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ORIGINAL RESEARCH PAPER

EFFECT OF HIGH-SPEED AND PLYOMETRIC TRAINING FOR 13-YEAR-OLD MALE SOCCER PLAYERS ON ACCELERATION AND AGILITY PERFORMANCE

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Abstract

Acceleration, sprint and agility performance are crucial in sports like soccer. There are few studies regarding the effect of training on youth soccer players in agility performance and in sprint distances shorter than 30 meter. Therefore, the aim of the recent study was to examine the effect of a high-intensity sprint and plyometric training program on 13-year-old male soccer players. A training group of 14 adolescent male soccer players, mean age (±SD) 13.5 years (±0.24) followed an eight week intervention program for one hour per week, and a group of 12 adolescent male soccer players of corresponding age, mean age 13.5 years (±0.23) served as control a group. Pre- and post-tests assessed 10-m linear sprint, 20-m linear sprint and agility performance. Results showed a significant improvement in agility performance, pre 8.23 s (±0.34) to post 7.69 s (± 0.34) ($p<0.01$), and a significant improvement in 0-20m linear sprint, pre 3.54s (±0.17) to post 3.42s (±0.18) ($p<0.05$). In 0-10m sprint the participants also showed an improvement, pre 2.02s (±0.11) to post 1.96s (± 0.11), however this was not significant. The correlation between 10-m sprint and agility was $r = 0.53$ ($p<0.01$), and between 20-m linear sprint and agility performance, $r = 0.67$ ($p<0.01$). The major finding in the study is the significant improvement in agility performance and in 0-20 m linear sprint in the intervention group. These findings suggest that organizing the training sessions with short-burst high-intensity sprint and plyometric exercises interspersed with adequate recovery time, may result in improvements in both agility and in linear sprint performance in adolescent male soccer players. Another finding is the correlation between linear sprint and agility performance, indicating a difference when compared to adults.

Key words: *speed training, agility, adolescent male soccer players*

Introduction

Physical factors are important in youth soccer development, among them running at straight-line speed and change-of-direction speed, often referred to as agility (Stroyer, Hansen & Klausen, 2004). Agility performance is a physiological prerequisite in soccer because players are often involved in sudden direction change in order to be effective during the game (Little & Williams, 2005). Match analyses have shown that sprint time is often only a few seconds (Castanga, D'Ottavio & Abt, 2003), and most sprints are shorter than 20 meter (Haugen et al., 2013).

Physiological consideration and concern regarding trainability are essential in youth athlete development because physiological adaption to training is different from that of adults (Malina, Bouchard & Bar-Or, 2004, Malina et al. 2004b). Growth spurt is associated with physical performance development (Rowland, 2005; Malina, Bouchard & Bar-Or, 2004), and 13.8 (± 0.8) years is the estimated age for peak height velocity for male soccer players, and 14.2 years for samples of European boys (Malina, Bouchard & Bar-Or, 2004). The present literature states that the age between 12 to 15 years is a critical period of speed development or as "windows of trainability" regarding sprint performance (Rumpf, Cronin & Pinder, 2012). Speed training is supposed to have a positive effect, stimulating the nervous system and muscular coordination during this stage of natural maturation (Aagaard, 2001; Mero, 1998), with an increase in testosterone, and in muscle mass (Rowland, 2005; Malina, Bouchard & Bar-Or, 2004). Therefore, training regimens that simulate speed performance are critical for optimal training results at this age (Venturelli, Bishop & Pettene, 2008; Diallo et al., 2001).

Training programs using short sprints have shown an improvement in the performance of adolescents in 10- and 30-meter straight-line sprint (Papiakovou, Giannakos & Michailidis, 2009; Venturelli, Bishop & Pettene, 2008). Pettersen & Mathisen (2012) found improvement in speed and agility in 11- to 12 -year-old soccer players with a program consisting of short-burst high-intensity activities. However, Buchheit et al. (2010) found no effect with repeated shuttle sprint and explosive strength training in adolescent soccer players in 30 meter sprint. In a review article Hughes, Lloyd & Meyers (2012) shows to a significant improvement in sprint performance in boys aged 12 and 15 years, but not in boys aged 11, 13, or 14 years, and concluded that more research is needed to discover the effectiveness of training at these stages of development.

Plyometric drills are recommended in soccer training because of the fast force production and explosive actions with change-of-directions, and their needs for the ability to start and stop quickly (Thomas, French & Hayes, 2009; Little & Williams, 2005). Plyometric training has been shown to improve performance in 10-30 meter straight-line speed in young male athletes (Thomas, French & Hayes, 2009; Meylan & Malatesta, 2009; Kotzaminidis, 2006; Diallo et al., 2001), and also in agility performance (Vaczi et al., 2013; Thomas, French & Hayes, 2009; Miller et al., 2006). However other studies have shown a limited effect in straight-line sprint performance (Haugen et al., 2013); thus, there is still a discrepancy regarding the effect. Plyometric training has been avoided in exercises for children and adolescents because there has been an understanding that it may lead to injuries (Michalidis et al., 2013; Hughes et al., 2012). The current view among researchers is that it is safe, if the program is considered with appropriate training volume and intensity, and that it may reduce the instance of injuries (Meylan & Malatesta, 2009).

Few studies have been conducted with adolescents; most have been executed as a mixture of short sprint with strength training (Hughes, Lloyd & Meyers, 2012)**.** To the authors' knowledge, there is no study involving both short-burst high-speed exercises including plyometric drills in adolescent soccer players. Therefore, in the present study, one of the ordinary soccer training sessions was replaced with those aforementioned exercises for 13-year-old male soccer players. Furthermore, there is uncertainty as to whether ordinary soccer training sessions alone will offer enough stimuli to develop short-speed and agility performance (Jullien et al., 2008, Meylan & Malatesta, 2009); thus, it would be interesting for coaches and practitioners to recognize whether the program would have any effect on speed and agility performance.

Materials and Methods

Experimental approach. To compare the effects of one hour of speed and plyometric training per week versus traditional soccer training, we tested 10-meter and 20-meter linear sprint and agility performance before and after an eight-weeks training program. The intervention took place in the preseason period, and the training group (TG) replaced one of the ordinary soccer training sessions with the intervention program. The training program for this period consisted of short-burst running straight-line sprints, or change-of-direction sprints with maximal effort for 2-6 seconds, and resisted acceleration with a partner, this was interspersed with recovery periods lasting 60 seconds (Pettersen & Mathisen, 2012; Ferrigno

& Brown, 2005). The program also included plyometric drills, which included skipping, multiple hurdle jumps, horizontal and lateral bounding executed as multiple jumps with a variation of single and double leg jumps. Each session started with 10 minutes' warm-up, followed by 15 minutes plyometric drills and 35 minutes of sprint training. The sessions consisted of a total of 30 short-burst sprints; 15 with straight-line and 15 with changes-of-directions, followed by 30 horizontal and vertical jumps (measured as ground contacts) in the first four weeks, and 40 jumps in the final four weeks. The control group (CG) followed an ordinary soccer training program of the same session duration as the TG. Pre- and post-tests assessed 10-m linear sprint, 20-m linear sprint and agility performance.

Participants. Fourteen male soccer players from a local club, with a mean age of 13.5 years (± 0.8), participated in the study. Twelve male soccer players with a mean age of 13.5 years (± 0.7) from another local club at a similar level served as control group (CG). In addition to the intervention program, the participants in the TG undertook two one-hour organized traditional soccer training sessions, and the CG undertook three organized sessions with traditional soccer training. Written informed consent to participate in the study was obtained from both the participants and their parents in both groups. The study was given institutional ethical approval, met the ethical standards in sports and exercise science research (Harris & Atkinson, 2011), and was undertaken in compliance with The Helsinki Declaration.

Test Procedures. The straight-line sprint-test consisted of a 20-meter track with 10-meter split-time recording. The photocells were placed at a height of 20 cm in the starting position, and at 100-cm height at 10-m and 20-m in the straight-line test. All tests were completed from a standing start, with the front foot placed 30 cm behind the photocells' start line. The agility test course was a 20-m standardized course used in previous studies, starting with a 5-m straight sprint followed by a 90° turn, a 2.5-m sprint followed by a 180° turn, a 5-m slightly curved sprint followed by a 180° turn, a 2.5-m straight sprint followed by a 90° turn, and a 5-m straight sprint (Pettersen & Mathisen, 2012). Three 120-cm high coaching sticks, which were not allowed to be touched, were used to ensure correct passage in the turns. The test was executed with the same starting procedure as the straight-line test and with photocells placed at a height of 100-cm at the finish line. Each participant performed two trials with a minimum of three minutes' recovery between; times were recorded to the nearest 0.01 second, and the faster of the two times was recorded. A familiarizing test on the sprint and agility

track was conducted during both the pre- and post-tests with two sub-maximal trials prior to the start of the test. Electronic photocells timing gates were used to record split and completion times (Brower Timing System, USA). The exercises and the tests were executed in a gym with a parquet floor, and with a temperature of 20 ° C. Prior to testing, the participants followed the same warm-up procedure with jogging and sprint drills.

By calculating the intraclass correlation coefficient (ICC), it has been demonstrated that both tests show good reliability (Table 3). Differences between groups were tested with a one-way analysis of variance, and the Pearson product moment correlation *r* was used to evaluate the relationship between linear sprint and agility performance test measures (SPSS 19.0).

Statistical Analyses. Data were checked for normality by a histogram plot and by using the Shapiro-Wilk's normality distribution test. Descriptive statistics were then calculated and reported as mean ± standard deviations (SD) of the mean for each group of players on each variable. Students *t*-test showed no difference in baseline between groups. A one-way between-group analysis of variance (ANOVA) was conducted to find the mean difference between training group and control-group before and after the intervention. The relationship between performances in linear sprints and agility tests was determined by using Pearson's correlation (*r*). The same procedure was used to detect any correlation among linear sprint, agility, and anthropometrical variables. The reliability of tests was assessed using the ICC. The test-retest reliability of parameters describing the players' running and agility performance is shown in Table 3. The ICC values showed good reliability in the tests. All calculations were carried out using SPSS v 19.0 (Inc., Chicago, Il., USA).

Results

Table 1 presents the anthropometric characteristics of the two groups before and after the intervention. There was no significant difference between the groups.

Table1

Anthropometric characteristic of the two groups (mean±SD)

	Training Group		Control Group	
	Pre	Post	Pre	Post
Age (years)	13.5 (0.2)	13.7 (0.2)*	13.5 (0.2)	13.7 (0.2)*
Height (cm)	162.5 (8.1)	163.5 (8.1)*	160.5 (5.7)	161.2 (5.7)*
Weight (kg)	48.8 (10.1)	49.6 (10.1)*	49.3 (5.6)	49.9 (5.5)*

*$p<0.05$ for pre- post-tests within group differences.
No significant differences between groups

The results of pre- and post-tests for both groups are presented in Table 2.

Table 2

Pre- and post-test results for sprint and agility performance (mean±SD) for training group (TG) and control group (CG)

	Training Group		Control Group	
Test	Pre	Post	Pre	Post
10 m sprint (sec)	2.02 (0.11)	1,96 (0.11)*	2.00 (0.11)	2.02 (0.12)
20 m sprint (sec)	3.54 (0.17)	3.42 (0.18)*#	3.55 (0.19)	3.58 (0.20)
Agility (sec)	8.23 (0.34)	7.69 (0.34)*#	8.25 (0.25)	8.18 (0.21)

*p<0.05 for pre- and post-tests within-group change in performance.
#p<0.05 for pre- and post-tests between-group change in performance.

Results showed a significant improvement in agility performance, pre 8.23s (±0.34) to post 7.69s (±0.34) (p<0.01), and a significant improvement in the 0-20 m straight-line sprint, pre 3.54s (±0.17) to post 3.42s (±0.18) (p<0.05). In the 0-10-m straight-line sprint; the participants showed an improvement, pre 2.02s (± 0.11) to post 1.96s (± 0.11), however this was not significant.

Table 3 the intraclass correlation (ICC) and SEM values between test and retest of each dependent variable in the CG, showing good reliability between test and retest.

Table 3

Test-retest reliability coefficients (ICC) and standard error of mean (SEM) values in sprint and agility tests in control group (n=12)

Test	ICC	SEM	p-value
10 m sprint	0.87	0.02	<0.001
20 m sprint	0.95	0.02	<0.001
Agility	0.79	0.07	<0.05

Table 4 shows the correlation between 10-m sprint and agility was r=0.53 (p<0.01), and between 20-m linear sprint and agility performance r=0.67 (p<0.01).

Table 4

The relationship between the performances in straight line sprint and agility performance and height in the two groups (n=26)

Relationship assessed	Pearson's *r*	*p* value
10 sprint vs agility	0.53	p<0.01
20 m sprint vs agility	0.67	p<0.01
height vs 10 m sprint	0.33	not sign.
height vs 20 m sprint	0.34	not sign.
height vs agility	0.11	not sign.

Discussion

In the present study we tested the effect of an eight-week program consisting of short-burst high-speed exercises including some plyometric drills on 13-year-old male soccer players. The main result in the study was a significant improvement (6.6%) in agility performance (Tab. 2), a significant improvement (3.4%) in 20-m straight-line sprint, and an improvement in 10-m straight-line sprint (3.0%), not significant between groups (Tab. 2). Sprint training is appropriate at the age of 12-15 years for the male population, because the improvements in strength, power and neural adaption are due to the rise of testosterone level at this stage of development (Rowland, 2005; Malina, Bouchard & Bar-Or, 2004). Growth spurt with an increase in testosterone and following an increase in muscle mass may partly explain the improvement in performance (Rowland, 2005; Viru et al., 1999); however, the duration of the intervention period was only eight weeks, and no significant changes in sprint and agility performance were found in the CG (Tab. 2). To the author's knowledge, this is the first study of adolescents soccer players involving both a speed and a plyometric program. The result from the present study is in accordance with that of previous research consisting of short-burst speed-training programs in 11-12-year-old soccer players (Pettersen & Mathisen, 2012), and speed combined with strength training (Rumpf et al., 2012; Kotzaminidis, 2006; Castanga, D'Ottavio & Abt, 2003). Plyometric training program has been shown to be effective in developing agility performance among youth soccer players (Meylan & Malatesta, 2009, however a study by Thomas, French & Hayes (2009) found no effect in straight-line sprint.

There is a suggestion that the positive effects in the present study are related to the choice of exercises in the intervention program, consisting of sprinting with change of directions, acceleration and deceleration, and plyometric drills with jumping, bounding and hopping exercises (Miller et al., 2006). Strength, balance and neuromuscular coordination are influenced by explosive actions throughout the training program, and plyometric and sprint training have been shown to improve these requirements (Meylan & Malatesta, 2009; Thomas, French & Hayes, 2009; Sheppard & Young, 2006; Ferrigno & Brown, 2005; Aagaard, 2003). The improvement is supposed to be due to the fact that neuromuscular adaptions including recruitment, activation of motor units, and coordination of muscles, are likely to have occurred (Thomas, French & Hayes, 2009; Rowland, 2005). Hughes, Lloyd & Meyers (2012) concluded that performance adaptions gained from sprint and plyometric training programs are linked to neural plasticity, especially at the onset of puberty.

Body height is a factor that indirectly affects speed through stride length in children and adolescents, and it has been shown that taller and heavier players are more often selected in teams younger than 18 years (Gravina et al., 2008; Gil et al., 2007). Almuziani (2000) found a correlation between the 50-meter sprint and relative height in 12-year-old boys, and Rowland (2005) shows an improvement in sprint velocity connected to height and stride length in children and youths up to 15 years. Maturational level is related to height at that age, and the adolescent spurt with enhancement in muscle mass occurs shortly after peak high velocity (Malina, Bouchard & Bar-Or, 2004). Findings from the present study showed a weak correlation between height and speed in 10-m (r=0.33) and in 20-m sprints (r=0.35), and in agility (r=0.11) (Tab. 4), and these results may be somewhat surprising. However, it is suggested that speed performances is more related to biological maturation than to anthropometric characteristics such as height alone (Mendez-Villnueva et al., 2011), and that other factors, such as stride frequency, attributed to neural factors are linked to speed ability, and also coordination and technique are linked to speed performance (Papiakovou, Giannakos & Michailidis, 2009).

This study also showed a significant relationship between 10-m linear sprint and agility performance, r=0.53 ($p<0.01$), and between 20-m linear sprint and agility, r=0.67 ($p<0.01$) (Tab. 4). Straight-line sprint and change-of-direction speed have been found to be independent abilities that are specific and produce limited transfer to each other in adult athletes (Little & Williams, 2005; Young, McDowell & Scarlett, 2001). However, Jones et al., (2009) suggest that a positive effect in straight-speed may lead to an improvement in change-of-direction speed. There are few studies on the topic; however, two studies with soccer players and basketball players aged between 11 and 14 years found a stronger correlation in linear sprint and agility performance than in adults (Jakovljevic et al., 2012; Pettersen & Mathisen, 2012). Common physiological and biomechanical determination may imply transfer to each other (Jakovljevic et al., 2012, Pettersen & Mathisen, 2012) and raise the issue of whether there is a stronger relationship between straight-line speed and agility performance in the youth population than among adults.

Moreover, there is a question about the effect of enhanced speed and agility performance on soccer match play. The capacity to produce high-speed actions is known to have an impact on soccer match performance (Little & Williams, 2005), and both initial acceleration and agility performance are found to be powerful discriminators between elite and regional junior players (Reilly, Bangsbo & Franks, 2000; Reilly et al.,

2000b). Therefore, the program demonstrated in the present study consisting of speed and plyometric training may have a positive effect on this type of physical demand. The current study indicates that a training program including straight-line sprints, sprints with changes-of-directions, and plyometric training, is effective in the development of sprint and agility performance in adolescent soccer players beyond the gain of traditional soccer training alone in adolescents.

Conclusions

From the results obtained in the present study, speed and plyometric training in one training session per week over eight weeks is sufficient to enhance sprint and agility performance in youth players in the preseason period. Taking into account the background from previous reports and with the demands for speed and agility performance in soccer, these physical factors have been shown to contribute to performance in match play. Therefore, since these qualities are important, and seem vary in the performance of young soccer players, speed and plyometric exercises ought to be part of a training program in adolescent soccer players in the pre-season period.

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ORIGINAL RESEARCH PAPER

THE IMAGE OF A PHYSICAL EDUCATION TEACHER AS SEEN BY SCHOOL COMMUNITY

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Abstract

The aim of the research was to get to know the image of physical education (PE) teachers as seen by themselves and to compare it with how it is perceived by school community. The study included 148 teachers and 171 final-year students from upper-secondary schools. As a result of purposive sampling and random-purposive sampling, three groups were distinguished. The groups included PE teachers (n=22), teachers of other subjects (n=22) and students (n=22). The data were gathered using ACL-37 (Adjective Check List) developed by G. Gough and A. B. Heilbrun. The findings revealed a number of significant differences between how PE teachers perceive themselves and how they are seen by their students and colleagues (teachers of other subjects). It turned out that PE teachers perceive themselves in a more positive manner than the other groups.

Key words: *image, PE teacher, students, teachers, school community, relations.*

Introduction

The quality of teaching is a crucial matter of national identity and an element that contributes to social and economic development. Changes resulting from the globalisation process have brought about evolution in youth education. Currently even great skills and professional knowledge of physical education (PE) teachers may be insufficient to teach and educate effectively (Arrighi &Young, 1987) and to instil the need to perform physical activity continually after finishing education (Rink & Hall, 2008). These days, apart from formal preparation and experience, one of the working tools of teachers is their image in school community. The image is created in consciousness individually on the basis of personal experience

gained through interactions and opinions of external environment (mass media, friends, family, etc.) (Kestere et al., 2013). The image of a given professional group is the way they are perceived by members of another group, which translates directly into relations as well as attitude towards them. School environment and its atmosphere are essential factors that motivate students and teachers (Skinner & Belmont, 1993). Some elements of the environment and its atmosphere are created by peers, while the other ones are formed by teachers through e.g. evaluation system, task levels or their performance methods (Smuka, 2012). Students who experience positive atmosphere in class and school and are treated by their teachers in a democratic way learn better, acquire knowledge and values more easily and shape their own identity consciously (Banks, 2008). How teachers are perceived is a significant factor that influences relations and atmosphere in a school community. Miron (1983) and Dressel (1987) indicate that the image of 'a good teacher' consists of such elements as (1) knowledge, (2) organisational and methodology skills as well as (3) relations between a teacher and a student. Duvivier et al. (2009) point to (1) personality traits, (2) qualifications and (3) strategies (ability to put knowledge into practice), whereas Barone (2004) claims that, apart from (1) personality traits and (2) a skill of sharing knowledge, experience and practical activities, also (3) discipline skills influence the image of teachers to a large extent. Therefore, according to future teachers, a good teacher should be characterised by two components, i.e. personality and specialist knowledge. As for personality, subjects pointed to empathy and care as the most desirable features (Arnon & Reichel, 2007). Students' expectations regarding good teachers are conditioned by cultural and ethnic factors (Reichel & Arnon, 2009). It shows that the shaping of a positive image of a teacher depends on many variables.

