	0.91
Relaxation	1.00	6.00	3.35	0.91
Activation	1.00	6.00	3.81	0.90
Stress management	0.00	6.00	3.84	1.06
Concentration	0.75	6.00	4.12	0.91
Visualization	0.25	6.00	3.54	1.17
Positive inner dialogue	0.00	6.00	3.26	1.02
Control of negative thoughts	1.00	6.00	3.74	1.10
Reframing	0.50	6.00	3.48	0.96
Self-confidence	1.00	6.00	4.37	1.02
Constructive evaluation	0.75	6.00	3.40	1.14
Mental preparation	0.50	6.00	3.05	1.30

Table 3
Mental skill scores for upper high school elite athletes in competition situation (N=159)

Mental skill	Minimum	Maximum	<i>M</i>	<i>SD</i>
Outcome goal	0.75	6.00	4.65	1.02
Process goal	1.25	6.00	3.96	1.00
Relaxation	1.25	6.00	3.37	0.92
Activation	1.50	6.00	3.85	0.93
Stress management	0.75	6.00	3.83	1.04
Concentration	1.00	6.00	4.32	0.91
Visualization	0.00	6.00	3.82	1.28
Positive inner dialogue	0.25	6.00	3.42	1.08
Control of negative thoughts	0.75	6.00	3.99	1.13
Reframing	1.00	6.00	3.54	1.01
Self-confidence	1.00	6.00	4.62	1.04
Constructive evaluation	0.50	6.00	3.62	1.21
Mental preparation	0.00	6.00	3.67	1.38

The relationship between the 13 mental skills was investigated using Person product-moment correlation coefficient. Most variables showed a medium to large positive correlation. In training situation, the three largest correlations were between: relaxation and activation $r=.67$, $n=160$, $p<.001$, process goal and constructive evaluation $r=.66$, $n=160$, $p<.001$ and relaxation and reframing $r=.65$, $n=160$, $p<.001$ (Table 4). In competition situation, the three largest correlations were between: activation and reframing $r=.67$, $n=159$, $p<.001$, process goal and activation $r=.66$, $n=159$, $p<.001$, relaxation and activation $r=.65$, $n=159$, $p<.001$ (Table 5).

Table 5
Mental skill correlation scores in competition situation (N=159)

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Outcome goal	-	.43	.32	.37	.32	.38	.28	.37	.12	.37	.48	.21	.34
2. Process goal		-	.52	.66	.13	.51	.55	.61	.15	.55	.46	.61	.52
3. Relaxation			-	.65	.16	.59	.47	.40	.17	.59	.41	.49	.40
4. Activation				-	.30	.58	.46	.56	.25	.67	.55	.48	.44
5. Stress management					-	.41	.09	.05	.41	.31	.52	.03	.16
6. Concentration						-	.41	.39	.27	.58	.50	.39	.41
7. Visualization							-	.58	-.04	.44	.25	.41	.39
8. Positive inner dialogue								-	.02	.55	.33	.48	.43
9. Control of negative thoughts									-	.37	.50	.03	.22
10. Reframing										-	.47	.50	.44
11. Self-confidence											-	.24	.37
12. Constructive evaluation												-	.36
13. Mental preparation													-

Educational profile and mental skills

A one-way between-groups multivariate analysis of variance (MANOVA) was performed to investigate group differences in mental skills. The independent variable was educational profile and the dependent variables were the 13 mental skills in training situations. No statistical significant difference between education profiles National Sport Education and Physical Education Specialization was found in the training context ($F(13,146)=.96, p=.49$). A second MANOVA was conducted for the mental skills in a competition situation. The independent variable was education profile. Also in this context, no significant difference between the two educational profiles was found ($F(13,145)=1.27, p=.24$). This means that there were no differences in reported mental skills between students studying either the National Sport Education or Physical Education Specialization, neither in training situations nor in competition situations.

School year and mental skills

Two MANOVAs were performed to investigate differences in mental skills depending on year (students in their first year of education, year one, and students in their second year of education, year two). No statistical significant difference between years was found in the training situation ($F(13,146)=1.04, p=.41$) or in competition situation ($F(13,145)=.49, p=.93$). This means that there was no difference in reported mental skills between students who were in their first year of education and students who were in their second year of education, neither in training situations nor in competition situations.