As far as performing social roles is concerned, both the external and internal images are of considerable importance. High self-esteem helps to make use of your own potential more effectively. It increases your trust and faith in your skills and abilities and it contributes to changes in behaviour patterns resulting from other people's opinions. Conversely, low self-esteem is conducive to limiting activity and expansiveness and it also leads to avoiding challenging tasks (Owens,1993).

The image of a professional group currently constitutes an interesting research area owing to implications it may have in the process of creating attitudes towards physical activity as well as forming mutual relations between different groups in school community.

The aim of the research was to get to know the image of PE teachers as seen by themselves and to compare it with how it is perceived by school community (students and teachers of other subjects).

Material and methods

The research included 22 PE teachers and 126 teachers of other subjects as well as 171 final-year students from 5 upper-secondary schools from different towns of Lubelskie province. Three same-size groups were selected for the study. In total, the comparative analysis included 66 people from the following groups:

- GROUP I – 22 physical education teachers from upper-secondary schools – 9 women and 13 men aged 26-55 (M=39.50, SD=8.21) who had between 3 and 30 years of working experience (M=14.86, SD=8.11);
- GROUP II – the group was created by purposive sampling (pair sampling taking into account such variables as age, gender and working experience). From among 126 teachers of subjects other than physical education, 22 respondents were selected, i.e. 9 women and 13 men aged 30-54 (M=40.09, SD=7.76) with working experience between 5 and 29 years (M=14.95, SD=8.14). No significant differences between group I and group II regarding age (U=233.50, p=0.84) and working experience (U=240.00, p=0.96) were observed.
- GROUP III – 22 participants aged 18-19 (M=18.36, SD=0.49) were selected (random-purposive sampling) from the group of 171 students. Population and gender of the respondents were controlled (9 women, 13 men).

All the participants were asked to complete the ACL-37 sheet (Adjective Check List) developed by G. Gough and A. B. Heilbrun. They were instructed to look at the list of 300 adjectives and tick the ones which best described PE teachers.

After controlling the accuracy of the completed sheets (No.Ckd value, i.e. the total number of adjectives checked, was higher than 19, the score on the communality scale Com was higher than 25, the value for each participant calculated from the 2COM+MLS-Unfav formula [COM – communality scale; MLS – military leadership scale; Unfav – number of unfavourable adjectives] was above 20 points), calculating raw scores and qualifying each person for a particular group (taking gender into consideration), every single result was compared to Polish T-score norms (Martowska, 2012). The analysis was carried out on the basis of results obtained within 37 scales classified into five groups:

- modus operandi – No.Ckd – total number of adjectives checked, Fav – number of favourable adjectives checked, Unfav – number of unfavourable adjectives checked, Com – communality scale;
- need scales formed according to the theory of H. A. Murray – the need of Ach – achievement, Dom – dominance, End – endurance, Ord – order, Int – intraception, Nur – nurturance, Aff – affiliation, Het – heterosexuality, Exh – exhibition, Aut – autonomy, Agg – aggression, Cha – change, Suc – succorance, Aba – abasement, Def – deference;
- topical scales that take into consideration the aspect of interpersonal functioning: Crs – counselling readiness scale, Scn – self-control, Scf – self-confidence, Pad – personal adjustment, Iss – ideal self-scale, Cps – creative personality scale, Mls – military leadership scale, Mas – masculine attributes scale, Fem – feminine attributes scale;
- transactional analysis scales referring to the concept of E. Berne: CP – critical parent, NP. – nurturing parent, A – adult, FC – free child, AC – adapted child;
- scales of structural dimensions of personality referring to the concept of G. Welsh: A1 – high origence – low intellectence, A2 – high origence – high intellectence, A3 – low origence – low intellectence, A4 – low origence – high intellectence.

The above-mentioned presentation of scales and the method of data interpretation shown later on in this work were prepared on the basis of the available literature of the subject (Gough et al. 2012; Martowska, 2012).

Results

At the first stage the results obtained by PE teachers were analysed (Table 1 – grey column). Their scores were related to respective T-score categories (0-29 – very low scores, 30-39 – low scores, 40-60 – average scores, 61-70 – high scores, 71-100 – very high scores) and then the obtained profile was interpreted. The vast majority of scores fell within average scores.

PE teachers describe themselves as being enterprising as well as ready and able to take the initiative, set even long-term goals and engage in hard work that would lead to achieving these goals. Task-oriented approach, diligence, conscientiousness, self-discipline, persistence, activity as well as strong will, ambition and readiness to take risks are undoubtedly connected with two traits that are worth copying, i.e. perseverance and efficiency. Cognitive skills (rationalism, quick thinking and reacting, perceptiveness, logicality, analyticity, wide interests) may turn out to be useful in this

process. PE teachers claim they are not competition-oriented. However, their great effort put into fulfilling a task as well as their willingness to meet the established criteria and socially accepted standards may lead to their being perceived by some as "programmed", dominant, disrespectful of other people's feelings and opinions or even ruthless (ready to use force) and condescending. A kind of interpersonal effectiveness, social ease, assertiveness, skilful group management particularly in the case of socially desirable activities and paying little attention to other people's opinions are useful when trying to achieve goals. Self-confidence, especially in task situations, causes PE teachers to pay little attention to possible criticism. They do not analyse their own behaviour as well as that of others thoroughly. They just accept it. However, they demonstrate the need of affiliation. Yet in many cases the need to be liked is connected with their concern for maintaining social status. It does not mean, though, that teachers are not gentle. They like people and they enjoy working with them and helping them. PE teachers respect socially accepted rules and cultivate established norms and values. They can control their own needs in order to attain a goal and they do not tolerate any disruptions regarding their activities. Therefore, it may be stated that their activities, productivity and reliability are, in a sense, accompanied by their resignation from individuality (in an emotional dimension as well) and it is necessary for them to suppress their own emotions. They appreciate autonomy and moderation and refrain from being over-expressive. Such control does not always have to be an indication of composure. Social roles they assume seem to be limited to the main course of action they are engaged in. PE teachers are success - and goal-oriented and at the same time they try to prove themselves and earn a particular reward. It gives them a feeling of security. Also, they have a positive attitude to life and appear to be well-adjusted and satisfied with life.

The next analysis stage consisted of comparing the scores of PE teachers with other groups, i.e. with teachers of other subjects and with students separately. Due to a low number of subjects in the compared groups, the analyses were made with the use of no-parametric U Mann-Whitney test. These results are shown in table 1. Significant values of U Mann-Whitney test are marked in dark grey (according to the formula of comparisons: Group I-Group III and Group II-Group I).

Table 1

Analysis of scores in particular scales (ACL-37 measurement) and differences between groups

	GROUP II teachers of other subjects		*GROUP I PE teachers*		*GROUP III students*	
	*RS**	*CS**	*RS**	*CS**	*RS**	*CS**
	M;SD	*M;SD*	*M;SD*	*M;SD*	*M;SD*	*M;SD*
No.Ckd	30.59;14.36	34.18;3.82	39.73;24.86	36.73;6.80	42.72;23.98	37.50;6.56
Fav	15.95;9.71	48.45;10.22	25.04;14.12	58.50;10.09	22.59;14.59	49.04;11.34
	----------		*U=121.00; p≤0.01*			
	U=123.50; p≤0.01				----------	
Unfav	1.95;2.80	45.77;10.73	0.45;0.86	39.73;2.29	1.95;2.80	45.77;10.73
	----------		*U=133.50; p≤0.01*			
	U=148.00; p≤0.05				----------	
Com	2.86;2.98	47.63;10.78	6.00;3.65	56.45;9.27	2.86;2.98	47.64;10.78
	----------		*U=144.00; p≤0.05*			
	U=111.00; p≤0.01					
Ach	5.41;3.84	57.14;13.54	7.77;4.15	63.09;9.91	5.41;3.84	57.14;13.54
Dom	4.54;2.44	60.09;7.14	5.45;3.22	61.64;6.56	4.86;3.28	58.50;7.12
End	3.82;4.81	51.45;13.34	7.14;4.11	58.95;4.91	5.36;4.82	51.86;8.40
	----------		*U=128,00; p≤0.01*			
Ord	2.45;3.53	50.77;12.07	5.59;3.55	60.00;5.14	4.18;3.87	52.95;7.65
	----------		*U=118.50; p≤0.01*			
	U=125.00; p≤0.01				----------	
Int	2.64;3.95	43.04;11.46	7.04;4.35	58.59;6.67	5.86;5.33	50.27;13.82
	----------		*U=146.50; p≤0.05*			
	U=63.00; p≤0.01				----------	
Nur	2.54;3.68	43.77;9.67	5.63;4.75	50.18;7.79	3.95;5.02	43.73;10.48
	----------		*U=155.50; p≤0.05*			
	U=155.00; p≤0.05				----------	
Aff	8.14;4.81	51.68;12.41	10.04;6.46	51.91;10.20	9.95;5.58	49.23;11.50
Het	2.45;2.81	46.73;10.34	2.41;2.70	44.32;6.22	2.77;2.74	44.59;6.96
Exh	3.00;2.31	55.54;6.22	2.32;2.46	52.95;6.24	3.23;2.22	54.32;4.54
Aut	1.23;2.39	49.82;9.98	0.59;2.03	46.14;9.47	1.82;2.36	51.86;9.52
Agg	-0.50;2.72	55.14;6.65	-2.18;2.08	51.18;5.46	-0.68;2.83	55.04;7.32
	U=143.00; p≤0.05				----------	
Cha	1.64;2.10	52.64;11.23	1.54;1.87	51.09;9.81	0.77;1.38	46.59;5.55
Suc	-0.09;1.31	45.91;7.08	0.09;1.60	48.63;8.31	-0.73;1.72	45.18;8.64
Aba	-1.36;1.53	42.59;5.63	-0.68;1.36	45.32;6.02	-1.50;1.82	43.09;4.96
Def	-0.09;1.82	46.91;5.17	0.63;1.79	48.82;6.28	0.32;2.01	47.59;6.47

Table 1 (continued)

Analysis of scores in particular scales (ACL-37 measurement) and differences between groups

Crs	-4.00;5.13	45.01;12.09	-3.36;4.83	48.09;8.04	-3.59;5.87	40.00;10.37
Scn	-0.45;2.15	48.23;7.16	0.73;1.93	51.82;6.24	0.09;1.69	50.18;5.74
Scf	6.23;3.74	60.68;11.07	7.14;4.39	61.04;9.38	6.86;4.40	57.95;8.70
Pad	3.59;2.99	53.41;10.95	5.36;2.77	58.73;7.21	4.63;3.57	53.14;11.51
Iss	4.91;4.14	59.77;11.56	7.14;4.58	64.86;11.20	5.82;5.08	57.77;9.82
	----------		*U=151.50; p≤0.05*			
Cps	2.27;2.33	59.64;8.91	2.82;2.74	60.77;13.17	2.14;2.45	55.77;8.27
Mls	3.32;3.89	51.54;10.26	6.91;3.86	61.91;8.40	6.14;4.70	55.27;9.66
	----------		*U=146.50; p≤0.05*			
	U=108.50; p≤0.01				----------	
Mas	3.41;2.04	52.09;9.59	4.36;3.55	54.14;12.55	5.27;3.41	55.54;8.81
Fem	2.68;2.25	42.09;12.73	4.32;3.27	49.00;11.58	3.73;2.66	42.77;7.89
Cp	2.32;1.61	49.86;5.79	2.41;2.30	49.09;8.18	2.63;3.29	47.59;7.96
Np	3.45;3.58	48.18;8.52	7.14;4.37	56.18;5.97	5.82;4.77	50.95;8.95
	U=104.50; p≤0.01				----------	
A	2.50;3.74	49.73;9.37	5.77;4.41	57.41;6.18	4.68;4.52	53.09;8.15
	U=140.00; p≤0.01				----------	
Fc	3.44;3.10	57.77;8.35	2.68;2.77	54.32;6.78	2.73;2.62	53.09;8.15
Ac	-3.36;3.47	44.27;12.19	-6.41;4.28	36.45;8.44	-5.64;4.49	41.32;11.33
	U=146.50; p≤0.05				----------	
A1	1.50;1.44	46.14;10.78	1.18;1.40	41.95;7.59	1.68;1.81	43.54;9.07
A2	1.82;1.40	45.95;7.31	1.95;1.89	44.27;7.67	2.32;1.91	46.18;8.83
A3	3.95;2.55	51.27;9.32	4.91;2.96	52.50;8.40	4.95;3.00	50.32;10.26
A4	3.45;2.77	51.09;9.16	6.13;3.48	60.68;8.90	5.00;3.48	52.73;9.91
	----------		*U=131.50; p≤0.01*			
	U=110.00; p≤0.01				----------	

* RS – raw scores; CS – calculated scores

Note: the key to other abbreviations and the description of ACL-37 scales can be found in the section referring to the methodology of the authors' own research

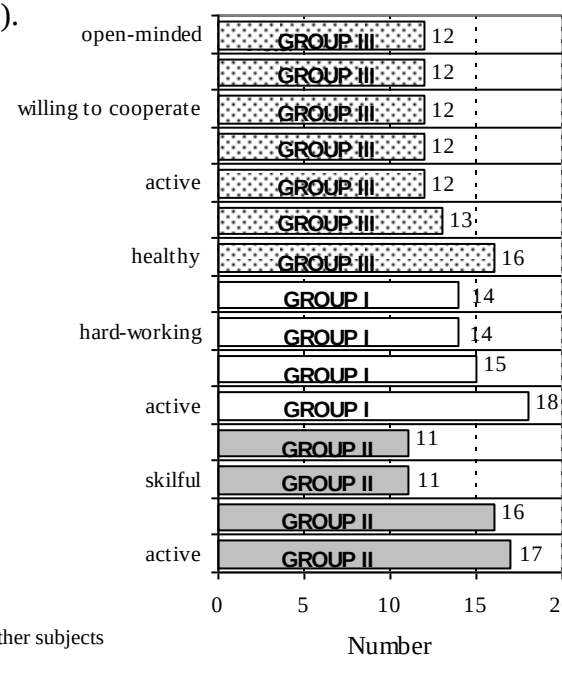
The findings revealed a number of significant differences between how PE teachers perceive themselves and how they are seen by their students and colleagues (teachers of other subjects).

Both groups (teachers of other subjects and students) claimed that PE teachers (compared to how they see themselves) are slightly less adjusted; they are impulsive, uncertain about their future, demonstrating an ambivalent attitude towards others and defensive patterns of behaviour (e.g. they express disagreement in a way different from the norm – by arguing or being acquiescent). They are less intellectual with fewer general interests. They are less interested in another person. In their opinion, PE teachers are less likely to analyse both their own and other people's behaviours and

feelings. They even avoid close relationships and are distrustful. Both groups noted that PE teachers are less responsible, restrained and patient. They are not so hard-working and they are willing to earn money more quickly. According to their students, PE teachers are less conscientious and less capable of achieving their goals. In turn, teachers of other subjects noticed that PE teachers are less satisfied with their current situation and have more difficulty dealing with stress and obstacles. They are less effective, which is connected with work requirements as well as their immaturity regarding the roles they have taken on.

When describing themselves, PE teachers marked significantly more adjectives that are favourable and fewer unfavourable adjectives than teachers of other subjects and students. Intragroup comparison revealed no significant differences between ranks, i.e. between the number of favourable and unfavourable adjectives marked in both comparative groups. PE teachers, though, marked more adjectives that are favourable than unfavourable ones ($Z=-4.11$, $p \leq 0.01$ - Wilcoxon signed-rank test).

The last stage of presenting the results of the authors' own research included the analysis of how often particular adjectives were selected. Figure 2 illustrates adjectives most frequently chosen by each of the groups (first three places).



GROUP I - PE teachers
GROUP II - teachers of other subjects
GROUP III – students

Figure 2. The most frequently selected adjectives describing PE teachers

It is worth noting that two adjectives are most frequently associated with the image of PE teachers (in all groups), i.e. active and energetic. These and all the other ones presented in figure 2 have a positive meaning.

Discussion

After the analysis of the findings, it was observed that PE teachers are perceived by school community in a positive way. They see themselves better than they are seen by teachers of other subjects and students. As far as theirown personality profile is concerned, efficiency is clearly distinguishable. The presence of this variable in a psychological profile is highly desired due to professional challenges (Gencay, 2009). This positive self-image may stem from their knowledge of what a PE teacher should really be like and/or from their own image of ideal 'me', i.e. how they would like to be perceived. The traits they marked as well as adjectives they indicated most frequently (active and energetic) may, in a sense, point to an attitude that is consistent with challenges PE teachers face nowadays, e.g. regarding healthy lifestyle (Gold et al. 2012).

The image of a PE teacher as seen by comparative groups is relatively similar. Teachers of other subjects and students discern some shortcomings in terms of psychosocial competences of a PE teacher particularly in the field of developing and maintaining satisfactory relationships with other people. It seems to be an essential indication as, firstly, it provokes reflection on the image and, secondly, it points to the need to verify teachers' professional preparation and to monitor the quality of education taking into account a possibility to introduce preventive and intervention measures. The culture of professional development including development that takes into consideration both the issues of promotion and the spheres of personal skills ought to be specified (Jasper, 2006; MacPhail, 2011).

Moreover, the features that teachers of other subjects marked indicate that they are more aware of current educational problems and the situation of Polish teachers than students. However, according to the assumptions of the definition of stress, external factors are not always perceived as the ones which disorganise optimal functioning of an individual. What is important is the skills of interpreting potentially difficult situations and, in broader terms, psychological resources (Lazarus et al. 1987; Paulik, 2012). These, according to the respondents, seem to be insufficient. Thus, it may be understood as another suggestion that future PE teachers (current students of physical education) as well as professionally active PE teachers should improve their skills and abilities, especially the so-called soft skills. They act as a buffer against the effects of the burnout syndrome that teacher (PE

teachers as well) are likely to suffer from (Carraro et al. 2010; Ha et al. 2011). It is hard to state whether the features and patterns of behaviour observed by teachers of other subjects result from the lack of competences of PE teachers or whether they are the first symptoms of the first stage of their burnout. Perhaps responses marked by teachers of other subjects stem from their own doubts and difficulties associated with working in this profession. This idea is worth analysing in future studies.

It also appears that the findings may be treated as a recommendation for further research whose results might be used to produce more comprehensive systemic solutions in the field of professional education and development (including psycho-socio-pedagogical aspects) of PE teachers. The need to implement such solutions has already been recognised (Karhus, 2010; MacPhail, 2011; Makopoulou et al. 2011; Kloeppel et al. 2013).

Conclusions

Physical education teachers see themselves as willing to take action and to undertake initiatives as well as to pursue their goals with determination. Such traits should not go unnoticed by school directors or head PE teachers. In order to make use of PE teachers' potential and enhance their image in the eyes of school community, their supervisors should engage them in school activities taking into consideration their skills and abilities. On the other hand, PE teachers' need of acceptance, suppressing emotions and assuming desirable social roles in specific areas may contribute to faster burnout (Skaalvik & Skaalvik, 2011; Carraro et al. 2010) as well as cause coronary heart diseases (Denollet, 1998). Preventing these unfavourable consequences in this professional group requires introducing programmes that would help them to deal with stressful situations and equip them with problem-solving skills.

The findings revealed that some elements of PE teachers' image as perceived by teachers of other subjects and students may exert negative influence on relations between them. These variables include hyperactivity, too high ambitions as well as difficulties in adjusting to the role of a PE teacher. The differences observed in the study create the dualism of the image. It may cause misunderstandings and reduce work efficiency. Therefore, it is necessary to develop social competences in this group and to confront the real image with the one created by school community as well as to undertake activities aimed at creating an image that would meet expectations of the community.

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ORIGINAL RESEARCH PAPER

E-PLANNER FOR PHYSICAL EDUCATION ON THE SECONDARY SCHOOL LEVEL IN LATVIA

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Abstract

An innovative planning and assessment tool for the subject of Physical Education (PE) on the secondary school level has been created in the course of this research project. Evaluation of the research on the Latvian assessment system in PE has shown the current need for an online based curriculum planning tool (e-planner) which would help teachers to effectively and qualitatively determine the levels of knowledge, skills, personal trait attributes and development dynamics in PE. This finding has served as basis for the hypothesis of the work: creating an e-planner will have a positive influence on the planning and evaluation processes in the subject of Physical Education on secondary level. The author set put to determine the theoretical foundation and the desired content of the E-planner according to the curriculum standard of PE on the secondary level in Latvia and create the planner based on the free Google Forms online platform. Study included the evaluation of teachers' opinion about using the E-planner for planning and evaluation purposes. The result of this project is the first on-line curriculum planning tool in the Latvian language which is based on the modern theoretical understanding of student-centered planning and the assessment approach in education. Implementing such a tool on a state level across the disciplines would improve the quality of planning and instruction in schools.