Gender and mental skills

Training context. A MANOVA was performed to investigate the influence of gender (independent variable) on mental skills (dependent variables) in training context. The analysis showed a statistical significant difference between males and females on the dependent variables in the training context $F(13,146)= 4.15, p<.001$; Wilks' Lambda=.73; partial eta squared =.27. The mental skills that showed a significant difference was: outcome goal $F(1,158)=21.06, p<.001$, partial eta squared= .12, stress management $F(1,158)=9.14, p=.003$, partial eta squared=.06 and self-confidence $F(1,158)=22.70, p<.001$, partial eta squared=.13. An inspection of the mean scores indicated that males reported slightly higher levels in all the three concerned variables: outcome goal, stress management and self-confidence (Table 6).

Table 6

Mental skills with significant difference between gender in training context

Mental skill	Male (N=99)		Female (N=60)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Outcome goal	5.04	0.79	4.31	1.21
Processgoals	4.46	0.93	4.31	0.89
Relaxation	3.41	0.96	3.25	0.81
Activation	3.88	0.96	3.68	0.79
Stress management	4.03	1.06	3.52	0.99
Concentration	4.25	0.81	3.89	1.04
Visualization	3.74	1.14	3.22	1.16
Positive inner dialogue	3.30	0.98	3.20	1.09
Control of negative thoughts	3.87	1.11	3.51	1.05
Reframing	3.53	1.01	3.39	0.87
Self-confidence	4.65	0.93	3.90	0.99
Constructive evaluation	3.50	1.21	3.23	0.99
Mental preparation	3.22	1.35	2.78	1.18

Competition context. A second MANOVA was performed to investigate the influence of gender (independent variable) on mental skills (dependent variables) in competition context. Also in this context, there was a statistical significant difference between males and females $F(13,145)= 4.04, p<.001$; Wilks' Lambda=.73; partial eta squared =.27. The mental skills that showed a significant difference was: outcome goals $F(1,157)=15.88, p.<001$, partial eta squared=.09 and self-confidence $F(1,157)=23.58, p<.001$, partial eta squared=.13. An inspection of the mean scores indicated that males reported slightly higher levels in the two concerned variables: outcome goals and self-confidence (Table 7)

Table 7

Mental skills with significant difference between gender in competition context

Mental skill	Male (N=99)		Female (N=60)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Outcome goal	4.89	0.84	4.25	1.16
Processgoals	4.00	1.05	3.88	0.93
Relaxation	3.44	1.01	3.25	0.75
Activation	3.91	1.00	3.77	0.80
Stress management	3.93	1.03	3.66	1.03
Concentration	4.36	0.88	4.25	0.95
Visualization	3.97	1.30	3.57	1.22
Positive inner dialogue	3.47	1.09	3.33	1.06
Control of negative thoughts	4.18	1.12	3.67	1.08
Reframing	3.57	1.07	3.48	0.92
Self-confidence	4.91	0.92	4.14	1.05
Constructive evaluation	3.63	1.32	3.62	1.00
Mental preparation	3.75	1.42	3.54	1.31

Discussion

The use of mental skills

The mental skill use among upper high school elite athletes has been described and the results indicated that the athletes tended to use outcome goal in both training and competition context, process goal in training context and self-confidence in competition context to greater extent than remaining skills. However, they used to a lesser degree mental preparation in training context, inner dialogue in both training and competition context and relaxation in competition context. A possible explanation to the extended use of outcome goal could be that coaches and teachers, and in the extension the athletes, perhaps perceive that it is relatively easy to focus on a competitive result of an event. A possible explanation to the lesser use of relaxation in competition context could be that many athletes have difficulties to cope with negative stressors in competition situations. An interesting note is that some of the mental skills that got the highest respectively the lowest score are skills that Hardy and colleagues (1996) called basic psychological skills.

Comparison between National Sport Education and Physical Education Specialization

In this study it was hypothesized that there is a significant difference between students who were part of the National Sport Education profile and students who were part of the Physical Education Specialization education profiles in their mental skills. However, the results about the two education profiles showed no significant difference in neither of the two contexts, training and competition. Thus, the hypothesis was not supported. Earlier research has shown that there were differences between more successful/high-level performing athletes and less successful/lower-level performing athletes in their use of mental skills (Mahoney & Avenier, 1977; Mahoney et al., 1987; Thomas et al., 1999; Durand-Bush et al., 2001; Gould et al., 2002). The athletes in this study were distributed between the two education profiles National Sport Education and Physical Education Specialization where the students on National Sport Education had a more elite athletic focus (Polhemskolan, n.d.). A possible explanation to the present results could be that National Sport Education didn't get the education in psychological aspects recommended by the Swedish National Agency for Education (*Ämne-Specialidrott (Gymnasieskolan)*, n.d) and therefore reported the same level of mental skills as Physical Education Specialization. Another possible explanation is that students in National Sport Education did get the recommended education but that the students in Physical Education Specialization also got the same education in psychological aspects and therefore had the same knowledge and reported the same level of mental skills as National Sport Education. Since it is common that teachers educate several classes, it is likely that the borders between profiles are partially erased.

Another possible explanation is that the students, independent of education profile, have obtained approximately the same knowledge of mental skills from their previous experience and training in their own sports associations. Even though National Sport Education had more elite athletic focus it is not guaranteed that better athletes necessarily choose this education over Physical Education Specialization. Indeed, students in both profiles had similar amount of athletic experience, the test for the number of years in practice showed that there were no significant differences in the number of years the athletes have practice their sport between National Sport Education and Physical Education Specialization. Also, the results about earlier experience of sport psychology showed that there were no significant differences in earlier sport psychology experience between National Sport Education and Physical Education Specialization. Previous research, where differences in mental skills between groups were found, had compared groups with a clear difference in athletic level or performance. For example, Taylor and others (2008) compared Olympic

medalists with Olympic non-medalists and Durand-Bush and colleagues (2001) compared elite athletes who were competing on national or international level with competitive athletes, who were competing in university teams or local sport clubs. The difference between the athletic level in National Sport Education and Physical Education Specialization could possibly be too small to note differences in mental skills, for example, both groups are in their early career and they tended to have similar amount of sport experience.

Comparison between school year one and two

The second hypothesis in this study was that there is a significant difference between students in school year one and students in school year two in their mental skills. However, also in this case the results about the two year showed no significant difference in either of the two contexts, training and competition. Thus, the hypothesis was not supported. Earlier research has shown some differences in mental skills between age groups (Bebetsos & Antoniou, 2003; Géczi et al., 2009; Munroe-Chandler et al., 2012; Thomas et al., 1999; Taylor et al., 2008). A possible explanation to the results could be that the students in year two didn't get more education in psychological aspects and therefore reported the same level of mental skills as year one. Instead it is possible that the students got most of their mental skills from practicing in their sport clubs. Furthermore, the result could have been slightly distorted by the fact that the age of the athletes didn't strictly follow the year they are in. The median year of birth in year one was 1996 and in year two 1995, however for instance five students in year one were born 1995 and one student was born 1993. Even though there was a significant difference between the two groups in how many years they had practiced their sport, this difference in comparison to the total amount of years of practice was relatively small. In previous research where significant differences were found, the difference in age between groups was bigger compared to this study in which the difference was only one year (Bebetos & Antonious, 2003; Géczi et al., 2009; Munroe-Chandler et al., 2012; Thomas et al., 1999; Taylor et al., 2008). For example Géczi and colleagues (2009) didn't find a difference between 16 year olds and 18 year olds or between 18 year olds and 20 year olds in psychological characteristics, while they did find a difference comparing 16 year olds and 20 year olds. This result indicates that slightly larger age differences are needed to detect possible differences in mental skills. The fact that only one year differed between the two groups in this study, could explain why the test showed no significant results.

Gender comparison

In this study, the third hypothesis was that there is a significant difference between males and females in their mental skills. As was hypothesized, the results about males and females showed significant difference in both of the two contexts, training and competition. Thus, the hypothesis was supported.

Research has showed that there is a difference between males and females in mental skills and that the skills varied in different contexts (Thomas et al., 1999; Taylor et al., 2008). In this study, males scored higher on outcome goals, stress management and self-confidence than females in training situations, but in competition situations they only scored higher on outcome goal and self-confidence. This result is in agreement with Mahoney and colleagues (1987) results where females tended to report lower self-confidence than males. The fact that males scored higher than females in self-confidence could perhaps be explained with a “male-focus” in sport and society that has a long tradition in supporting males and their performances to a greater extent than for females. An alternative explanation could be that both males and females have the same level of mental skills but that their self-image contributes to the level of self-report in the questionnaire. An interesting aspect is that Thomas and colleagues (1999) found that, in a practice context males scored lower in goal setting than females did, a result standing in contrast to the results of this study where males scored higher in the similar mental skill outcome goal in both practice and training contexts. On the other hand the results from Weinberg and colleagues (1993) showed that males scored higher on outcome goals than females and females tended to set more performance goals than males which are in agreement with this study. Males and females do not typically practice and compete together, so an explanation for the difference in mental skills could be that the structure of the practice or the trainer interaction during competition is different between the genders. This can be due to an either conscious or sub-conscious behavior of coaches and teachers based on their expectations of differences between males and females. Bringing this gender difference in to light could help teachers and coaches to actively equalize their behavior. It could also be advantageous for males and females to practice together so that they are exposed to the same situations. As Hardy and colleagues (1996) proposed in their model, the whole organizational environment influences the athletes’ mental skill training and besides the school, the sport clubs also have an important influence on athletes’ mental skills. It is therefore important to bring the results of the study to sport clubs, where the athletes have much of their early exposure and where part of the athletes’ self-confidence is established.