Key words: *Curriculum Planning, Physical Education*

Introduction

The historical investigation tracing the evolution of planning and evaluation in education has shown several common tendencies indicating the general paradigm shift from normative assessment to criteria-based assessment with corresponding changes in planning techniques and curriculum content development. The psychometric testing era of the early 20th century was challenged by research on the effect of assessment on learning which started as early as 1960s (Glaser, 1963). Growing challenges of the ever faster changing world, along with the unpredictably progressive technological advancement challenged the notion of standardization of skills and knowledge, and increased the interest in finding the key to effective education. In evaluation and planning a new theory of qualitative assessment has emerged - studies in the 1980s and 1990s demonstrated the positive influence of feedback-driven, criteria-measured assessment on learning outcomes and results. This meant rethinking the value of exams, tests, and all summative evaluation in the learning process - admitting that in measuring the effectiveness of the learning process, the predominant value belongs to formative rather than summative assessment. These research findings were followed by a series of other studies in the late 1990s (e.g., Black et al.) which demonstrated the conservative character of education industry - the new understanding of assessment was there, but teachers were reluctant to implement change because it required additional effort and solid example of best practice in implementing the new paradigm. Examples of tools and methods were suggested and tested by various researchers and practitioners. At this point assessment for learning and its implications for the cohesiveness of planning, evaluation and guideline setting processes are establishing themselves in the educational systems all over the world. Latvia is not an exception, but rather a vivid example of this paradigm shift. During the Soviet era, the distinctively normative character of assessment policy was especially vivid in the area of physical education. The very name of the Soviet Physical education program "Ready for Defence and Work" implicated the direct link to state ideology of standardization and connection of one's fitness to military readiness. The Physical Education program was not primarily focused to address the individual needs of a diverse body of children, young men and women, but to create and mold them into one predictable and effective standard *worker* or *soldier*. Thus, the role of the teacher in terms of assessment was mainly to measure and compare the achievement of students to a certain standard and the teaching process was aimed at improving numbers and figures to fit a certain framework. Since Latvia regained its independence in 1991, much

work has been done to re-adjust the educational program to fit the modern understanding of effective organization and implementation of teaching and learning. The change from a norm-driven standard to learning outcomes-defined standard in PE has finally come in 2008. The new and current state standard for PE defines summative and formative assessment and outlines the general standards as well as learning outcomes in four distinct categories.

However, when investigating the tools and instruments provided for Latvian teachers to help them implement the change, the author found no system of collaborative sharing as well as a lack of technological support available in this field. Currently, the only tools provided for the implementation of the new standard are lecture type professional development courses, several publication containing examples of methods and approaches. Acknowledging this situation inspired the author to take action and create an innovative planning tool which would enable teachers to create and share unit plans in PE that would be aligned with the modern understanding of an effective educational planning, where state standards, unit plans and assessment are linked and mutually supportive.

Material and Methods

The goal of this project was to create a portal with a unit planning tool, using instructions for it, as well as unit sharing options. The portal would become a place for planning, collaboration, reflection and an effective resource at the same time.

After the general description of the unit in the first step, the planning tool has the State standards and corresponding learning outcomes pre-set and ready for choice in the second step. Teachers are prompted to create guiding questions for each of the learning outcomes they have chosen. This aligns with the modern understanding of learning through inquiry. In the third step, the teachers are asked to describe the assessment methods with certain framework and parameters of description that corresponds to the modern understanding of assessment for learning. There are options to check and choose from formative or/and summative assessment; options for the time when assessment occurs; there are two separate text boxes for descriptions of teacher's and students' actions, a box for a general description of the activity and an opportunity to attach a file if there is pre-made rubric or description. The planner gives an opportunity to create 5 assessment methods per unit. Finally, in the last 4th step, the teachers can describe different activities which will be used to teach and learn the chosen learning outcomes. After submission, the program creates a *Google document* - an editable document which is made on the basis of pre-set

template with teacher-chosen input values displayed in the corresponding parts of the document. Thus, the first page displays the values of the general description, the name and length of the unit. The second page outlines the chosen standards, learning outcomes and corresponding questions of inquiry in a visually transparent and clear manner. Then, the chosen learning outcomes are placed in the pre-set evaluation rubric and serve as assessment criteria for this unit with grading scale and point translation provided.

Finally, the suggested activities are listed and teachers are able to fill out the pre-made individual lesson plan tables, outlining the sequence and timeline for each lesson. In addition, the teachers are asked permission to use their plan as an example and if permission is granted, the pdf version of the unit (without the lesson plans) is automatically posted on the portal and becomes available for viewing and download by other teachers. Go to: http://www.planotsportu.lv/. The platform for creating of this system was *Google Sites*, *Google Docs* and *JotForm* free tools. Basically, the e-planner is an advanced online form which pushes the input data to a *Google Spreadsheet* which in turn uses the added script to automatically create a *Google Document* using the placeholder feature and data merge feature. The same feature is used for data in the mirror spreadsheet, to create PDF files and then post them on the website again using the free script for posting folders in *Google Sites.*

Results

To test the functionality of the e-planner, the project has been integrated into the professional development courses for PE teachers that took place in Riga and Tukums in the end of March 2013. As a result 42 teachers were introduced to the basic idea of the project and then given an opportunity to try out the planning process using the portal www.planotsportu.lv. After reading the instructions, teachers worked on creating unit plans using the e-planner. After this experiment an on-line survey with rating scale and open ended questions was conducted among teachers and 28 of them gave their responses.

The teachers rated the visual design, logical structure and format of the e-planner extremely well – more than 85% of respondents gave 4 or 5 on the scale of 5 for this categories. Around 80% also agree to a great extent that the e-planner tool helps to understand and use the State standard (curriculum guidelines) in PE. Just slightly less agreement (70% agree) that the E-planner and the created unit plans are fully applicable in every day teaching routine. More teachers responded as “I don't know” to the questions related to usability of the project and its product. The correlational

study revealed that some teachers were not able to create a plan due to time limitations, technical problems or their error in filling the planner template. Thus, there is a high degree of correlation between the rating of the layout of the created plan and the usability of the assessment criteria. Teachers who rated the layout as well designed also give a high rating to the usability of the plan, and vice versa – those who marked "I do not know" to the first, also responded "I do not know" to the second. This in turn simply proves a logical point – without seeing the final product, it is hard to judge on its usability in practice, and most importantly – the vast majority of those who have seen the final product "strongly agree" or "agree" that it is usable in practice.

Discussion

The created system is fully functional, but the author acknowledges that it is only a prototype to a more advanced and effective IT solution for this idea. The author hopes that provided prototype can be used for a creation of an online planning and collaboration tool for all subjects on a state level in Latvia. Moreover, the vision is to create a social environment on the planning portal offering teachers the capability to share, download and, most importantly, rate the unit plans, which would be powered by monthly awards for the best rated and most downloaded plan.

Conclusions

The research provided in the work provided a solid base for the design and content implications of the E-planner Tool which was then successfully created and proved to be fully functional by testing done during the teacher professional development courses. The feedback from teachers indicates the positive outcome of this study. The implementation of the E-planner will not consequently provide for development of exemplary units of work, but also valuable data will be gathered about the best practices and the degree of implementation of the state standard in real life. In any case, the major motivation for accomplishment of this project is the desire to help Latvian teachers to better understand, implement and develop an effective curriculum in PE.

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ORIGINAL RESEARCH PAPER

ARE THERE DIFFERENCES IN MOTIVES BETWEEN PARTICIPANTS IN INDIVIDUAL SPORTS COMPARED TO TEAM SPORTS?

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Abstract

The aim of this study was to explore which motives dominate among adolescents when it comes to participation in individual versus team sports. We expected that intrinsic motives will dominate in both groups. We also had a hypothesis that those who compete in individual sport will have higher scores on intrinsic and lower on extrinsic motivation than those in team sport. We also expected that intrinsic motives would explain why they had chosen individual sports instead of team sport. The participants were 78 athletes, 39 in team sports and 39 in individual. Participants' motives were assessed with the Motives for Physical Activity Measure - Revised (MPAM-R). The extrinsic motive "fitness" had highest score in both groups, followed by the intrinsic motives "interest/enjoyment" and "competence". The only motive with a difference between team and individual sport was the intrinsic motive interest/enjoyment. The participants in team sport had a higher score on interest/enjoyment than those in individual sport. We conducted a regression analyze to explain why pupils chose individual instead of team sports. "Interest/enjoyment" had an explanation when we included this as a single independent variable. If they participated in team sport they had a higher score on the intrinsic motive "interest/enjoyment". When we included all the motives none of them had an explanation. In conclusion we could not find any differences in motives for participation in team versus individual sport. We also only partly found support for the assumption that adolescents mostly are intrinsic motivated for participating in sport.

Key words: *Motivation, self determination theory, individual sports, team sports*

Introduction

Sport is for most participants, intrinsically motivated. Exercisers are more likely to be motivated by extrinsic motives such as improving one's appearance. Moreover the more amateur level of sport, the more the motives for engaging in it were intrinsic. Sports are more often played for enjoyment and interest than for extrinsic goals (Vallerand & Losier, 1999; Verloigne et al., 2011). Contexts fostering autonomy and perceived competence enhance enjoyment and sustained motivation (Chatzisarantis, Hagger, Biddle, & Karageorghis, 2002; Hagger & Armitage, 2004; Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003; Hagger, Chatzisarantis, & Harris, 2006). Sustained exercise is most likely when a person has both well internalized extrinsic motivation and intrinsic motivation (Duncan, Hall, Wilson, & Jenny, 2010; Ryan & Deci, 2007; R. M. Ryan & Deci, 2002; Smith, Ntoumanis, Duda, & Vansteenkiste, 2011; Vlachopoulos, Ntoumanis, & Smith, 2010).

A controversial but also interesting issue is the impact of competition on intrinsic motivation. Competitive contexts have both informational and controlling aspects; this is according to the cognitive evaluation theory (Deci & Ryan, 1985). Competitive environments can offer optimal challenge and competence feedback. But at the same time competition often includes controlling components, as people feel pressured to win (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Ryan & Deci, 2007). Participants pressured to win can lose intrinsic motivation even if they win, while those competing without pressure don't (Camacho, Soto, González-Cutre, & Moreno-Murcia, 2011; Gillet, Vallerand, Amoura, & Baldes, 2010; Reeve & Deci, 1996; Ryan & Connel, 1989; Ryan & Deci, 2007). Even those who do not come out on top, can maintain intrinsic motivation in the absence of controlling pressure to win (Vansteenkiste & Deci, 2003).

It is more than intrinsic motivation for engaging in sport and exercise. People have many extrinsic reasons for engaging, from health reasons to desire of recognition. Moments of flow are often separated by long periods of hard work. Sometimes this practice itself is not inherently enjoyable (Ericsson, 2003). Within self-determination theory there are two broad classes of nonintrinsic motivation. This is extrinsic motivation which is behavior motivated by expected outcomes not inherent in the activity itself. The other one is amotivation which is not having either energy directed toward action or intention. People are viewed as typically having multiple motives, both extrinsic and intrinsic (Hagger & Chatzisarantis, 2008; Lonsdale, Sabiston, Taylor, & Ntoumanis, 2011; Ryan & Connel, 1989).

With the satisfaction of the needs of autonomy, competence and relatedness we will achieve an optimal motivational function. This is called the basic psychological needs theory. Cognitive evaluation theory describes the environmental contingencies that lead to the adoption of intrinsically or extrinsically motivated behavior. Last the organismic integration theory identifies the quality of motivation on a scale of perceived locus of causality. These causalities are ranged from highly autonomous to highly controlling (Edmunds, Ntoumanis, & Duda, 2007; Markland & Ingledew, 2007 ; McLachlan & Hagger, 2011; Ryan & Deci, 2007).

Extrinsic motivation when it is controlling/low autonomy, the locus of causality is named external regulation. People are engaged in physical activity because of external reinforcement such as gaining rewards or avoiding punishment. A person could also be motivated out of introjected regulation which is defined from avoiding external sources of disapproval, or gaining externally referenced approval. Introjection is based on self-esteem-related contingencies and ego involvements (McLachlan & Hagger, 2011; Ryan & Deci, 2007; Ryan, Koestner, & Deci, 1991). Both external and introjected regulations are controlling forms of motivation based on controlling the self by pressure and contingencies.

When a person behaves through identified regulation, extrinsic motivation can be relatively autonomous. Here the person engages in the extrinsic action because of identification with the purpose and value. This can be values such as learning new skills. An even more autonomous level is called integrated regulation. Here behaviors are fully integrated into the repertoire of behaviors that satisfy psychological needs of autonomy, competence and relatedness. Thus still it is not fully intrinsic motivated. The highest level of intrinsic behavior we only do for enjoyment, pleasure and fun. There are no rewards, or discernible reinforcements involved (Bagoien & Halvari, 2005; Hagger & Chatzisarantis, 2007).

Autonomous regulation is associated with action and maintenance of change for exercise (Edmunds, et al., 2007; Landry & Solomon, 2004), exercise related self-esteem (K. B. Wilson & Rodgers, 2004), greater physical fitness (Stanley, Cumming, Standage, & Duda, 2012; Wilson, Rodgers, Blanchard, & Gessell, 2003), more frequent self-reported exercise behavior (Wilson, Rodgers, & Fraser, 2002), and more positive attitude toward exercise (Stanley, et al., 2012; Wilson, et al., 2003). Perceived autonomy support from friends is positively associated with identified regulation an intrinsic motivation (Wilson & Rodgers, 2004). It is also reported that perceived autonomy support from the exercise instructor

positively predicted relatedness, autonomy, competence need satisfaction and intrinsic motivation (Edmunds, et al., 2007).

Psychological need satisfaction is positively correlated with identified and introjected regulation and intrinsic motivation (Stanley, et al., 2012; Stuart, 2013; Wilson, et al., 2002). Competence need satisfaction, introjected and identified regulations positively predicted strenuous exercise behavior, while external regulation is a more negative predictor of strenuous exercise behavior. Competence need satisfaction also have both direct and indirect effects on behavioral investment (Edmunds, et al., 2007).

The aim of this paper is to explore which motives dominate among adolescents when it comes to participation in individual versus team sports.

We expect that intrinsic motives will dominate in both groups (Quested & Duda, 2011; Stanley, et al., 2012). We also have a hypothesis that those who compete in individual sport will have higher scores on intrinsic and lower on extrinsic motivation than those in team sport. This expectation builds upon the assumption that there is less autonomy in team sports because the more participants the coach have to deal with the harder it is to give each participant the possibility to make their own choice (Stanley, et al., 2012; Wilson, et al., 2002; Wilson, et al., 2003). When you are part of a team it is more difficult to evaluate your personal competence and the psychological need satisfaction will be less (Chatzisarantis, Hagger, & Smith, 2007; Edmunds, et al., 2007).

We also expect that intrinsic motives will explain why pupils chose individual rather than team sports (Patrick & Canevello, 2011; Ryan & Deci, 2007).

Method and Participants

The participants were 78 athletes in four different sports, handball (11), football (soccer 29), gymnastic (12) and track and field (28). It was 26 boys and 54 girls from 13 – 19 years old (mean 14.3). We asked the parents about permission for those under 15. The only inclusion criteria was if they competed in individual or team sport.

Procedure. Data were collected during one month in the spring of 2013. The language of the questionnaire was Norwegian. The questionnaire has been translated, and validated into Norwegian in an earlier study (Brislin, 1970, 1986). We collected the data just after a training session for all participants.

*Measure.*Participants' motives were assessed with the Motives for Physical Activity Measure – Revised (MPAM-R) (Ryan, Frederick, Lepes,

Rubio, & Sheldon, 1997). The scale consists of a total of 30 items assessing five different motives for participating in physical activities.

Fitness (5 items) refers to being physically active out of the desire to be physically healthy and to be strong and energetic ("Because I want to be physically fit"). Appearance (6 items), assesses being physically active in order to become more physically attractive, to have defined muscles, to look better, and to achieve or maintain a desired weight ("Because I want to lose or maintain weight so I look better"). Competence (7 items), refers to being physically active because of the desire just to improve in an activity, to meet a challenge, and to acquire new skills ("Because I like engaging in activities that physically challenge me"). Social (5 items), refers to being physically active in order to be with friends and meet new people ("Because I enjoy spending time with others doing this activity"). Interest/enjoyment (7 items) measures being physically active just because it is fun, makes you happy, and is interesting, stimulating, and enjoyable ("Because I like the excitement of participation").

The questions are rated on a 7-point Likert scale, from one (not at all true for me) to 7 (very true for me). We also registered if they participated in individual or team sport.

Analysis. Data were analyzed using SPSS (Version 20.0). In the section describing the sample, ANOVAs were applied to determine sample differences. For multivariate associations of the choice between team- and individual sport regarding the motivational scales, multivariate analyses of variance (MANOVA) were applied. Significant main effects were followed up using one-way analyses of variance (ANOVA). Effect sizes are reported using Cohen's *d* and partial eta- square η^2. Cohen defined effect sizes as "small, *d* = .2," "medium**,** *d* = .5," and "large, *d* = .8" (Cohen, 1988).

Results

Preliminary data analysis. Data were screened according to the recommendations of Hair, Black, Babin and Anderson (2009). Examination of the assumptions associated with regression analyses (homoscedasticity, linearity and normality) suggests that there were no particular problems on the data. Both homoscedasticity and linearity assumptions were tenable.

To explore whether the data were marked by multicollinearity, both tolerance and variance inflation were examined. No problems were found, since the obtained values are within acceptable values (Hair et al. 2009).

Reliability analysis and descriptive statistics. Internal consistency estimates (Cronbach's alpha) of the MPAM-R subscales were computed**.**

The reliability analyses indicate that internal consistency coefficients were good. All coefficients were greater than 0.79 for all multi-item scales.

The motive with the highest score in the whole sample was fitness with a mean score at 5.97 (SD = .83)(team m = 6.10, SD = 8.3; individual m = 5.84, SD = 8.2), followed by interest/enjoyment (total m = 5.95 SD = .81; team m = 6.14, SD = .75; individual m = 5.74, SD=.84), competence (total m = 5.82, SD = .83; team m = 5.99, SD = .90; individual m = 5.62, SD = .71), social (total m = 4.46, SD = 1.55; team m = 4.60, SD = 1.61; individual m = 4.31, SD = 1.47) and last appearance (total m = 4.18, SD = 1.23; team m = 4.36, SD = 1.29; individual m = 3.98, SD = 1.16). There are significant difference (.01) in mean score between all the motives except fitness and competence, fitness and interest and appearance and social. Between competence and interest the difference was significant at 5% level.

Differences in motives between team and individual sport. Adolescents in both team and individual sport seem to score high on intrinsic motives like interest/enjoyment and competence. They also have high score on fitness which is an extrinsic motive. Both groups have a low score on appearance as expected. The last motive social has a relatively low score in both groups. The only motive where statistical differences appeared between the two groups is interest/enjoyment. The participants in team sport scored significant higher on interest/enjoyment (5% level, η^2 =.35 and = .51) than those in individual sport. Also competence was close of being significant at 5% level (sign .057). Those in team sport scored higher than the individual.

Regression analysis. One hierarchical regression analysis was conducted to examine how extrinsic and intrinsic motives predict the variable team or individual sport. We did an analysis with 5 different models (Tab. 1).

Table 1

5 models of hierarchical regression analyses predicting "team versus individual sport" from MPAM-R Subscale

	Model 1 St.beta	Model 2 St.beta	Model 3 St.beta	Model 4 St.beta	Model 5 St.beta
Interest/enjoyment	-.252*	-.214	-.210	-.226	-.231
Fitness		-.164	-.162	-.107	-.112
Comeptence			-.007	-.004	-.004
Appearence				-.096	.106
Social					.022
Adjusted R^2	.048	.059	.043	.033	.017
F value	4.298*	2.974	1.951	1.545	1.219
Sign. F change N=78	.045	.197	.974	.535	.901

**sign.01 level, * sign .05 level

The only model with a significant explanation on the dependent variable "individual or team sport" was where "interest/enjoyment" was the only independent variable included. Those who competed in team sports had a high score on "interest/enjoyment". This model explained only 5 % of the variance and was significant at the 5 % level. When we included the other variables none of them had an explanation on the dependent variable.

Discussion

Our first hypothesis was that intrinsic motives would dominate in both individual and team sports (Quested & Duda, 2011; Stanley, et al., 2012). We only partly found support for this. The extrinsic motive "fitness" had the highest score in both groups, followed by the intrinsic motives "interest/enjoyment" and "competence".

Next we expected that those who competed in individual sport would have higher scores on intrinsic and lower on extrinsic motivation than those in team sport. We had an assumption that there was less autonomy in team sports because the more participants the coach have to deal with the harder there is to give each participant the possibility to make their own choice (Stanley, et al., 2012; Wilson, et al., 2002; Wilson, et al., 2003). We did not find any support for our hypothesis. The only motive with a difference between team and individual sport was the intrinsic motive "interest/enjoyment". The difference was actually the other way than we expected. The participants in team sport had a higher score on interest/enjoyment than those in individual sport. The same result appeared at the intrinsic motive competence but was not significant. We can therefore discard our hypothesis.

Finally we had an assumption that intrinsic motivation would explain why adolescents choose individual sports instead of team sports (Patrick & Canevello, 2011; Ryan & Deci, 2007). When we included all of the motives none of them had any explanation regarding the dependent variable "team versus individual sport". "Interest/enjoyment" had an explanation when we included this as a single independent variable. If they participated in team sport they had a higher score on the intrinsic motive "interest/enjoyment. Our hypothesis is therefore rejected.

Limitations of the study. There are some limitations of this study that should be considered. The number of participants in the study could have been extended. Only 80 participants took part. There are also more girls than boys in the study and results might have been different if we had included more boys.

Future research perspectives. Future research in this area could look into differences between boys and girls. Are there any sex differences when it comes to participating in team or individual sports?

The fact that motivation seems to change with age makes it interesting to look into different age groups to find out which motives dominate at different ages.

Conclusions

In this study, we could not find any differences in motives for participation in team versus individual sport. Furthermore, we only partly find support for the assumption that adolescents mostly are intrinsic motivated for participating in sport.

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ORIGINAL RESEARCH PAPER

PHYSICAL ACTIVITIES AND BODY COMPOSITION AMONG WOMEN IN FITNESS

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Abstract

Nowadays sedentary lifestyle is becoming more and more frequent all over the world. Obesity represents one of the most serious health issues (Hill et al., 2008). It develops because of misbalance between energy intake and consumption, which results from human behavior – feeding behavior, leisure time spent physiology and life quality objective factors (Haslam & James, 2005). The aim of the research is to describe women's involved in fitness relation of body composition parameters and subjective evaluation of the amount of physical activities and objective parameters of life quality. Research methods: the study included 51 women (27 +/- 6 years old). TANITA BC-545 platform was applied to evaluate body composition parameters and IPAQ short version was used to state the amount of physical activities. SPSS ver.17.0 data procession program was applied to analyze the data. Descriptive statistics (frequency, mode, mean); mathematical statistics (One-Sample Kolmogorov-Smirnov Test, Spearman rank correlation) was made. Results: the research showed that there is a number of weak significant correlations between women's in fitness body composition parameters, the amount of physical activities, the habits of spending leisure and the life quality objective factors $(0.2<|r_s|<0.49;\ p<0.05)$. *Whereas there were noted strong* $(0.7<|r_s|<0.99;\ p<0.01)$ *and moderate* $(0.5<|r_s|<0.69;\ p<0.01)$ *correlations among body composition parameters. Conclusions: Women's, involved in fitness physical activities, life quality objective factors and the habits of spending leisure have the impact on the body composition parameters.*

Keywords: *body composition, IPAQ, physical activities, quality of life*

Introduction

Obesity is one of the most widespread problems all over the world. About 25% of children and 40 – 60% of adults in all developed countries suffer from the excess weight which causes physiological and psychological changes of the body, as well as serious health problems (Lobstein, et al., 2004). At any age sedentary lifestyle and inappropriate diet increase obesity risk (Brach, et al., 2004; Hills et al., 2013; Ara, et al., 2006). However, small number of researches has shown that exactly these two behavior factors not other environmental factors affect human body composition. To understand body weight management, one should understand dynamics of energy balance and also the effect of environment (Giskes et al., 2010; Corder et al., 2010).

Research articles show that 5% of all death causes all over the world is due to obesity and 6% – due to sedentary lifestyle. According to the data of the World Health Organization about death causes of citizens in the European countries in 2012, 80% of all death cases are the ones of non-communicable diseases, including 50% of problems of the cardio-vascular system. It should be added that there are more male cases than female cases. Since 1995 the death cases from diabetes have increased up to 25%. Since 1990 the diseases of the digestion system have increased up to 30% (Health 2020: a European policy framework supporting action across government and society for health and well-being, 2012). If we look in detail at the amount of time EU citizens spend doing vigorous and moderate physical activity we see, that only 8% do it regularly in Europe at all and 6% in Latvia, 33% in Europe and 25% in Latvia do it with some regularity, 42% in Europe and 39% in Latvia never do physical activities. If we compare genders doing physical activities, we can see, that 55% of European men and 63% of European women never or seldom do physical activities. Even worse situation is in Latvia – 66% of men and 71% of women never or seldom do physical activities (Eurobarometer, 2013). The research about worldwide variability in physical inactivity shows, that overall, about 15% of men and 20% of women from the 51 countries analyzed there (most of which are developing countries) are at risk for chronic diseases due to physical inactivity. Both men and women living in urban areas were more likely to be inactive compared to those living in rural areas. The difference was more obvious for men (Guthold et.al, 2008). Also statistical data about children physical activity in the USA, that might be related to family habits, show that only 42% of children aged 6-11 and only 8% of children aged 12-17 are physically active daily (Troiano et al, 2008). Statistical data of Canada also emphasize that the level of physical activities among

adolescents is very low (Colley et al., 2011). Also in Australia the data about the number of adolescent moderate physical activities are lower than the recommended ones to improve and maintain one's health (Cleland et al., 2008). Researchers suggest that even slight alterations of human behavior can change a situation and decrease the speed of the spread of obesity epidemic (Hill et al., 2003; Brach, et al., 2004; Hills et al., 2013; Ara, et al., 2006; Hughes et al., 2002; Knöpfli et al., 2008; Yackobovitch-Gavana et al., 2009; Tyler et al., 2007).

The aim of the research is to describe women's involved in fitness relation of body composition parameters and subjective evaluation of the amount of physical activities and life quality objective parameters.

Material and methods

51 women from four fitness clubs participated in the study. The average respondents' age is 27 +/- 6 years old. The women participation in the study was voluntary.

In order to assess women's, involved in fitness, body composition parameters the segmentary bioimpedence body monitor TANITA BC-545 (Japan) was applied, when analyzing the right and left arm, the right and left leg and the trunk. With the help of this device body weight, muscle percentage, fat percentage in body segments, bone mass, the coefficient of the body type, the coefficient of the visceral fat, the metabolic age of the body, and daily calorie amount were stated, as well as the height and body mass index were calculated.

To assess the amount of physical activities International Physical Activity Questionnaire (IPAQ) short version in Latvian (Kaupuzs & Larins, 2010) was used. The respondents answered to what extent they had done very hard or moderately intensive physical activities during the last 7 days and how much time they had spent sitting or walking (Guidelines for data processing and analysis of the International Physical Activity Questionnaire, 2005).

Additionally the objective parameters of life quality, such as age, home, occupation, education level, financial situation, family status, kinds of leisure activities, and belonging to some group or club were stated. The inquiry (questionnaire) and data summarization were made anonymously.

SPSS ver.17.0 data procession program was applied to analyze the data. Descriptive statistics (frequency, mode, mean) was made, Kolmogorov-Smirnov criterion was applied to state whether the data are parametric or non-parametric, and correlation analysis of the non-parametric

statistics was made to determine the Spearman Rank Correlation Coefficient.

Results

Having summed up the data, it can be concluded that all respondents' questionnaires were useful for data procession. Most respondents have higher education (56%) or higher not finished education (18%), they mostly live in a house with no hire (28%), in a property with mortgage (24%) or in a property without mortgage (26%). Most respondents are employed, employers (75%) or those who are studying (18%). 64% of the respondents answered that their material situation is satisfactory, 28% pointed out that they can get along, but 8% think that their material situation is unsatisfactory. 18% of the respondents have the status of free relation, 40% – have relations, 16% – are married and 24% are married and have child (-ren).

A large number of respondents do not take part in leisure activities mentioned in the questionnaire. For example, 36% of the respondents have not visited any bar or café during the last month, 86% – have not been to any sport events, 78% – have not been to a service in a church, 30% – have not chatted to acquaintances or neighbors, 22% – have not had a meal out, 42% – have not been to a cinema, 24% – have not visited friends, 18% – have not done any physical activities, and 96% of the respondents do not belong to a club or society.

With the Kolmogorov-Smirnov criterion it was stated that the data are non-parametric, and the method of non-parametric statistics correlation analysis should be applied.

Having evaluated the obtained Spearman rank correlation coefficients (one-tailed), it can be concluded that there are several weak ($0.2<|r_s|<0.49$) and one medium close ($0.5<|r_s|<0.69$) (Dravnieks, 2012) correlations between the objective factors and body composition parameters, for example:

- the older the respondent is, the more is her weight ($rs = .246$, $p<0.05$); the higher the body mass index is ($rs = .242$, $p<0.05$), the higher the fat percentage in the body is ($rs =.352$, $p<0.01$); the less there is water amount in the body ($rs =-.270$, $p<0.05$), the higher the visceral fat coefficient is ($rs =.460$, $p<0.01$), as well as the higher is the metabolic age ($rs =,504$, $p<0,01$) (see Fig.1).

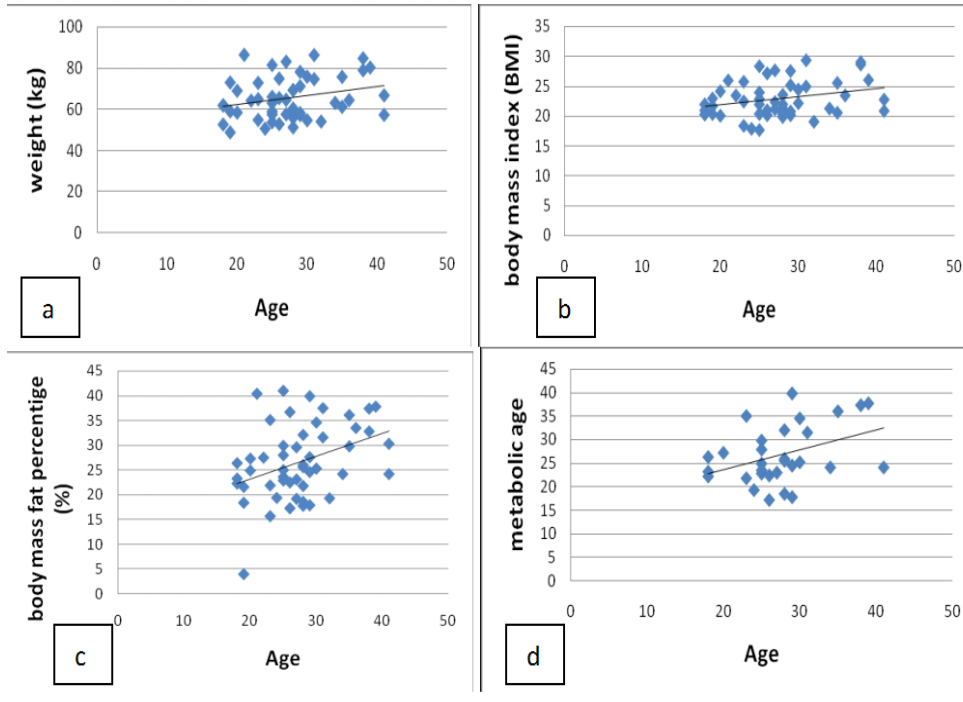

Figure 1. Correlation between age and weight (a), body mass index (b), body mass fat percentige % (c), metabolic age (d) (n=51)

- the higher a respondent's education level is, the bigger her weight is (rs =.275, $p<0.05$), the higher the body mass index is (rs =.342, $p<0.01$), the higher the fat percentage in the body is (rs =.264, $p<0.05$), the bigger the muscle mass is (rs =.310, $p<0.05$), the less the body structure type coefficient is, which shows obesity, hidden obesity or bad physical condition (rs =-.237, $p<0.05$);
- the better a respondent's financial situation is, the less the visceral fat coefficient is (rs =-.271, $p<0.05$).

There are some weak ($0.2<|r_s|<0.49$) correlations between the habits of spending leisure and the body composition parameters:

- the more often one attends sports competitions, the higher the body structure type coefficient is, which shows that the body is trained, muscled (rs = .342, $p<0.01$) (see Fig. 2);
- the more often one chats with neighbors or acquaintances, the less the body mass index is (rs = -.248, $p<0.05$);

- the most often one eats out, the less the fat percentage in the body is (rs = -.239, p<0.05);
- the more one goes to the cinema, the less her weight is (rs = -.255, p<0.05);
- the most often one visits her friends or acquaintances, the less her body weight is (rs = -.253, p<0.05), and the less the body mass index is (rs = -.305, p<0.05) (see Fig.2).

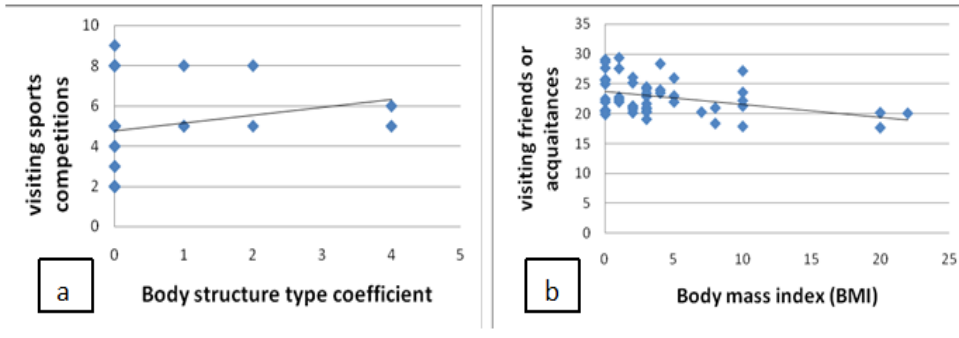

Figure 2. Correlation between body structure type coefficient and visiting sports competitions (a), body mass index and visiting friends/acquaintances (b) (n=51)

There are several medium close (0.5<|rs|<0.69) and close (0.7<|rs|<0.99) (Dravnieks, J., 2012) correlations between the body composition parameters:

- the more is weight, the higher the body mass index is (rs = .914, p<0.01); the higher the fat percentage is (rs= .695, p<0.01), the less there is water amount in the body (rs = -.733, p<0.01), the higher the visceral fat coefficient is (rs = .736, p<0.01), the less the body structure type coefficient is which draws closer to the obesity coefficient (rs = -.538, p<0.01) and the higher the metabolic age is (rs = .742, p<0.01);
- the higher the fat percentage is, the less there is water amount in the body (rs = -.880, p<0.01), the higher the visceral fat coefficient is (rs =.784, p<0.01), the higher the metabolic age is (rs =.815, p<0.01);
- the less there is water amount in the body, the higher the visceral fat coefficient is (rs = -.918, p<0.01), the less the body structure type coefficient is (obesity, hidden obesity) (rs = .729, p<0.01); the less

- metabolism in rest state is (rs = -.304, p<0.05), the higher the metabolic age is (rs = -.939, p<0.01).

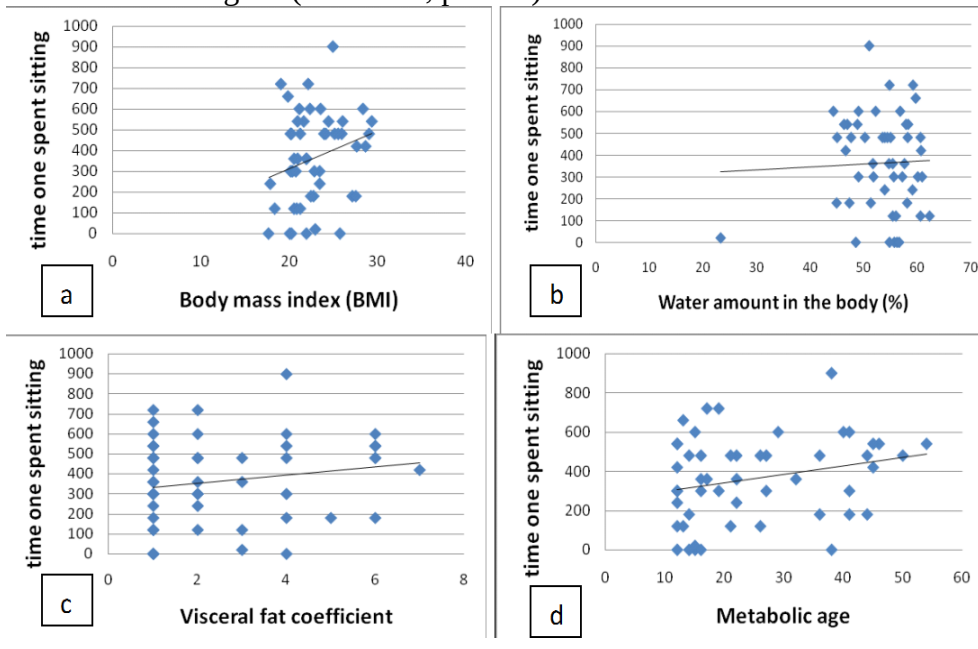

Figure 3. Correlation between the time one spends sitting and the body mass index (a), water amount in body (b), visceral fat coefficient (c), metabolic age (d) (n=51)

Studying women in fitness, several weak and medium close correlations are stated between the body composition parameters and the kinds and amount of physical activities:

- the less one does very hard physical activities, the bigger the body weight is (rs = -.312, p<0.01); the higher the fat percentage in the body is (rs = -.327, p<0.05), the less the body mass is (rs = -.254, p<0.01); the less the body structure type coefficient is (obesity, hidden obesity) (rs = .408, p<0.01), the slower metabolism is (rs = -.308, p<0.05).
- the less a respondent does moderate physical activities, the less there is water amount in the body (rs = .252, p<0.05), the higher the metabolic age is (rs = -.250, p<0.05).
- the more hours one spends sitting, the higher the body mass index is (rs = .245, p<0.05), the higher the fat percentage in the body is (rs = -.243, p<0.05), the less there is water amount in the body (rs = -.243, p<0.05), the higher the visceral fat coefficient is (rs = .255, p<0.05),

- the less muscle mass is ($rs = -.243$, $p<0.05$), the slower metabolism is ($rs = -.243$, $p<0.05$) and the higher the metabolic age is ($rs = .245$, $p<0.05$) (see Fig.3).

Discussion

Having compared the study results to other researches on body composition, physical activities and the objective factors of life quality, it can be concluded that in several researches there are similar connections as between the parameters of our study. However, most part of researches is about children and the subjects of puberty period, as well as people at senior age (+55).

In our study there was a correlation between the women's in fitness body composition parameters, the kind and amount of physical activities. That is, by increasing physical activities or changing their kind, we can beneficially affect the body composition parameters. In the research of 2013 it was proved that low intensity physical activities can decrease women's body fat percentage and increase their muscle mass (Fuentes Bravo et al., 2013). In the research about the effect of dancing classes on women's body composition it was testified that aerobic load, such as dancing, can positively change the body composition parameters (Kostić et al., 2006). In the research about physical activities, health and body composition it was also stated that any physical activity protects us from physical dysfunctions and beneficially affects body composition (Brach, et al., 2004). In the research of 2006 about body composition and physical activities during the puberty period it was stated that without changing the diet, but doing physical activities 3 hours per week it is possible to decrease body fat percentage, to increase muscle and bone mass ($p<0.05$), as well as an correlation was stated between the body muscle mass and fat percentage ($r_s = - 0.37$, $p<0.05$) (Ara, et al., 2006). In another research was stated, that in order to positively affect body composition, in the sedentary women it is enough to control the energy balance, whereas in those that trained regularly it is necessary to control energy balance and composition of daily meals (D'Angelo et.al. 2010). In the research about body management it was pointed out that the first what should be done to decrease weight and get rid of the excess weight is to change one's lifestyle, what includes the increase of the amount of physical activities (A statement of the American Diabetes Association, the North American Association for the Study of Obesity, and the American Society for Clinical Nutrition, 2005).

As another interconnection of our research the correlation was shown between the body composition parameters and the habits of spending one's

leisure time, what emphasized that the more active one is in one's leisure time, the more his/her body composition parameters correspond to the norm. In the research of 2001 about young women and men it was proved that the body fat percentage and the body mass index of those who have an active lifestyle correspond to the norm (Görner et al., 2001). In the research of 2002 about the body composition and physical activities at senior age (55+) there was also a correlation between age, leisure time spending habits and fat percentage in women, but there was no correlation between age, leisure time spending, muscle and bone mass in men and women ($p<0.01$) (Hughes et al., 2002).

In our research there was another correlation found out between the objective factors of life quality and body composition parameters. So, changing the objective factors of life quality we can change the body composition parameters. In 2008 in the research about body composition, physical activities and life quality a correlation was stated between the increase of physical activities and the improvement of body composition with the result of the increase of life quality level ($p<0.01$) (Knöpfli et al., 2008). In 2009 in the research about the effect of diet and physical activities on the body composition parameters and life quality it was proved that weight management programs that facilitates eating of healthy food and increase of physical activity amount can improve life quality (Yackobovitch-Gavana et al., 2009). In the research about bad life quality of Mexicans, living in the USA and suffering from obesity, it was testified that even decrease of small weight can improve one's life quality and psychological feeling (Tyler et al., 2007).

Having summed up the data about research articles about body composition, physical activities and life quality parameters, it can be concluded that these factors are interrelated.

Conclusions

In our study about women in fitness it was found out that there are several weak correlations between the body composition parameters and kind and amount of physical activities, for example, between the time how long very hard physical activities are executed and body weight ($r_s = -.312$, $p<0.01$); between the time how long moderate physical activities are executed and the metabolic age ($r_s = -.250$, $p<0.05$); between the time how long one spends sitting and the visceral fat coefficient ($r_s = .255$, $p<0.05$).

There are also several weak and one medium close correlation between the body composition parameters and the objective life quality parameters, for example, age and the visceral fat coefficient ($r_s = .460$,

$p<0.01$); education level and the body mass index (r_s =.342, $p<0.01$); financial situation and the body visceral fat coefficient (r_s =-.271, $p<0.05$).