Limitations

This study was a cross-sectional study with the aim to investigate the report of use of mental skills among upper high school athletes and had therefore the limitation to only make statements about upper high school athletes in the specific studied educational profiles, school years and sports. Other results may possibly have been reported if other context was studied or if the study was designed differently. For example, this study could only make statements for the athletes' reports of mental skills use in the school year they were measured in, but could not follow the development of mental skills of students going between school years, which would have required a longitudinal study, following the students over time. Furthermore, the results were based on only the sports represented in the study and it is not known how the results relate to other sports in other upper high schools. This study had a majority of team sports represented which could have a possible influence on the results, an aspect that this study wasn't able to investigate based on the sample size distribution on different sports.

The instrument PACE has been developed and mainly used for working with Olympic athletes, and it has, to the author's knowledge, not before been used to measure the mental skills of upper high school elite athletes. During the testing, participants asked several questions regarding the meaning of some questions and concepts, especially the question relating to "years on elite level" was a source of confusion for many of the participants. This indicated that the questionnaire was not optimally formulated for adolescent athletes in upper high school and thus that participants might not have fully understood all questions. Following up the questionnaire with interviews could possibly help reveal if such problems existed.

A common problem in self-reporting questionnaire is the bias that the participants report a self-image that doesn't match the reality in a sufficiently representative way. Since the participants in this study were measured at one specific time, there is a possibility that independent factors could have influenced the participants' answers. For example, the measures were made in the beginning of the semester and the participants' answers could have been different at the end of the semester. Also the participants' subjective situation could have influenced the answers. For example if a participant was injured at the time for measure, his or her attitude or self-image could have been affected. Furthermore, the fact that some of the sports was in the beginning of the season could perhaps also have influenced the participants attitude and answers. When using self-reporting questionnaire, there is a risk for social desirability bias. In this study the participants could possibly have answered in a way

they thought were appropriate or expected from the researcher. Another limitation of the study is the risk of overlap of mental skills education between the education profiles, since teachers usually have several different classes.

Ideally a larger sample with more diversity and more equal distribution between education profiles, gender and sports would have benefited the study and maybe shown different results. Also, a more equal distribution between individual sports and team sports would have allowed investigation of factors not possible to investigate in this study. For example, team sports and individual sports are practiced differently and perhaps the athletes in the different sport categories used different mental skills or used them to a different degree. The difference between team and individual sports could have affected the study since there was a difference in the ratio of individual athletes to team athletes between genders.

Future research

An improvement to the study could have been to complement the quantitative investigations with qualitative aspects, for example the questionnaire could be followed up with interviews or observations. Personal interviews and/or observations could elicit more information regarding participants' knowledge, use and experience of mental skill, and could provide important insights, which this study was not able access. The complemented interviews could also reveal if there was any misunderstandings and confusion among the participants regarding concepts, definitions and the items in the questionnaire. Longitudinal studies and studies with an experimental design would additionally be preferable in order to study the development of mental skills over time. In future research it would be interesting to compare different sports and mental skills and to compare individual sports and team sports relative to mental skills, an aspect not possible in this study because of a too small sample size. Especially the sample size for individual sports was small, as only one individual sport was represented. Another improvement would be to perform interventions, to investigate how mental skills use could be improved. A possible design could for example be to let students in National Sport Education receive sport psychological consulting as an intervention and use students in Physical Education Specialization as a control group. It would also be interesting to compare groups where men and females train together, with groups where they train apart, to investigate how different constellations of gender influence mental skills.

Conclusion

Mental skills are important factors to enhance the athletes' ability to reach peak performance and should be a natural element of an upper high school education with sport profile. In this study no difference could be found in mental skills between students in different education profiles, and also not when comparing students in year one and two. A proposal is that the school could consider overlooking the syllabus to make sure that the expected level of psychological theory and training is present and is also taught in practice. The study further found that female students had significantly lower self-confidence, outcome goal and, in training context, also lower stress management. Since mental skills are acquired not only in school but also in sport clubs, it is suggested that both schools and sport clubs should try to find ways to improve females' self-confidence and provide help to set realistic goals.