It was stated in the study about women in fitness that there are several weak correlations between the leisure time spending habits and the body composition parameters, for example, attending sports competitions and the body structure type coefficient (r_s = ,342, $p<0,01$); visiting friends and acquaintances and the body mass index (r_s = -.305, $p<0.05$). There are several medium close and close correlations between the body composition parameters: weight and the fat percentage (r_s = .695, $p<0.01$), water amount in the body (r_s = -.733, $p<0.01$), the visceral fat coefficient (r_s = .736, $p<0.01$).

The women's involved in fitness the body composition parameters are affected by the amount and kind of physical activities, the time how long one spends sitting, the objective life quality parameters and also the leisure time spending habits.

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AMATEUR AND PROFESSIONAL ICE HOCKEY PLAYER HYDRATION STATUS AND URINE SPECIFIC GRAVITY VALUES BEFORE AND AFTER TRAINING IN WINTER CONDITIONS

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Abstract

The aim of our investigation was to determine and compare the pre- and post- training body hydration status in professional and amateur male ice hockey players consumed the drinks according to their thirst sensation in winter conditions. Materials and methods: 11 amateur and 23 professional ice hockey players participated in the investigation. The players were weighted before and after training using precise scales. The body mass composition of every athlete was determined by the body composition analyzer. Every player collected mid–stream urine specimens before and after the training. Urine specific gravity (USG) was measured by urine refractometer. Results: 56% of the professional ice hockey players and 82% of amateur players were hypohydrated before training according to their USG values ≥ 1.020, 5% of professional players were dehydrated their USG values ≥ 1.030. After the training with duration of 1.5 hours the mean body mass decreased for 0.9±0.5% of pre– training value in amateur players and for 1.6±0.8% in professionals (p=0.005). After the training the professional players' hydration status worsened: 66% were hypohydrated and 26% dehydrated according to USG, the mean USG after training was significantly higher than before it (p=0.011). USG after training did not change in amateur players: their mean USG values before and after training did not differed significantly (p=0.677). Conclusions: Fluid uptake according to thirst sensation in winter conditions cannot compensate the fluid loss at rest and during training especially in professional ice hockey players. The body mass loss exceeded value critical for performance - 2 % in one third part of professionals. The differences between two groups can be explained by higher intensity of exercises during training, the better physical conditioning and greater sweating rate in professional players in

comparison with amateurs, which causes close to twice greater uncompensated fluid loss in professionals than in amateurs.

Key words: *hydration status, urine specific gravity, urine refractometry, ice hockey players*

Introduction

Recent research data in team sports, such as soccer, football, and basketball, have shown that a body mass (BM) loss of 2% decreased skill performance (Edwards et al. 2007; Maughan 2003; Shirreffs S. (2010)). The BM loss in hockey players did not reached 2 % in the investigations available in literature (Logan-Sprenger H.M., Palmer M.S. and Spriet L.L**.,** 2011), Incomplete replacement of fluid losses during prolonged exercise can lead to exaggerated increases in heart rate, core temperature, and perceived exertion, and decreases in stroke volume and cardiac output with as little as a 1% loss of pre exercise body mass (Montain, S.J. and Coyle, E.F. 1992).

One would speculate that the relatively cool micro-environment of a hockey arena (~10^{o} C) would reduce sweating. However, the equipment worn, which allows only the face to be exposed for sweat evaporation, coupled with the very high intensity of the intermittent exercise elicits high sweat rates and the potential for hypohydration (Godek, S.F., Godek, J.J., McCrossin, J. and Bartolozzi, A.R. 2006; Palmer Matthew S. and Spriet Lawrence L. 2008). The fluid loss during exercises for sport games players depends not only on climatic conditions, but is proportional to many other factors, such as: exercise intensity, the athlete's acclimatization, the athlete's physical conditioning, physiologic individual characteristics and the player's biomechanics (Maughan RJ, Leiper JB.,1994; Monteiro C.R., Guerra I., Barros T.L., 2003). The rate of sweat loss will also depend on genetic differences, the aerobic fitness status of the player, and the player's hydration status (Logan-Sprenger H.M., Palmer M.S., and Spriet L.L. (2011).

Palmer Matthew S., Logan Heather M., and Spriet Lawrence L. (2010) were unaware of any studies that have examined the repeatability of the hydration status measures on different test days in the same population. Recent field research reported that elite junior and professional (Palmer Matthew S. and Spriet Lawrence L. (2008) ice hockey players choose to drink water over a carbohydrate– electrolyte solution (CES) during on-ice practices when left to make their own drink selection. The ingestion of carbohydrate in a drink has been shown to delay fatigue and improve performance, compared with a placebo, when ingested during moderate

intensity endurance exercise (Coyle, E.F. 2004), and as such could be beneficial for hockey players during on-ice practices. When athletes exercise during training or while competing, it is clear that they sometimes benefit by ingesting various mixtures of water, carbohydrate and electrolytes (Casa D.J., Armstrong L.E., Hillman S.K., Montain S.J., Reiff R.V., Rich B.S.E., Roberts W.O., Stone J.A., (2000); Coyle, E.F. 2004). The benefits can be expressed through improved performance and/or reduced physiological stress, on an athlete's cardiovascular, central nervous and muscular systems. Although the scientific evidence exists to support the general theory for encouraging athletes to consume water, carbohydrate and electrolytes during exercise, the practical recommendations for optimally applying these general theories is not simple. This is due to the quite varied nature of the physical stresses encountered during training and competition for a wide range of sports, as well as the unique rules of each sport regarding the allowance for fluid and fuel intake during competition (Coyle, E.F. 2004).

It has been known that when given *ad libitum* access to fluid, and thus drink voluntarily, that these mechanisms compel people to drink at a rate that replaces approximately one-half of their fluid losses and at best two-thirds (Coyle, E.F. 2004). The concept that thirst during exercise does not drive people to take in fluid at the rate of fluid loss is termed 'voluntary dehydration'. In the 1960s, athletes were generally advised 'to drink only a little water during exercise' and to 'ignore their thirst' and to thus replace a small percentage of lost fluid. It is unrealistic to expect that brief guidelines, which are naturally general, can be practically used by all athletes in all sports under all conditions (Coyle, E.F. 2004).

It is important to point out that unrestricted drinking that causes initially euhydrated people to gain large amounts of body weight and body water should be discouraged. Coyle, E.F. (2004) has reported that dehydration without hyperthermia reduces stroke volume by 7–8% and that hyperthermia without dehydration also reduces stroke volume by 7–8%. However, the combination of dehydration and hyperthermia elicits synergistic effects in reducing stroke volume by more than 20%. Competitive athletes exercising at high intensity in sports such as running, cycling and soccer have high rates of heat production that require dissipation to the environment to prevent progressive heat storage and elevation of core temperature to above 39^{o}C (Coyle, E.F. 2004).

The aim of our investigation was to determine and compare the pre- and post- training body hydration status in professional and amateur male

ice hockey players consumed the drinks according to their thirst sensation in winter conditions.

Material and methods

Subjects. 34 male ice hockey players (11 amateur and 23 professional) participated in our research. The anthropometrical data of the amateur player group were: the mean age 33.27 ± 9.5 years, mean height 1.815 ± 0.095m, mean weight 92.6 ± 14.7kg and mean BMI 28.0 ± 3.7kg/m^2. The one's of the professional player group were: the mean age 18.0 ± 0.6 years, mean height 1.812 ± 0.058m, mean weight 78.9 ± 7.7kg and mean BMI 24.0 ± 2.0kg/m^2. The investigation was proved by the Ethics Comity of the Latvian Academy of Sports Education.

Methods. The anthropometric data were collected before the training. The ice hockey players were weighed using special scales Midrics1 (Sartorius, Germany) with precision 10g and maximal weight of measurement 150kg. The weighing of the athletes was repeated after training with duration of one and half hours. Before the training ice hockey players' body mass composition was tested using the body composition analyzer BC-545 (Tanita, Japan).

Every athlete collected mid–stream specimens of urine before and after the training. Urine samples were collected in 15 ml sterile tubes (Sarsted Aktiengesellschaft & Co, Germany). Urine specific gravity (USG) was measured by urine refractometer PAL – 10S (Atago, USA) with precision ± 0.001, at ± 0.1^{o}C. The players were weighed using special scales Midrics1 (Sartorius, Germany) after the training again.

The evaluation of the athlete hydration degree was performed by using National Athletic Trainers' Association and American College of Sports Medicine used scale, were USG under 1.020 means euhydration, USG in range 1.020 – 1.029 means hypohydration and USG equal or higher than 1.030 means serious hypohydration (Casa D.J., Armstrong L.E., Hillman S.K., Montain S.J., Reiff R.V., Rich B.S.E., Roberts W.O., Stone J.A., 2000). Every ice hockey player could uptake mineral water or sports drinks during the training without any limitation. The duration of training was 1.5 hours. The SPSS version 20 program was used for statistical analysis of the data.

Results

More than half of professional ice hockey players (56%) and greatest number (82%) of amateur players were hypohydrated before training according to their to USG values ≥ 1.020, Fig.1. Five percent of professional

players were seriously dehydrated before the training, USG ≥ 1.030. The mean USG value before the training in amateurs was 1.021 ± 0.004 and in the professionals – 1.020 ± 0.008. The difference between both groups of hockey players was not significant (p=0.486).

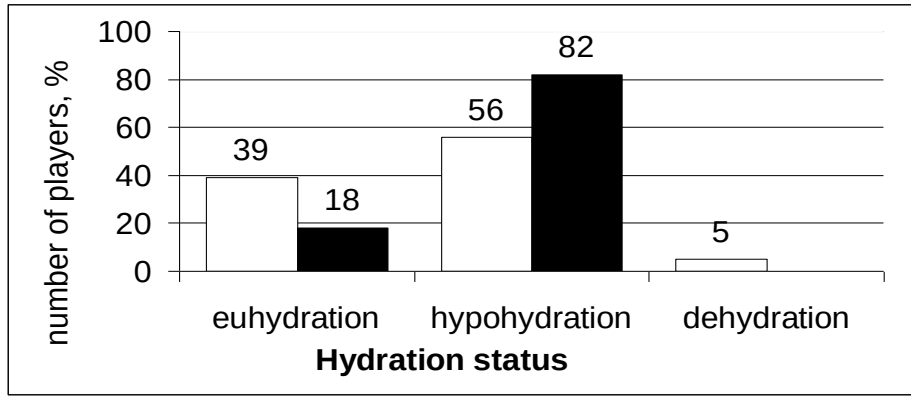

Figure 1. Hydration state of professional (□) and amateur (■) ice hockey players' before training from the data of USG

The mean body mass decreased for 0.9±0.5% in amateur players and for 1.6±0.8% in professionals, the difference between the groups is significant (p=0.005). The body mass changed after training in comparison with the mass before the training in every athlete, this is shown in Fig.2. The body mass loss exceeded 2 % from pre- training value in seven professional players and was greater than 3 % in one professional player.

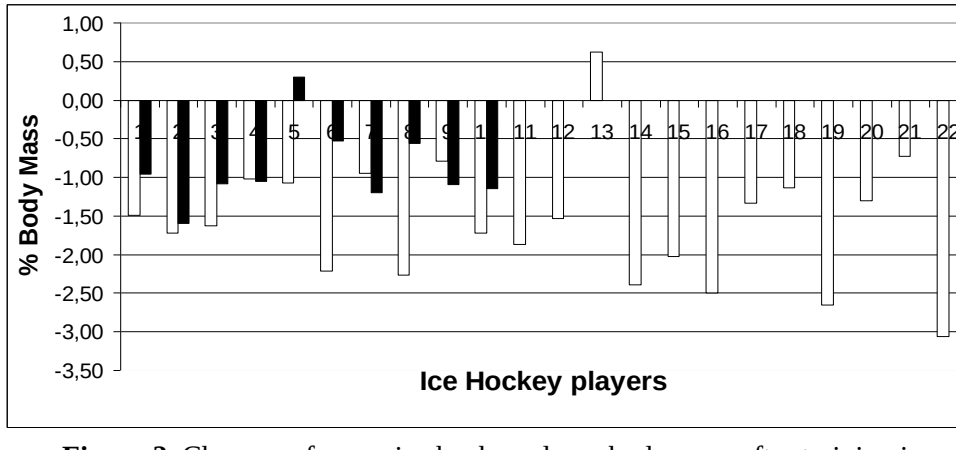

Figure 2. Changes of every ice hockey player body mass after training in comparison with the mass before training, professional (□) and amateur (■) ice hockey players

The mean USG value after the training in amateurs was 1.022 ± 0.005 and in professionals – 1.025 ± 0.006 (p=0.095). After the training the professional players' hydration status worsened: 65 % were hypohydrated and 26% seriously dehydrated according to USG values (Fig.3.), the mean USG after training was significantly higher than before it (p=0.011). The mean USG after training did not change in amateur players: their mean USG values before and after training did not differed significantly (p=0.677) before and after training. Nobody of amateur players was seriously dehydrated after training, Fig.3.

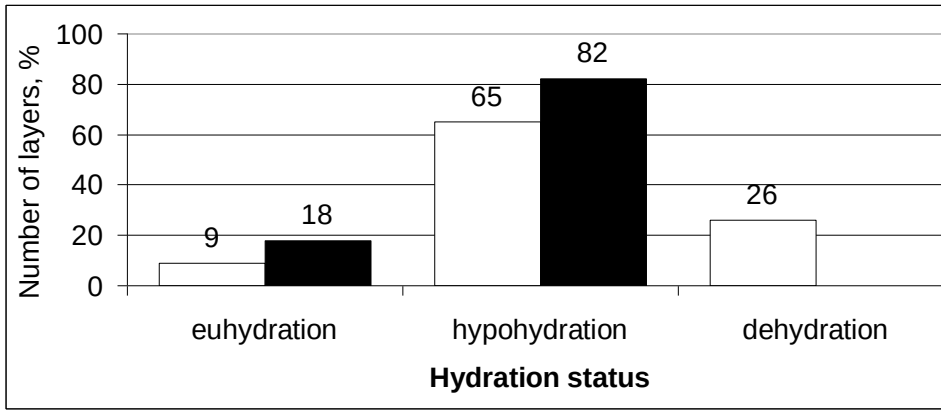

Figure 3. Hydration state of professional (□) and amateur (■) ice hockey players' after training from the data of USG

Discussion

Our data of the mean pre – practice USG indicating mild hypohydration (1.021 ± 0.004 in amateurs and 1.020 ± 0.008 in professionals) are in good agreement with results obtained in junior ice hockey players where the mean pre-practice USG was 1.020 ± 0.001 (Palmer Matthew S. and Spriet Lawrence L., 2008). In Palmer Matthew S. and Spriet Lawrence L. (2008) research, large number of ice hockey players arrived at practice well hydrated (n = 20), but over 50% (n = 24) were hypohydrated to varying extents prior to practice - 11 players had the USG between 1.021 and 1.025, in 12 players USG values were between 1.026 and 1.030, and one player USG was greater than > 1.030. In our case, pre-practice situation of ice hockey players was worse – more than 80% of tested amateur ice hockey players and 56 % of professional players were hypohydrated before practice, five percents of professional athletes were seriously dehydrated before the training (see Fig.1). This could be explained by inadequate nutritional and fluid intake habits in our athletes.

A different situation was in the study of junior ice hockey players performed by Logan-Sprenger H.M., Palmer M.S., and Spriet L.L. (2011), where pre - game urine sample USG analyses showed that on average players arrived at the rink in euhydrated state (USG 1.016 ± 0.002). Mean USG for forwards was 1.016 ± 0.004 and for defense players - 1.016 ± 0.004. However, of the 22 skaters, 41% (3/7 defense, 6/15 forwards) arrived hypohydrated (USG $\geq$ 1.020). Both goalies arrived at the game well hydrated with a USG of 1.015 ± 0.002. In our research pre-practice hydration data were worse may be due to the opinion of old generation Latvian ice hockey coaches to restrict the uptake of water or drinks during the training and the game and asking to ignore the thirst sensation in players. This leads to more expressed hypohydration and dehydration of athletes which can cause decrease of their performance. The research of body hydration in ice hockey players is rather new in Latvia. Therefore it is necessary to educate coaches and athletes about importance of well hydrated body.

Palmer Matthew S. and Spriet Lawrence L. (2008) reported that the mean body mass loss of the players during the training was 0.8% ± 0.1%. However, 13 players lost between one to two percents of body mass, and body mass decrease in one player exceeded two percents. In our research the mean changes in the body mass were: 0.9 ± 0.5% in amateurs and close to twice greater - 1.6±0.8% in professionals, the difference between the groups was statistically significant (p=0.005). The differences between the professional and amateur ice hockey players can be explained by higher intensity of exercises during training, the better athlete's physical conditioning and greater sweating rate in professional players in comparison with amateurs, which causes close to twice greater uncompensated fluid loss in professionals than in amateurs. Shirreffs (2010) suggested that soccer players to avoid decrease in physical performance should limit the degree of dehydration to less than 2% decrease of the pre- practice body mass. From our data the body mass loss exceeded 2% in seven from 23 or close to one third part of professional ice hockey players. This proved that fluid uptake during training was not sufficient to compensate sweat losses and may be to maintain performance. The body mass decrease was greater than 1.5% only in one amateur player. This allowed us to suggest that the hydration status of amateur players during the game was not so critical to affect their performance.

This is very important to personalize the recommendations for athletes (especially in professional players) taking into account the information about environment (temperature and relative humidity, solar load and

altitude above sea level), athletes' body composition, sweating rate and salt concentration in sweat, athletes diet and physical activity (duration and intensity) as well as taking into account fluid consumption possibilities (how often the athletes will be able to consume fluid, when next practice or competition round will happen), athletes clothing and adaptation level.

Conclusions

1. More than half (56 %) of the professional ice hockey players and 82% of amateur players were hypohydrated before training according to their USG values ≥ 1.020, 5% of professional players were seriously dehydrated their USG values ≥ 1.030. This confirms that fluid uptake according to their thirst sensation in winter conditions cannot compensate the fluid loss at rest.
2. After the training with duration of 1.5 hours the mean body mass decreased for 0.9±0.5% of pre– training value in amateur players and for 1.6±0.8% in professionals, the difference is significant (p=0.005). The body mass loss exceeded value critical for performance - 2 % in one third part of professionals. After the training the professional players' hydration status worsened: 66% were hypohydrated and 26% seriously dehydrated according to USG values, the mean USG after training was significantly higher than before it (p=0.011). USG after training did not change in amateur players: their mean USG values before and after training did not differed significantly (p=0.677). The differences can be explained by higher intensity of exercises during training, the better physical conditioning and greater sweating rate in professional players in comparison with amateurs, which causes close to twice greater uncompensated fluid loss in professionals than in amateurs.

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ORIGINAL RESEARCH PAPER

TRAINING-INDUCED CHANGES IN AEROBIC AND ANAEROBIC CAPACITY AND RESTING HORMONAL STATUS IN BLOOD IN ELITE MALE AND FEMALE SPEED SKATERS

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Abstract

To date, there is only one published study with the use standardized ergometry exercise tests regarding effect of long lasting training period on a change of physical fitness among international level male and female speed skaters (van Ingen Schenau JG, 1992). This study showed high level initial performance and lack of its improvements despite trainings. That phenomenon might be resulted in inadequate training modalities, accumulation of fatigue or simply such high initial fitness, that it was impossible to improve it. Our study was aimed to examine the responses of several biomechanical and physiological parameters to preparatory training period (4 months) with incising predominance of strength-velocity exercises over time course. The results showed minor, non-significant improvements of some parameters of anaerobic and aerobic capacity in the males. In females there was no change in aerobic capacity, and those in anaerobic one were lower than in males. After the period in both sexes resting blood cortisol was elevated and testosterone- to- cortisol ratio, was declined, that suggest shift of protein metabolism toward catabolism. We suspect that among females their adverse hormonal status may have been responsible for, general lower expected training effects.

Key words: *speed skating, gender, training, physical capacity, hormones.*

Introduction

Speed skating is a sport discipline that requires concurrent excellent aerobic and anaerobic capacities because starting distance ranges from 500 to 10.000 m. Obviously, some skaters specialize in races at shorter distances, while the others at longer ones. Nevertheless, for each speed skater a contribution of strength-velocity and endurance exercises in a whole preparatory training period (PTP) plays a crucial role. For that reason various laboratory exercise tests was incorporated for evaluation physical capacity and prediction of skating performance. The two main exercise tests anaerobic and aerobic one allows to examine maximal power output and aerobic threshold respectively. For speed skating practice, laboratory exercise tests were incorporated in the 80s and 90s of the last century. Geijsel et al. (1984) fund high correlations between power output realized during supra-maximal bicycle test lasting 30s (Wingate) and based on ice and air frictions and calculated power output generated during skating racing on 500m and 1500m. Nemoto et al. (1988) reported, that maximal oxygen uptake (VO_2 max) when expressed as l/min recorded during incremental graded test, allowed to distinguish top level skaters from those less skilled and successful, however, anaerobic and aerobic thresholds and absolute VO_2 max did not correlated with performance on races on various distances within each group.

Several laboratory studies conducted among athletes of various sport disciplines, especially in track and field, showed higher physical abilities in males, and these differences were often expressed as sex-related differences in scores of sportsmanship. The similar relationships between ergometry tests and scores of on-ice skating performance. Male speed skaters generated higher external power output and are fasters that their female counterparts on various distances due to greater skeletal muscles mass in male athletes. However, that predominance in anaerobic power are somewhat lower, when maximal power output is related to total body mass (Watts/kg) and it additional decreases when this parameters is expressed as power/lean body mass. In speed skating interesting direction of the changes between sexes has been found for anaerobic effort oxygen consumption (liter /minute) per relative external power (P/body mass). These parameters are similar in both sexes, but the oxygen consumption related to P/lean is higher in male skaters (Van de Groot. 1983). Blunting of sex-related differences in muscles power were (power adjusted to muscle mass) was found in speed skaters during 30s and 150s supra-maximal cycling (Van Ingen Schenau et al. 1988). The similar phenomenon was noted among male and female ice hockey players (Gilenstam et al. 2011).

To date, there is only one study on the changes of physical fitness among elite speed skaters throughout their training period. That early investigation showed very minor fluctuations of maximal anaerobic power output and VO_{2max} in elite speed skaters examined at three different occasions, in the February, May and September (Van Ingen Schenau et al. 1992). That indicated that elite speed skaters sustained almost the constant high fitness levels over the long entire pre-competitive period. Presumably, their mean maximal power output generated in Wingate in February was so high, that it was impossible to improve it despite increasing trainings volume from 10 to 20h per week. There are no other investigations on this topic, hence, our study aimed to examine the effect of 4-monthly preparatory training period on changes in maximal power, endurance ability and resting hormonal status in blood among elite Polish female and male speed skaters. This period has been characterized itself by increasing contribution of strength-velocity exercises decreasing volume on changes in maximal power.

Material and methods

Preparatory training period lasted from the end of May to the end of September. The studies involved elite four senior female (aged 22-24 ys) and males (22-25ys) speed skaters of the Polish national levels. The study carried out twice. It has been started after completion of the 1st phase and prior to the 2nd phase (1st examination). The 1st phase was characterized by predominance of endurance trainings. These trainings consisted in a great part of cycling on a long distances (daily up to 80-100 km with a speed not exceeding 35km/h) with the use of road bikes, which shape imposed an inclined stances, somewhat similar to that during a competitive run. Throughout that phase groups of males and females were trained separately under supervision of their coaches. After that, came 4-month period of strength-velocity trainings, which involved repeated cycling sprints on shorter distances (2-5km), circuit legs exercises (leg press, squats with a barbell) riding on rollerblades and short lasting uphill runs. That 2nd phase of preparatory training for both males and females covered five repeated 2-3 week training camps, where housed together athletes were accommodated in Training Centers, and had similar training schedule and the same supervision. At the end of that period the whole group was examined again (2nd examination). In both examinations the study lasted two successive days and it included: (the 1st day) estimation of free fat mass (three measures of skin folds thickness: triceps, biceps and subscapula) according to the methodology described by Durnin et al (1974). Determination of

resting (08:00) plasma cortisol (C) and testosterone (T) levels with the use of ELISA method, commercial kit provided by DRG-GERMANY and attached to the analytical run control samples as a reference material provided by BIORAD. The hormones were assayed in duplicates, based on these results within assay error were 5.5 and 5.9% for cortisol and testosterone respectively. Anabolic-catabolic indexes were expressed as T: C ratio $*10^2$. Two exercise tests, Wingate 30s and Incremental graded test (IT) were performed forenoon day-by-day in a counter-balanced order on a cycle ergometer (Monark 824E) which was connected on-line with a computer recording a linear speed of flywheel` rotation.

During Wingate test based on the speed and braking force (load), which equaled 7.5% of body mass for both sexes, power output was calculated (authorized software). Biomechanical parameters, maximal power (Watts), work output (Joules), their relative values adjusted to body mass and free fat mass, and time (s) of attaining and sustaining 97.5% maximal power were recorded during the test. Wingate test was preceded by 5-minute warm-up of a moderate intensity; a loud verbal encouragement was used during that test.

IT was continued until volitional exhaustion. It was performed with the unchanged pedal cadence (80 rpm) imposed by an acoustic chronometer. Power output was increased every 3 minutes by the same value, 0.75W/kg for females and 0.90W/kg for males, by the appropriate elevation of the braking force prior to the next stage. Capillary blood lactate (LA, Super GL 2, Dr Müller), maximal VO2 uptake (Metalyzer 3 B Cortex) and rating of perceived exertion (RPE, Borg`s scale) after completing of the last, the most intensive bout of IT were recorded.

Non parametric statistical tests were used, for comparison between groups (U-test, Mann-Whitney), and for comparison between examinations within each group Wilcoxon`s signed rang test was used. The study protocol was approved by the Ethical Commission at Institute of Sport

Results

During exercise tests biomechanical parameters were recorded on-line as follows:

1. P_{max} – maximal power output (the sampling frequency of 1000Hz)
2. W – Total work output
3. T att – time to attainment P_{max}
4. T sus – time to sustain P_{max}
5. FI – fatigue index $(P_{max} - P_{30sec})*100\%/ P_{max}$ (relative decrement of power at the end of Wingate)

6. BM – total body mass
7. FFM – free fat mass
8. VO_{2max} – maximal oxygen uptake

Biomedical and biomechanical variables for female and male speed skaters and results of statistical calculations are displayed in Table 1 and 2 respectively.

Table 1

Post training anaerobic and endurance capacity and the blood hormonal status in elite female speed skaters (n=4)

Variable	Before training period	After training period	Z	p
C (nmol/L)	620±150 (546-790)	768±259 (461-1070)	1.83	0.068
T (nmol/L)	1.7±0.3 (1.3-2.0)	1.8±0.3 (1.3-2.1)	1.07	0.285
T/C*100	0.27±0.06 (0.24-0.37)	0.23±0.12 (0.19-0.43)	0.731	0.465
Biomechanical variables of Wingate				
P_{max} (Watt)	639±111 (539-795)	666±80 (579-769)	1.09	0.273
$p1_{max}$ (Watt/BM)	10.20±0.62 (9.45-10.91)	10.55±0.35 (10.01-11.01)	1.46	0.144
$p2_{max}$ (Watt/FFM)	12.83± 1.11 (11.87-14.43)	13.30 ± 0.54 (12.62-13.98)	1.09	0.273
W (kJ)	15.07±2.51 (12.81-18.56)	15.84±1.67 (13.84-17.92)	1.09	0.273
w1 (J/BM)	241±15 (221-255)	251±10 (243-265)	1.46	0.144
w2(J/FFM)	303 ±25 ((278-337)	316± 11 (305-326)	1.09	0.273
Tatt (sec)	4.30±0.76 (3.26-4.95)	4.03±0.54 (3.37-4.70)	1.09	0.273
Tsus (sec)	3.61±0.28 (3.26-3.88)	3.33±0.74 (2.48-4.10)	0.731	0.465
FI (%)	22.1±1.2 (20.5-23.3)	22.1±1.6 (19.5-23.3)	1.09	0.273
Biomechanical and physiological variables of the incremental graded test				
P_{max} (Watt)	305±37 (260-350)	308±33 (261-338)	1.09	0.273
$p1_{max}$(Watt/BM)	4.89±0.10 (4.81-5.03)	4.88±0.22 (4.66-5.16)	0.365	0.715
$p2_{max}$(Watt/FFM)	6.17±0.17 (6.04-6.40)	6.14±0.11 (6.07-6-29)	0.365	0.715
w1 (kJ/BM)	3.33±0.10 (3.23-3.45)	3.31±0.30 (3.01-3.71)	0.365	0.715
w2 (kJ/FFM	4.20±0.07 (4.14-4.29)	4.20±0.22 (3.97-4.53)	0.00	1.00
VO_{2max} (L/min)	3.36±0.41 (2.90-3.89)	3.35±0.33 (2.94-3.74)	0.00	1.00
$VO_{2\ max}$ (ml/min/BM)	53.65±1.77 (51.7-56.0)	53.08±2.37 (51.5-56.3)	0.00	1.00
$VO_{2\ max}$ (ml/min/FFM)	67.4±2.0 (68.3-70.6)	66.9±1.8 (66.0-68.7)	0.365	0.715
La (mmol/L)	11.8±0.23 (10.6-14.1)	13.8±1.3 (12.9-15.9)	1.46	0.144
RPE (6-20 points)	19.5±0.6 (19-20)	19.8±0.5 (19-20)	0.00	1.00

Table 2

Changes in post training anaerobic and endurance capacity and the blood hormonal status in elite male speed skaters (n=4)

Variable	Before training period	After training period	Z	p
C (nmol/L)	428±83 (357-523)	647±163 (533-889)	1.83	0.068
T (nmol/L)	20.1±0.9 (18.9-21.4)	19.3±2.7 (17.4-23.4)	0.731	0.465
T/C*100	4.5±0.6 (3.2-5.8)	3.1±0.7 (3.0-4.5)	1.83	0.067
Biomechanical variables of Wingate				
P_{max} (Watt)	1017±92 (944-1147)	1055±84 (982-1158)	1.83	0.068
$p1_{max}$ (Watt/BM)	12.58±0.68 (11.71-13.2)	13.00±0.67 (12.11-13.42)	1.83	0.068
$p2_{max}$ (Watt/FFM)	14.01±1.02 (12.61-14.82)	14.42±0.94 (13.14-15.40)	1.83	0.068
W (kJ)	23.84±1.82 (22.39-26.23)	24.98±1.71(23.27-27.18)	1.83	0.068
w1 (J/BM)	295±11 (279-303)	308±17 (283-319)	1.83	0.068
w2(J/FFM)	328±19 (301-345)	341±24 (306-361)	1.83	0.068
Tatt (sec)	3.67±0.53 (2.99-4.51)	3.46±0.74 (2.87-4.22)	0.365	0.715
Tsus (sec)	2.44±0.53 (1.88-2.84)	2.63±0.78 (1.71-3.30)	0.00	1.00
FI (%)	10.6±2.4 (7.3-12.4)	9.9±1.8 (7.7-11.7)	1.46	0.144
Biomechanical and physiological variables of the incremental graded test				
P_{max} (Watt)	432±69 (368-528)	454±73 (370-543)	1.83	0.068
$p1_{max}$ (Watt/BM)	5.31±0.50 (4.97-6.04)	5.59±0.54 (5.07-6.32)	1.83	0.068
$p2_{max}$ (Watt/FFM)	5.90±0.59 (5.33-6.72)	6.20±0.58 (5.74-6.98)	1.83	0.068
w1 (kJ/BM)	3.50±0.35 (3.03-3.96)	3.88±0.78 (3.23-4.76)	2.46	0.144
w2 (kJ/FFM	3.91±0.41(3.47-4.40)	4.31±0.61 (3.68-5.12)	0.731	0.465
VO_{2max} (L/min)	4.97±0.83 (3.92-5.95)	5.12±0.56(4.31-5.44)	0.548	0.583
$VO_{2\ max}$ (ml/min/BM)	61.48±6.11 (55.33-68.21)	63.96 (57.70-68.78)	1.83	0.068
$VO_{2\ max}$ (ml/min/FFM)	69.7±6.4 (62.2-76.2)	68.5±6.2 (61-77.1)	1.83	0.068
La (mmol/L)	12.4±2.5 (9.7-15.7)	14.3±1.4 (12.8-16.2)	1.09	0.273
RPE (scores 6-20 points)	19.5±0.6 (19-20)	19.8±0.5 (19-20)	0.00	1.00

Because of small size of the samples of both sexes results of statistical comparison (Wilcoxon`s signed rank test) did not revealed any post training changes, neither in females nor in males, however, the relative changes were, in general, somewhat higher among males, as was shown in Table 1 and 2. Training period triggered the increase in blood cortisol, by 51.1% and 23.9%, in males and females respectively. Because of very minor changes in testosterone levels, anabolic-catabolic index (T/C*100) decreased by 31.1% in males and by 14.8% in females. In females after

training period biomechanical parameters of Wingate test were slightly improved, while those biomechanical and physiological of incremental graded test were the same. In males slightly (by few percents) improvements were noted in scores of both exercise tests. In both group and examination perceptual responses to IT estimated with RPE were the same, the skaters rated the exertion as very, very hard. Based on the total results taken together from the both terms (8 observations within each sex) we found significant gender differences in some variables. As expected, during incremental test the levels of absolute maximal power output and work output were higher in the males group, however, these differences were lower when the variables were expressed as relative values, i.e. when these biomechanical parameters were related to body mass, and lack of the differences appeared when comparison was done for fat free mass. The similar trend was occurred for maximal oxygen uptake during the incremental test. Interestingly, female skates demonstrated two-fold lowed exercise-induced fatigue decrement of power output at the end of Wingate test. Table 3 presents statistical between-sex comparisons.

Table 3

Comparison of sex-related differences in biomechanical and physiological parameters recorded during both examinations

Variables	Z-function	P-value
Wingate test		
P_{max} (Watt)	-3.31	0.001
$p1_{max}$ (Watt/BM)	-3.31	0.001
$p2_{max}$ (Watt/FFM)	-2.15	0.031
w1 (J/BM)	-3.31	0.000
w2(J/FFM)	-2.15	0.031
Tatt (sec)	0.84	0.401
Tsus (sec)	2.57	0.010
FI (%)	-3.31	0.000
Incremental graded test		
P_{max} (Watt)	-3.31	0.001
$p1_{max}$ (Watt/BM)	-2.63	0.011
$p2_{max}$ (Watt/FFM)	0.89	0.372
w1 (kJ/BM)	-1.31	0.189
w2 (kJ/FFM	0.79	0.431
VO_{2max} (L/min)	-3.31	0.000
$VO_{2\,max}$ (ml/min/BM)	-3.09	0.002
$VO_{2\,max}$ (ml/min/FFM)	-0.26	0.793
La (mmol/L)	0.92	0.331

In one of examined female we noted post training decrements in biomechanical parameters of Wingate, incremental graded test and $VO_{2\ max}$ (by few percentages), with strong rise of C level (to 1070 nmol/L) and the highest fall of T/C ratio. These symptoms may suggest development of chronic fatigue and the data influenced mean variables within female group.

Discussion

It is worth to note, that for each sport discipline the main issue of physical preparation to competitive period in endurance-velocity trained athletes is an optimal scheduled trainings period undertaken after detraining period. Although regular concurrent aerobic and anaerobic exercises are undertaken during retraining, but first phase of this period is oriented mainly on improvement of endurance capacity, therefore, aerobic exercises predominate in the physical activity. After achievement of required endurance, the next, second stage of preparation is focused on development of strength-velocity abilities with using anaerobic exercises. Finally, a short-term period of reduced activity, so-called taper period directly precedes a competition. Correctly carried out a second phase of the preparation should lead to enhance strength-velocity abilities without loss of previously attained physical endurance, thus, achievement of high speed and good endurance require appropriate training modality. As mentioned earlier, the real effectiveness of trainings utilized throughout the second, strength-velocity period is easy to confirm with using two standardized exercise-tests. It was reported that some biomechanical parameters obtained from off-ice field exercise tests have tremendously predictive power for ice skating performance. Majority studies examine speed running on a short distance. For instance among juvenile females (aged 12ys) practicing ice-hockey, 40-yd dash time was the strongest predictors of skating speed (Bracko and George 2001). More comprehensive examinations among ice-hockey players revealed, that scores of four the laboratory tests, 30-meter sprint, vertical jump, broad jump and 3 hop jump, accounted for a total from 65 to 78% of the variance in on-ice sprint performance (Farlinger et al. 2009; Krause et al. 2012). Likewise, the study in speed skates revealed that higher mean power by 25W results higher mean velocity on ice by 0.5% (Houdijk et al. 2000), therefore we utilized power and endurance tests in our study.

Hormonal changes

Up to date there were only two published results regarding changes in the resting hormonal status induced by training period in speed skaters (Banfi et al. 1993) and the hormonal responses to repeated efforts among

three those, who after training period were demonstrated overreaching state (Nederhof et al. 2008). Our study showed training-induced elevation of resting adrenal activity (the increase of C level) and levered T/C ratio that suggests shift of resting metabolism toward protein catabolism. That change is typical for overreaching state after training period, although, biomechanical improvements of physical fitness components recorded during Wingate and incremental graded test were rather small. It is worth to note higher cortisol level among female then in male skaters, both prior to- and after training period. That phenomenon was often reported previously among athletes but not in non-athletes.

Wingate performance

3-month preparatory training period did not significantly change biomechanical parameters of Wingate test in both sexes. Maximal mean power generated by males and females examined by us were markedly lower as compared to those recorded over 20ys earlier in the world class skaters from The Netherlands (Van Ingen Schenau et al. 1988) (males 1103Watts, females769 Watts). The similar predominance presented the other Dutch speed skaters when comparing their relative power (males -14.2 Watts/kg and females 12.6 Watts/kg) (Van Ingen Schenau et al. 1992). As mentioned, the females demonstrated lower work-induced decrements of power output at the end of Wingate test. That lower end-exercise fatigability (FI%) in exercising females may be linked with sex-related differences in proportion between types of muscle fibers (type II and I) (Staron et al. 2000), and the lower work-induced rate of reduction of ATP and PCr, and higher pos-effort rate of phosphagens recovery in women (Esbjörnsson-Liljedahl et al. 1999; Esbjörnsson-Liljedahl et al. 2002). On the other hand, lower cross sectional area of fast twitch fibers (type II) in woman may explain significantly lower relative maximal power express as Watts/free fat mass and somewhat slower reaching peak power (longer Tatt) as were also reported earlier by Billaut (Billaut et al. 2003) . Additional effects of differences in muscle exercise metabolism is significantly lower accumulation of blood lactate in women after completing short-lasting all-out efforts (Esbjörnsson-Liljedahl et al. 2002), however, in our study that parameters was examined only after incremental graded test.

Incremental graded test

The only published data providing information regarding aerobic capacity in elite speed skaters was study conducted among Dutch skaters by van Ingen Schenau GJ (Van Ingen Schenau et al. 1992). He reported VO_2 max accounted an average 63.1 and 55.3ml/kg/min in males and females respectively. These values are comparable with those noted by us.

Comparing pre- and post-preparation variables of Incremental graded test it is worth to note that males demonstrated non-significant, small the improvements, while in females these variables were unchanged. Interesting effects of between sexes comparison of maximal power were found when the variables were related successively to body mass and free fat mass. Absolute power (Watts) was significantly higher in males but no difference was found for the relative values express as Watts/free fat mass. That may indicate that work-efficiency of muscle slow twitch fibers and rate of aerobic metabolism are non sex-dependent.

Conclusions

The study showed that period focused on an improvement of strength-velocity abilities does not diminish aerobic capacity among both groups, but it elicited minor but somewhat better improvement of anaerobic capacity in the males. That is the evidence, that after achievement of good endurance, that ability may be sustained over strength-velocity training period.

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ORIGINAL RESEARCH PAPER

ANXIETY AND AFFECT IN SUCCESSFUL AND LESS SUCCESSFUL ELITE FEMALE BASKETBALL PLAYERS: *IN-SITU* SAMPLING BEFORE SIX CONSECUTIVE GAMES

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Abstract

Justification and aim of the study: Successful athletes tend to approach contest situations with different psychological mind-set than their less successful counterparts. The aim of this repeated-measures design study was to assess whether a successful (national league third rank) and a less successful (11th rank) first division women's basketball team differ in anxiety, positive affect, and negative affect before six consecutive games in the annual championship. Methods: Two psychometrically validated questionnaires, the Sport Competition Anxiety Test (SCAT; Martens et al., 1990) and the Positive Affect Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) were used to measure pre-competitive anxiety and positive- and negative affect. The scales were completed by first division female basketball players, who were members of either the successful or the less successful team, before six matches; three played at home and three played away from home. Results: Successful players reported lower anxiety before games (effect size (Cohen's d = 1.2) than less successful players. Both teams displayed more positive affect before the games played at home than before the games played away from home (d = .44). However, ratings of the subjective states varied substantially across the games. Conclusion: The results, interpreted in light of an interactional model (Cerin et al., 2000), show that subjective appraisal of each competition situation yields very specific or unique expectations, which in turn determine the psychological states of the players before the upcoming contest.

Key words: *athlete, expectation, home field advantage, season, team*

Introduction

A major striving in sport psychology is to differentiate between successful and less successful athletes with a view on selection, prediction, and psychological skill training. In this quest, numerous scholars have adopted the mental health model (Morgan, 1985) that was forwarded on the basis of results obtained with the Profile of Mood States Inventory (POMS; McNair, Lorr, & Droppleman, 1992). Accordingly, successful athletes report higher vigour and lower fatigue on the POMS, also connotated as the *iceberg profile*, than less successful athletes. However, despite becoming textbook material, the mental health model has been challenged nearly two decades ago on the basis of the results of a meta-analysis (Rowley, Landers, Kyllo, & Etnier, 1995). Later, Beedie, Terry, and Lane (2000) concluded that the model and the POMS may still be useful in predicting performance, but not athletic success. Therefore, mental differences between more- and less-successful athletes deserve attention from other theoretical perspectives and using other instruments as well.