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Appendix A

Explanation of mental skills according to PACE (Performance And Competition Evaluation)

Process goal: The individual expects to, irrespective of other athletes performances, set up goal for their own performance and how to fulfill their tasks.

Outcome goal: The individual expects to, in relation to other athletes' performances, set up goals for their own performance.

Relaxation: The individual expects to control and regulate their own arousal to an optimal level.

Activation: The individual expects to regulate their own arousal level and keep it optimal.

Stress management: The individual expects to handle stressful situations and to control their thoughts, feelings and physiological activation level while performing.

Visualization: The individual use controlled and clear mental images regarding the performance and the improvement of performance.

Positive inner dialogue: The individual has an inner dialogue which is constructive and improves the performances.

Control of negative thoughts: The individual is able to reduce and stop thoughts that has a negative influence on their performance.

Concentration: The individual expects to direct their focus on relevant information and keep it stable.

Self-confidence: The individual is able to believe in their own competence in a specific situation.

Constructive evaluations: The individual expects to evaluate their performances in purpose to improve their skills and capacity.

Reframing: The individual is able to effectively turn an inner negative dialogue to a positive inner dialogue, to keep the positive dialogue motivating and put the negative thoughts in a constructive perspective.

Mental preparation: The individual implement procedures, rituals or established patterns that helps the individual to reach optimal mental state.

Appendix B



NIU

Hej,

Polhemskolan har sedan flera år ett samarbete med Institutionen för psykologi vid Lunds universitet. Under hösten 2012 utökades samarbetet ytterligare, vilket inkluderade ett vetenskapligt projekt som kommer att pågå under flera år. Ambitionen är att följa er, elever på NIU såväl som elever som tar kursen idrottsfördjupning, i er utveckling av idrottspsykologiska färdigheter. Exempel på idrottspsykologiska färdigheter är målsättningstekniker, självförtroende, koncentration och stresshantering i förhållande till träning såväl som tävling. De frågeformulär som kommer att användas heter OMSAT och PACE som bl.a. används av Sveriges Olympiska Kommitté, SOK. Du kommer att bli erbjuden att delta och detta innebär att du fyller i det elektroniska frågeformuläret under skoltid. Detta kommer att ske vid fyra tillfällen under dina tre gymnasieår. Första tillfället är torsdagen den 12 september, ht13. All insamlad information behandlas konfidentiellt.

Förutom att du fyller i frågeformuläret så kommer du även att erbjudas idrottspsykologisk utbildning under läsåret 13/14. Denna utformas som ett samarbete mellan din/dina tränare på NIU och idrottspsykologiska rågivare från Lunds universitet.

Det är viktigt att även dina föräldrar blir informerade om projektet. Därför ber vi dig att visa denna information för dina föräldrar. Om du inte vill delta, d.v.s. fylla i frågeformuläret, ber vi dig att meddela detta till sofia.bunke@psy.lu.se.

Vi ser fram emot att träffa dig!

Karin Moesch, Simon Granér och Sofia Bunke

Forskare i idrottspsykologi vid Lunds universitet

Appendix C



Idrottsfördjupning

Hej,

Polhemskolan har sedan flera år ett samarbete med Institutionen för psykologi vid Lunds universitet. Sedan hösten 2012 utökades samarbetet ytterligare, vilket inkluderade ett vetenskapligt projekt som kommer att pågå under flera år. Ambitionen är att följa er, elever som tar kursen idrottsfördjupning såväl som elever från NIU, i er utveckling av idrottspsykologiska färdigheter. Exempel på idrottspsykologiska färdigheter är målsättningstekniker, självförtroende, koncentration och stresshantering i förhållande till träning såväl som tävling. De frågeformulär som kommer att användas heter OMSAT och PACE som bl.a. används av Sveriges Olympiska Kommitté, SOK.

Du kommer att bli erbjuden att delta i detta projekt, vilket innebär att du fyller i det elektroniska frågeformuläret under skoltid. Detta kommer att ske vid fyra tillfällen under dina tre gymnasieår. Första tillfället är tisdagen den 10 september, ht13. All insamlad information behandlas konfidentiellt.

Det är viktigt att även dina föräldrar blir informerade om projektet. Därför ber vi dig att visa denna information för dina föräldrar. Om du inte vill delta, d.v.s. fylla i frågeformuläret, ber vi dig att meddela detta till sofia.bunke@psy.lu.se.

Vi ser fram emot att träffa dig!

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