Athletic contest is defined by three situational variables: (a) demands, (b) constraints, and (c) opportunities (Cerin, Szabo, Hunt, & Williams, 2000). The appraisal of these situational components is a function of personality factors, experiences, and coach-fostered (Becker & Solomon, 2005) expectations about the actual situation. Subjective appraisal of challenge influences both the mental states and form (i.e., positive or negative affect) and intensity of the emotions (Jones, 1995; Lazarus & Folkman, 1991). The interactional model for challenge in athletic contest (Cerin et al., 2000) may account for psychological differences between more successful and less successful athletes, because of differences in skills, success, and associated expectations in each of the three contest variables. To date the model did not receive sufficient attention. However, this interactional model could account for differences not only between successful and less successful athletes, but also for mental states generated in relation to various contest situations (i.e., easy-hard, home-away competitions).

There is a general assumption that home field advantage also provides psychological benefits that facilitate athletic performance (Carron, Loughhead, & Bray, 2005; Courneya & Carron, 1992; Pollard & Gómez, 2014; Prieto, Gómez, & Pollard, 2013). Clear evidence for home field advantage was presented by Pollard and Pollard (2005) who examined the records of 400,000 games played between 1876 and 2003. The take home message of their analysis was that there is a home advantage in professional team sports including National Basketball Association, Major League

Baseball, National Hockey League, National Football League, and professional soccer league in England. The conclusions were echoed in a more recent meta-analysis based on 30 relevant studies (Jamieson, 2010).

Research also looked at the psychological aspects of the home field advantage in various team and individual sports. In light of Cerin et al.'s (2000) interactional model for competition challenge, the situational advantage risen from the home field should influence athletes' appraisal of the game and the associated expectations. This proposition matches the original model forwarded by Courneya and Carron (1992). The net result of a favourable appraisal, and the emerging emotional response to this appraisal, should be a more positive psychological state before home games in contrast to games played away. However, research findings are rather equivocal.

Many studies failed to reveal evidence for *psychological* advantage before the games played at home. A 27-day diary study of 12 professional rugby league players, who competed in the Super League, found no statistical differences in self-reported mood states leading up to home or away games (Polman, Nicholls, Cohen, & Borkoles, 2007). Another study with 15 rugby players reported that the game venue did not affect players' pre-contest mood, as based on two home and two away games (Kerr & Schaik, 1995). Contradicting these findings, the examination of 100 rugby union players showed that in contrast to away games, home games were associated with lower anxiety and also more positive mood (Terry, Walrond, & Carron, 1998). The examination of 30 professional soccer players before a game played at home and one away revealed no differences in anxiety before the games played at the different locations (Duffy & Hinwood, 1997). Similar results emerged in mood measures in another inquiry with five professional soccer players tested before two games played at home and two games away from home (Waters & Lovell, 2002). Further, in individual sports, 26 alpine skiers reported no differences in pre-contest anxiety or self-confidence at home compared to away (Bray & Martin, 2003). However, positive results emerged with, 14 ice-hockey players who showed more self-confidence and less anxiety before games played at home in contrast to those that were played away from home (Carré, Muir, Belanger, & Putnam, 2006). Furthermore, Thuot, Kavouras, and Kenefick (1998) also found higher levels of self-confidence and lower somatic anxiety when 23 high school basketball players competed at home instead of away.

In basketball, the home field advantage - from technical and outcome perspectives – is well established (Gayton & Coombs, 1995; Silva &

Andrew, 1987; Snyder & Purdy, 1985; Varca, 1980). Bray and Widmeyer (2000) found that team collective efficacy was a critical psychological factor increased by the home advantage. Team quality was also implicated in the home field advantage (Madrigal & James, 1999). It was found that high quality, or more successful, teams suffered in matches played away from home, whereas less successful teams seemed to profit (Loughead, Carron, Bray, & Kim, 2003). Thus, research in basketball home field advantage appears to shows that both the situation and quality, or success, of the team could affect athletes' psychological states and, therefore, the ensuing athletic performance.

In the present inquiry, anxiety, positive- and negative affect were gauged before six consecutive (three home and three away) games in a successful and a less successful first division female basketball team. In light of Cerin et al.'s (2000) interactional model, it was hypothesized that as a result of the varying situations, the measures will be more positive during the home than away games, and that further differences between successful and less successful teams may also emerge, with a more favourable profile in the more successful team. It was also presumed that the successful team will exhibit lower anxiety profile as measured with the Sport Competition Anxiety Test (Martens, 1977; Martens, Vealey, & Burton, 1990).

Material and Methods

Participants. Elite female basketball teams, playing in the national first division and finishing the past season among the top and bottom third of the league, were invited for participation in the research. Nine players from a relatively successful team (ranked third in the first division) and a 12 players from a less successful team (ranked 11th in the first division) agreed to take part in the study. All players were contracted members of their respective teams. Athletes spoke the same language and had similar social and cultural background. Age of the more successful team was higher (M = 26.3, SD = 6.1 years) than that of the less successful team (M = 21.9, SD =4.1years). However, the age-difference was statistically not significant. The 21 players have all consented to participation in the inquiry. One player from the less-successful team was excluded from the study due to absences and, hence, lack of data. The final sample consisted of 20 participants. Confidentiality of personal responses was assured. The study was conducted in accord with the local as well as international ethical regulations (i.e., The British Psychological Society, 2010; World Medical Association, 2008).

Measures. The Sport Competition Anxiety Test (SCAT; Martens, 1977; Martens et al., 1990) was adopted for determining competitive

anxiety. The SCAT contains 15 items; five are dummy and 10 assess anxiety. Eight of the 10 items measure somatic anxiety and two are indices of cognitive anxiety. Therefore, the SCAT is commonly adopted as a somatic-trait instrument. The respondents have to indicate how they usually feel when they compete on a 3-point scale: (a) hardly ever, (b) sometimes, and (c) often. The scale contains statements like: "Just before competing, I notice my heart beats faster than usual," or "Before I compete I am nervous." The letter-codes are transformed into numbers (a=1, b=2, c=3). Two items out of 10 are rated inversely. A total score calculated for the 10 items reflects competitive anxiety. The higher the score, the higher is the anxiety. Martens et al. (1990) reported good psychometric properties for the scale; the internal reliability ranged from .95 to .97 (Cronbach's alpha) and its mean test-retest reliability was .77. The SCAT was used in over 100 inquiries (Dunn & Dunn, 2001; database searches May, 2013). Despite the contention that the SCAT is a trait measure, its sensitivity to both short and long term intervention-induced changes was shown in the literature (Lohr & Scogin, 1998; Rani & Dhadwal, 2013; Singh & Gaurav, 2011; Smith, Smoll, & Barnett, 1995).

The Positive Affect Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) was used for measuring affect. The 14-item abbreviated version of the scale (Gauvin & Szabo, 1992) was adopted in the current inquiry for its reliability in past experience sampling research (Gauvin & Szabo, 1992; Szabo & Parkin, 2001). This scale consists of six positive items (happy, pleased, energetic, joyful, relaxed, and experiencing enjoyment/fun) and eight negative items (angry/hostile, stressed, irritated, frustrated, guilty, depressed, unhappy, and worried/anxious). Each item is rated on a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*very much*). An aggregate score is obtained for both positive and negative items. The PANAS has excellent psychometric properties (Watson & Clark, 1999; Ostir, Smith, Smith, & Ottenbacher, 2005. The internal reliabilities obtained in the current study are presented in the Results section and Table 1.

In contrast to the SCAT, the PANAS is a state measure that gauges affect, defined as a non-reflective, but consciously retrievable, psychophysiological mental state bridging emotions and mood (Russell & Feldman Barrett, 2009).

Procedure. After giving consent for participation, basketball players completed the SCAT and PANAS in the presence of the experimenter within 30 min before the start of the game. This assessment was repeated before six consecutive matches, played at one-week intervals, during the season. The players completed the two questionnaires near the basketball

court and during this time they were not allowed to interact with anyone, except if they had a question to the experimenter pertaining to the completion of the questionnaires. The experimenter recorded the nature (home or away) and the outcome (win or loss) of the game. Data were entered in an SPSS data file for subsequent statistical analyses. Sample size based statistical power analysis was performed with the G*Power software (Faul, Erdfelder, Lang, & Buchner, 2007). Calculation for repeated measures analysis of variance, mixed between-within interaction design, with a moderate effect size, two groups and six repeated measures, α error = .05, with n = 20, assured less than the optimal (.95) statistical power (1 - β error) = .84. However, it is generally accepted that tests with a power greater than .80 (or ß <= .20) may be considered statistically fairly robust (Park, 2008).

Results

Measures and Variability. The internal reliabilities (IR; Cronbach's alpha) of the three dependent measures were calculated for the six games and are presented in Table 1.

Table 1

Internal reliability (Cronbach's alpha) of the scales at six sampling periods

Game	Anxiety	Positive Affect	Negative Affect
Game 1	.85	.85	.75
Game 2	.79	.87	.70
Game 3	.77	.78	.53
Game 4	.84	.86	.64
Game 5	.79	.84	.76
Game 6	.71	.90	.70

According to a commonly accepted classification (Kline, 1999) anxiety IR values were in the range of *acceptable to good*. The IR results for positive affect were mostly in the *good* category. However, two out of six IR scores for negative affect were in either in the *poor* or *questionable* category, whereas the other four fitted into the *acceptable* range. Due to the low sample size, the current IR values should be considered approximate rather than accurate in spite of the fact that the Cronbach's alpha coefficient appears to change relatively little with an increase in the sample size (Javali, Gudaganavar, & Raj, 2011). Further, these calculations were aimed at verification rather than psychometric validation.

Correlations, for each instrument, over the six games showed substantial variability with results for anxiety varying between r = -.02 to r = .63, for positive affect between r = -.03 to r = .80, and for the negative

affect values between r = .16 to r = .84 (Table 2).

Table 2

Correlations (r) between the dependent measures across six games

	Game 1	Game 2	Game 3	Game 4	Game 5	Game 6	
Game 1	- - -	.59* .50* .60*	.13 -.03 .26	.56* .62* .79*	.42 .44 .67*	.13 .52* .73*	Anxiety Positive Affect Negative Affect
Game 2		- - -	-.03 .29 .40	.47* .43 .40	.33 .80* .84*	.63* .42 .39	Anxiety Positive Affect Negative Affect
Game 3			- - -	.12 .33 .25	.45* .32 .45*	.05 .28 .16	Anxiety Positive Affect Negative Affect
Game 4				- - -	-.05 .23 .48*	.53* .56* .55*	Anxiety Positive Affect Negative Affect
Game 5					- - -	-.02 .41 .54*	Anxiety Positive Affect Negative Affect
Game 6						- - -	Anxiety Positive Affect Negative Affect

Note. *Statistically significant (p < .05)

Again, the aim of these calculations was to detect variability of the responses across the games rather than to investigate the test-retest reliability of the instruments.

Team Parameters. The more successful basketball team has finished in the third place in the division, lost only two games (3 and 6) out of the six played during the inquiry, and displayed statistically significant differences in pre-game anxiety levels (Friedman test; $F_r(5) = 11.66$, $p = .04$) and negative (but not positive) affect ($F_r(5) = 12.89$, $p = .02$) across matches in

the championship. The less successful team has finished 11th in the first division, lost all six consecutive games in the course of the investigation, and reported different levels of positive affect across the six matches ($F_r(5) = 13.54$, $p = .02$), while its scores in anxiety and negative affect were statistically not significant.

Team Differences. Team differences in anxiety, positive-, and negative-affect before the six consecutive games in the championship were tested with a 2x6 (Teams by Number of Games) repeated measures MANOVA, with pre-competition anxiety, negative-, and positive-affect being the multivariate dependent measures. This analysis has only disclosed a statistically significant main effect for team-measures, with no main effect for games or game by team interaction ($\Lambda = .526$, $F(3, 16) = 4.80$, $p = .014$, partial eta^2 (η_p^2) = .47). Follow-up univariate tests have revealed that the multivariate effect was due to the statistically significant difference in pre-game reports of anxiety ($F(1, 18) = 9.79$, $p = .01$, $\eta_p^2 = .352$; Fig. 1).

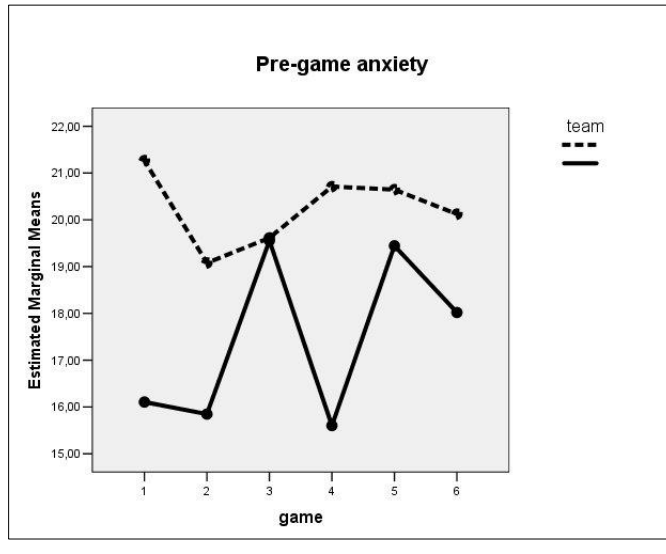

Figure 1. Anxiety as measured with the SCAT in a more successful (continuous line) and less successful (broken line) first division female basketball team over six consecutive championship games.

The more successful team exhibited 17% lower pre-competition anxiety ($M_{aggregate} = 17.43$, $SD = 2.30$) than the less successful team ($M_{aggregate} = 20.42$, $SD = 2.04$), effects size, Cohen's $d = 1.2$). Two relatively weak trends were also observed in the other dependent measures, with the

more successful team demonstrating lower negative affect (p = .12; Fig. 2) and higher overall positive affect (p = .15; Figure 3).

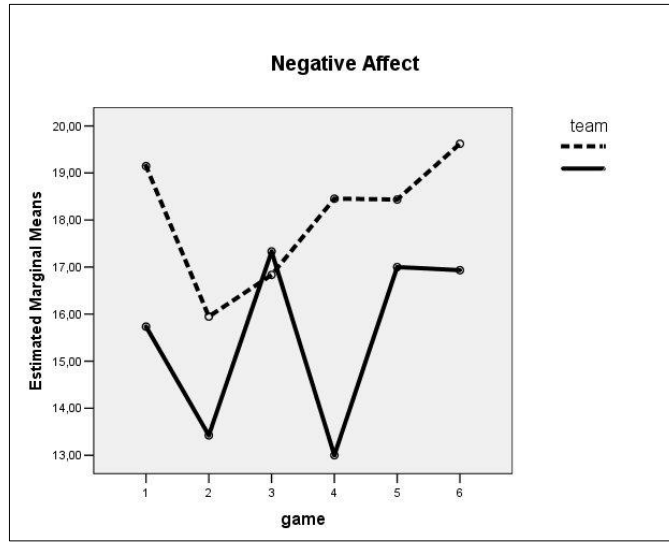

Figure 2. Pre-game negative affect in a more successful (continuous line) and less successful (broken line) first division female basketball team over six consecutive championship games

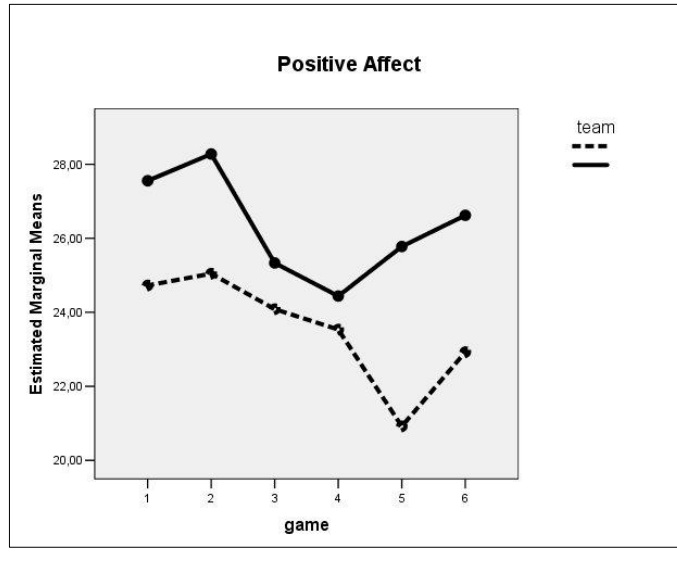

Figure 3. Pre-game positive affect in a more successful (continuous line) and less successful (broken line) first division female basketball team over six consecutive championship games

Home and Away Matches

Since in the previous statistical analysis no game by team interaction was disclosed, aggregate score for games played at home and away were calculated, and these scores were subjected to Wilcoxon signed-rank tests for pre-game anxiety, positive affect, and negative affect. Statistically significant difference emerged for positive affect (Z = - 2.56, p = .01; M = 25.72, SD = 3.71 at home, and M = 23.88, SD = 4.61 away, respectively; d = .44). A trend in lower negative affect reported before the games played at home (M = 16.49, SD = 3.75) in contrast to games played away from home (M = 17.40; SD = 4.16) was also noted (Z = -1.83, p = .07, d = .23). The mean values of anxiety were not different between the matches played at home and away.

Won and Lost Games

The more successful team lost two games out of four: one at home and one away. The measures before these two lost contests (one at home and one away) were compared with the non-parametric Wilcoxon signed-rank tests due to low number of paired observations. These tests were statistically not significant for any of the three dependent measures. However, a further analysis contrasting measures for games won at home and away yielded statistically significant differences for positive affect (Z = - 2.38, p = .02; M = 27.92, SD = 4.86 and M = 25.11, SD = 4.37, respectively; d = .61) as well as a trend in scores of anxiety at home (Z = - 1.72, p = .09; M =15.97, SD = 3.07 and M =17.52, SD = 2.65, respectively; d = .54), showing more positive affect and less anxiety at home than away from home.

Discussion

The findings in the current research show that there is a psychological advantage in context of the home field basketball contest. They also show a great variability in the ratings of affect and anxiety, pointing to a noteworthy role of situational factors. The psychological states of the more successful team were superior to those of the less successful team. Both the variability of measures and the team-differences could be explained in terms of the pre-game appraisals of the contest, the ensuing expectations and the associated feeling states, all in line with Cerin et al.'s (2000) interactional model for competition challenge.

The results of the present inquiry corroborate the scanty reports in the literature that home field advantage is associated with more positive mental states in basketball teams (Bray & Widmeyer, 2000; Thout et al., 1998). In

this study elite female basketball players showed a more favourable profile in positive affect and a trend pointing towards lower negative affect prior to games played at home in contrast to games played away. Unlike in an earlier inquiry with high school basketball players (Thout et al., 1998), differences in anxiety could not be detected between home and away games. The discord in findings could be related to the level of the athletes studied (i.e. high school vs. elite) and to different measures used for gauging anxiety (state vs. trait). It should be appreciated that despite of the high response variability, both within and between players, the SCAT is insensitive to cognitive anxiety, because it is tool for measuring somatic anxiety. In line with the interactional model for athletic contest (Cerin et al., 2000), the more positive affectivity before games played at home, regardless of level of success, could be linked to a familiar and/or reassuring (or confidence generating) situation and more pleasant evaluation of the home game environment, resulting in positive affectivity.

The high variability both within and between the teams' responses in both state (affect) and trait (anxiety) measures, strongly supports the notion that pre-competitive emotions need to be studied from an interactional—person, situation or contest, appraisal-expectations – point of view for which a theoretical model presented more than a decade ago by Cerin et al. (2000) appears to be the most appealing. In the current study, the more successful basketball team showed significant variability in anxiety and negative affect, but not scores of positive affect, whereas the less successful team showed statistical significance in the latter measure. This observation suggests that positive affectivity is more homogeneous in the successful team, but negative measures (anxiety and negative affect) may prevail relatively in the less successful team. Consequently, there appears to be a relatively stable positive psychological dominance in successful athletes while the reverse, or a negative mental dominance, may be more characteristic of less successful athletes. This surmise is in agreement with the mental health model (Morgan, 1985) as well.

When team quality was disregarded and correlations were performed between the six (game) ratings of the three dependent measures, the results clearly disclosed high variability, or inconsistency, in the appraisal of the measures across the games. This finding cannot be linked to other factors than the specific expectation associated with each upcoming contest. In accord with the interactional model (Cerin et al., 2000), expectations vary from one game situation to another for a number of reasons, such as: athletes' readiness, coaches' perception of the game and instruction(s) given to the athletes (Becker & Solomon, 2005), game location (Jamieson, 2010),

quality of the opponent team (Thout et al., 1998), audiences' expectation (Baumeister et al., 1985), and perceived importance of the contest (Marchant, Morris, & Anderson, 1998). It is obvious that the interaction of these factors yields different appraisals and expectations in athletes' mind that eventually result in different mental states before every contest (refer to the Figures). This contemplation then purports that home field advantage is only one of the many factors contributing to the situation-generated expectations.

Athletic success may be one of the key determinants of situational expectations and mental responses, but it may have a heavier weight than the other factors. In the current work the results show that more successful elite basketball players demonstrate less anxiety overall (a trait measure) than the less successful athletes. A trend, but reaching only 85% confidence interval, in more positive affect and less negative affect over six games in the higher quality team has also emerged. While not reaching the conservative levels of statistical significance, this trend should not be ignored because it adds to the overall results of the inquiry revealing that more successful players exhibit more positive mental states before championship contests in general. These findings may be expected and are also self-explanatory, because with a better record (upper third) in the division the more successful team is positively motivated to *gain* an even better position while the lagging team (bottom third) is negatively motivated to *avoid* failure and possible drop out from the first division. These collective motivations and individual views of the upcoming contest inevitably result in different appraisal-expectations that trigger situation-specific mental states, in accord with the interactional model for athletic challenge (Cerin et al., 2000).

Affect and anxiety prior to win-loss games could be examined only in the more successful team in the current study (4 wins, 6 losses), because the less successful team has lost all six games during the course of the inquiry. For the four won games an overall more positive affect and a trend in lower anxiety has characterized the home games. For the two lost games, one at home and one away, no differences were found in any of the dependent measures, further affirming that appraisal of the game situation goes beyond the home field advantage. It should be noted, that a more positive affect was a general result also emerging for home games irrespective of team quality. Therefore, the results of the current study show clearly that players' mental states vary with both the game location and quality, or the level of success, of the team.

Limitations of the Study

The most striking limitation, also forcing limitations in the type of statistical analyses, was the relatively low sample size investigated in the current research. Indeed, the power in the repeated measures parametric test was only .84 which may be the reason for the inability to demonstrate statistical significance in state measures, which showed strong trends (with 85% confidence interval) in differentiating more- and less-successful players. Unfortunately, basketball teams are relatively small and not all the members agree to participation, while the involvement of two high and low quality teams – that may increase sample size – would also introduce uncontrollable team-specific factors. Indeed, most investigations examining the psychology of the home field advantage have used relatively low sample sizes, often less than in the current inquiry (Carré et al., 2006; Kerr & Schaik, 1995; Polman et al., 2007), with a record on the lower end testing only five participants (Waters & Lovell, 2002). In spite of the relatively low sample size, the current work involved six experiential measures yielding a more thorough picture and assumedly more reliable results in contrast to single assessments.

What may be seen as further limitation is the use of SCAT for measuring anxiety. As noted above the SCAT is rather a somatic and trait measure. If the repeated evaluation of the SCAT results is statistically significant ratings – that has occurred here and in several other studies (Lohr & Scogin, 1998; Rani & Dhadwal, 2013; Singh & Gaurav, 2011; Smith, Smoll, & Barnett, 1995) – two explanations may be forwarded. The first is that the SCAT is *not* a "purely" trait measure. The second is that situational appraisal before championship contests is so profound that it even affects how one perceives oneself as a result of a strong trait-state interaction in the evaluation process. Based on current and past results, it is our opinion that the SCAT is not a stable competitive trait anxiety measure, which has implications for past and future inquiries in which SCAT was or will be used as a baseline measure for trait anxiety while researching state anxiety in sport. Finally, the current results are limited to elite female basketball players only. Different results may emerge with males, mixed teams, and in other sports. It is recommended that future studies use experiential sampling with larger teams in which state and trait measures are repeatedly and jointly administered to address the dilemma of dynamic baselines in experiential measurements. For the better understanding of pre-game mental states and the sources of variability, and the connection to performance, Cerin et al.'s (2000) interactional model may prove to be valuable.

Conclusions

This study has three contributions: (a) Supports the classical mental health model (Morgan, 1985), more successful elite female basketball players appear to demonstrate more positive mental states before competition than less successful athletes; (b) Regardless of athletic success, home field advantage is linked to more positive affect in elite female basketball players; (c) High variability in psychological trait and state measures reflects the situation-specific appraisal of each game that may results in unique expectations yielding highly variable pattern of mental states prior to competitions, which supports the interactional model for sport challenge (Cerin et al., 2000).

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ORIGINAL RESEARCH PAPER

THE LEVEL OF STRENGTH AND ENDURANCE-STRENGTH ABILITIES OF THE FEMALE EARLY EDUCATION TEACHERS AS EXAMINED BY THE MEDICINE BALL FORWARD THROW AND THE 3 MIN. BURPEE TEST: A COMPARATIVE ANALYSIS

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Abstract

Aim: The aim of the study is to assess strength and endurance-strength abilities of selected female early education teachers (EET) against classification norms, and subsequently compare the level of these abilities to that of pre-school and early school children and female university students. Methods: The research comprised: 700 pre-school children, 1306 early school children, 303 female university students and 217 EET. In order to determine the research participants' level of motor abilities, two motor tests, i.e. the medicine ball forward throw and the 3-min. Burpee Test were applied. Results: Based on the classification norms, the EET obtained an average level of strength and endurance-strength abilities. Moreover, in the medicine ball (2 and 4kg) forward throw trial, the EET achieved significantly worse results than the 1st year female university students (p = 0.0000), yet significantly better results than the examined pre-school and early school children (p = 0.0000). On the other hand, in the 3 min. Burpee Test, the EET gained significantly worse results than the 2nd (p = 0.0000) and 3rd (p = 0.0000) year girls and boys and the 1st year female university

students (p = 0.0000), but significantly better results than the pre-school children (girls: p = 0.0000, boys: p = 0.0166) and the 1st year boys (p = 0.0000). Conclusions: Since motor fitness is important in EET's everyday work, it is worrisome that the teachers under study attained an average level of strength and endurance – strength abilities. There were also many teachers who were exempted from any form of physical exercise for health reasons, which may be a consequence of their poor eating habits or/and an insufficient amount of daily physical activity. It seems to be reasonable, thus, to design and implement new enrollment criteria for admission to early education studies including fitness tests, and to expand the curriculum of early education studies by increasing the number of practical P.E. classes.

Key words: *early education teachers, female students, 6 – 9-years-old children, motor abilities, classification norms*

Introduction

Motor fitness (MF), as one of the main indicators of a person's biological development (including physical health), has been the subject of numerous research works in the field of physical culture. Although this term has been defined and assessed differently over the last two decades (Raczek, 2010; Szopa, Chwała, & Ruchlewicz, 1998), currently the concept of Health-Related Fitness (H-RF) has become the most preferable and widely recognized approach worldwide. In the light of this theory, a physically fit person is characterized by: an adequate level of cardio-respiratory endurance, a vigor of life, positive relationships with other people, an appropriate level of body fat, a desirable level of strength and flexibility, and a healthy lower (lumbar-sacral) spine (Howley & Franks, 1997). Irrespective of the approach preferred, determining the level of motor fitness is still an important link when controlling motor development in the field of physical culture (Lovecchio, Merati, Guasti, Casolo, & Eid, 2013; Podstawski & Borysławski, 2012; Tudor, Ružic, Sestan, Sirola, & Prpic, 2009), physical recreation (Strydom, 2013), rehabilitation (McMurray et al., 2000), as well as in the sports training (Gabbett, 2009; Mikulić & Ružic, 2008).

Strength and endurance-strength abilities are thought to be basic elements of a person's motor potential. As for strength abilities, some scientists believe strength to be the fundamental motor ability as it is necessary to initiate, continue and stop the movement, as well as essential to set in motion one body by another. Therefore, it can be assumed, that

strength constitutes a primary substrate in relation to other abilities, one that conditions a person's mobility (Podstawski & Borowska, 2011). An adequate level of strength abilities has a decisive influence on a person's overall health and his/her being active in everyday life, especially in the aspect of a sports training (Kreamer, 1992; Sallis, Hovell, & Bouno, 1992). A decline in the muscle strength can cause adverse changes, which markedly diminish a person's motor fitness and consequently deteriorate the health quality of his/her life (Podstawski, Skibniewska, & Paradowska, 2011).

Endurance abilities, on the other hand, are closely linked with physical efficiency. In the main, endurance can be defined as an ability of a body to sustain a long physical effort of a given intensity and to maintain increased resistance to tiredness under the conditions of the surrounding environment (Szopa, 1998). Apart from a high aerobic efficiency in endurance efforts, anaerobic potential bears a special significance, which is linked with glycolytic processes of an acidosis phase resulting directly from the time and intensity of a physical effort (Szopa, Chwała, & Ruchlewicz, 1998). A biological substrate of endurance abilities is made up of energy predispositions, namely maximal oxygen uptake ability VO_2max (maximal aerobic power – aerobic potential), largely affecting two integral factors: cardio-respiratory endurance and body resistance to acidification (Brooks, Fahey, White, & Baldwin, 2000).

The above information indicates clearly that the research on the level of strength and endurance abilities is of great importance, and so far has been viewed in many different aspects. However, there is a group of professional people whose strength and endurance abilities have been examined in a limited range, which seems to contradict the main principles underlying their work. The professionals in question are early education teachers (EET), who no doubt substantially contribute to shaping a positive attitude in relation to body and physical activity (PA) of pre-school and early school children, and by this having an influence on their level of MF. A thorough penetration of the literature on the comparison of EET's strength and endurance-strength abilities to those of children and adolescents resulted in finding no data on this subject. There is also a marginal number of research works on testing EET's MF.

Therefore, assessing the level of the EET's strength and endurance-strength abilities against classification norms, and comparing this level to that of pre-school and early school children and university female students deserves attention and may help solve the problem of continuously

decreasing PA of children and youth (Ara, Moreno, Leiva, Gutin, & Casajŭs, 2007; Monyeki & Kemper, 2007).

The aim of this research is to assess the level of EET's strength and endurance-strength abilities against classification norms, and compare this level to that of pre-school and early school children and first-year female university students enrolled at the University of Warmia & Mazury in Olsztyn (UWM), Poland. In order to determine the level of strength (the medicine balls forward throw) and endurance-strength (the 3 min. Burpee Test) abilities, classification norms were devised according to T- score scale.

Materials and Methods

Participants. The research on the level of strength and endurance – strength abilities of the pre-school and early school children was carried out in 12 preschools and 14 elementary schools. The 1st-year female students participating in the research attended the UWM, whereas the EET under study were examined at their workplace (40 preschools and 50 elementary schools). In order to provide a broad spectrum of the children's socioeconomic backgrounds, the schools and preschools situated in villages, small, medium-size and big towns were selected for the purpose of the study. All the preschools and schools were situated in the area of the voivodeship of Warmia & Mazury, north-eastern Poland, and all the research participants were inhabitants of this region.

The research comprised: 700 pre-school children (mean age 6.3 years old) (367 girls, 333 boys), 1306 elementary school pupils aged 7-9 (225 first-year girls, 219 second-year girls, 233 third-year girls, 201 first-year boys, 213 second-year boys, 215 third-year boys) (mean age 8.3 years old), 303 first-year female full-time students enrolled at UWM (mean age 19,6 years old) and 217 certified, professionally active EET (mean age 26.24 years old). In all the preschools and schools under investigation, 96% of all the children took part in the tests, except for those who were absent on the day of the examination. In the case of the EET, the women who were either exempted from the examination on health grounds or unwilling to participate in the tests were excluded from the research. Of 721 women who had been asked to participate in the research, as many as 167 (23.16%) refused to be involved for health reasons (permanent damage to their locomotive apparatus confirmed by a medical certificate), and the other teachers (337 women) refused to be engaged giving no particular reason. The children involved in the research attended obligatory P.E. classes a total of 3 lesson units a week 45 min. each, providing they did not practice any other sports discipline, as any involvement in out-of-school sports activities

would significantly distort the obtained results. The UWM students attended compulsory P.E. classes a total of 2 lesson units a week, 45min each. Taking into consideration a vast number of the research participants, the obtained data can be representative for this type of research.

Procedures. The research program was approved by the UWM Bioethical Committee as well as the principals of the schools under study, and the students and teachers themselves. It is also in accordance with the Helsinki Human Rights Declaration.

Instruments. All the research participants' height and body mass were measured, on the basis of which the values of their BMI were calculated. The BMI values of the adults were subsequently assessed according to WHO norms (WHO, 2000), whereas the BMI values of the pre-school and early school children were calculated on the basis of the international norms devised by Cole, Flegal, Nicholls, & Jackson (2007). The results obtained by the children, female students, and the EET in the individual motor tests constituted dependent variables. Two motor tests were applied to accurately assess the participants' strength and endurance-strength abilities, namely the medicine ball (4 kg for the EET and the female students, and 2 kg for the 6-9-year-old children) forward throw [cm], and the 3 min. Burpee Test [number of cycles]. The accuracy and reliability of the above motor tests has been confirmed by numerous studies on the topic (Pilicz, 1997).

The description of the applied motor tests:

Medicine ball (4 kg) forward throw (Fig. 1): the participant stands at a line with the feet slightly apart facing the throw-in area, then he or she vigorously throws the ball forward with both hands over the head; the participant is not permitted to step forward over the line after the ball is released. Two attempts are allowed and the score is obtained by recording a better throw measured in the straight line from the nearest trace of the ball to the inner edge of the throw line exact to 1cm (Pilicz, 1997).

Figure 1. 3 min. Burpee Test

3min. Burpee Test (Fig. 2): From the upright standing position, the participant assumes a supported squat with both hands on the ground, then thrusts his or her feet backwards into a push-up position with straightened arms (body trunk and legs form one line); from this position the participant once again returns to the supported squat and the whole cycle is completed by the participant returning to the upright position and simultaneously clapping his or her hands over the head, making sure the arms remain extended. The cycle is performed as many times as possible in the given time limit (3 minutes). The number of cycles executed within 3 minutes constitutes the result of the test (Podstawski, Kasietczuk, Boraczyński, Boraczyński, & Choszcz, 2013).

Figure 2. Medicine ball forward throw

The level of strength and endurance-strength abilities was assessed on the basis of the EET and university students' results based on a derived 5-point scale. It was assumed that both study groups fell into the range of the same developmental stage in terms of their morph-functionality. All the children and the university students were instructed on the proper technique of executing the motor tasks during the lessons preceding the actual tests and given ample time to practice them. The EET learnt how to perform each motor test during the meeting with the research director, who thoroughly demonstrated the proper technique of executing each test. Afterwards, the teachers were given enough time to practice the tasks on their own. Prior to performing the actual tests the participants took part in a 10-minute warm-up. The study was conducted during the period from March to May in the summer semester of the academic year 2011/2012.

Statistics. Statistical analysis of the research data was performed using Statistica PL v. 10 software, applying descriptive statistics and the Mann-Whitney *U* nonparametric test for two groups. The calculations were made assuming the significance level $\alpha = 0.05$. If the probability of exceeding the calculated value was less than the adopted significance level ($p < \alpha$), the differences between the analyzed groups for a given motor test were

accepted as significant. In order to transform individual results obtained in the motor tests into a uniform scale for both EET and university students, „3 sigm" rule was applied (Rabiej, 2012), on the basis of which T-score scale for the medicine ball (4 kg) forward throw and the 3 min. Burpee Test was devised (Tab. 1).

Table 1

The range of different levels of motor fitness

The level of MF	Standard results	Scores in T* scale
Very good	$> \bar{X} + 2SD$	80 ÷ 100
Good	$> \bar{X} + SD \div < \bar{X} + 2SD$	60 ÷ 80
Average	$\bar{X} - SD \div \bar{X} + SD$	40 ÷ 60
Poor	$\bar{X} - 2SD \div < \bar{X} - SD$	20 ÷ 40
Very poor	$< \bar{X} - 2SD$	0 ÷ 20

Notes: $\bar{X}$ - average test results obtained in the reference group, SD – standard deviation of the overall test results in the reference group. * - Point intervals in T-score scale are right-closed (left-open).

Results

The description and interpretation of the results have been narrowed to the EET so as to reduce the amount of information considered irrelevant to the aim of the work. Table 2 shows the results of the measurements of the teachers' height and body mass as well as the calculated BMI. Due to a slight sexual dimorphism of 6-9 aged children (Osiński, 2003; Podstawski & Borysławski, 2014; Raczek, 2010), the results of the anthropometric features of the examined children (both girls and boys) from each class are presented as one.

Table 2

Characteristics of the study group in terms of their body mass, height, and BMI

Group	*Research participants*	*[No]*	*Age [years]*	*Body mass [kg]*	*Body height [cm]*	*BMI [kg/m^2]*
			Mean ± stand. dev.(max÷ min)			
a	Preschool girls and boys	700	6.09 ± 0.279	20.64 ± 2.862	118 ± 4.011	14.75 ± 1.736
b	1st-year girls and boys	426	6.98 ± 0.158	25.91 ± 5.803	125 ± 7.723	16.59 ± 2.588
c	2nd-year girls and boys	432	7.99 ± 0.196	29.34 ± 6.704	132 ± 6.137	16.65 ± 2.993
d	3rd-year girls and boys	448	9.01 ± 0.188	32.74 ± 6.364	136 ± 6.154	17.66 ± 2.658
e	1st-year female students	303	19.01 ± 0.244	61.33 ± 6.501	160 ± 8.130	24.18 ± 3.575
f	EET	217	26.24 ± 1.679	68.22 ± 9.330	164 ± 7.654	25.16 ± 2.465

Significance of result differences (the Mann-Whitney *U* Test):
– for body mass: f > a, b, c, d, e, **
– for body height: f > a, b, c, d, e, **
– for BMI: f > a, b, c, d, e, **

Notes: differences statistically significant * – at the level $\alpha = 0.05$, ** – at the level $\alpha = 0.01$.

As can be seen in table 2, the values of the EET's body mass and height as well as their BMI were significantly higher than the values of the pre-school and early school children, and the first-year students. In addition, the average BMI values of the examined teachers (25.16 kg/m^2) point to overweight (Tab. 2).

Table 3 presents the assessment of the teachers' motor abilities based on T-score scale.

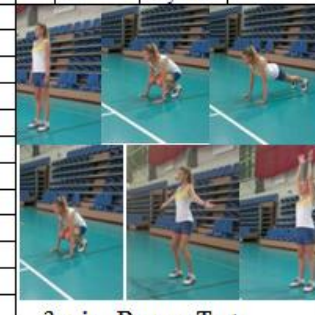
Table 3

T-score scale of EET's physical fitness in the 3 min. Burpee Test and the medicine ball (4 kg) forward throw

Level	*T scale*	*3 min. Burpee Test*	*Medicine ball forward throw*	Level	*T Scale*	*3 min. Burpee Test*	*Medicine ball forward throw*	*Level*	*T Scale*	*3 min. Burpee test*	*Medicine ball forward throw*
	points	No of cycles	cm		points	No of cycles	cm		points	No of cycles	cm
Very good	100	-	760	Good	80	56	-	Average	60	50	595
	99	-	-		79	-	660		59	49	590
	98	-	-		78	-	-		58	-	580, 585
	97	-	-		77	-	650		57	48	567, 569, 570, 573
	96	-	-		76	-	645		56	47	558, 560, 561, 563
	95	-	-		75	-	640		55	-	550, 551, 554, 555
	94	-	740		74	-	635		54	46	544, 545, 548, 549
	93	-	-		73	54	630		53	45	538, 540, 542, 543
	92	-	-		72	-	625		52	-	531, 532, 535, 537
	91	-	-		71	-	-		51	44	521, 525, 528, 530
	90	-	-		70	-	623		50	43	515, 517, 518, 520
	89	-	-		69	-	621		49	42	510, 512, 513, 514
	88	-	-		68	53	620		48	-	503, 505, 508
	87	-	-		67	-	-		47	41	498, 500, 501
	86	-	-		66	-	616		46	40	490, 493, 495
	85	-	-		65	-	615		45	39	480, 485, 488
	84	-	690		64	52	613		44	-	470, 475, 479
	83	-	-		63	-	610		43	38	458, 460, 465, 468
	82	-	680		62	-	600		42	37	440, 445, 450, 455

Table 3 (continued)

T-score scale of EET's physical fitness in the 3 min. Burpee Test and the medicine ball (4 kg) forward throw

Level	*T scale*	*3 min. Burpee Test*	*Medicine ball forward throw*	Level	*T Scale*	*3 min. Burpee Test*	*Medicine ball forward throw*	*Level*	*T Scale*	*3 min. Burpee test*	*Medicine ball forward throw*
	points	No of cycles	cm		points	No of cycles	cm		points	No of cycles	cm
Poor	40	35	435					Very poor	20	29	-
	39	-	-						19	-	-
	38	-	428						18	28	345
	37	-	-						17	-	-
	36	34	425						16	-	-
	35	-	-						15	27	323
	34	-	420						14	-	-
	33	-	-						13	-	-
	32	33	400						12	-	300
	31	-	-						11	-	-
	30	-	398						10	-	-
	29	-	-	3 min. Burpee Test					9	-	290
	28	32	390						8	-	-
	27	-	-						7	-	-
	26	-	385						6	22	270
	25	-	380						5	-	-
	24	31	375						4	-	250
	23	-	370						3	-	-
	22	-	360						2	-	-
	21	30	-	Medicine ball forward throw					1	20	200

The score tables presented in Table 3 enable to assess the endurance-strength abilities (the 3 min. Burpee Test) and strength abilities (the medicine ball (4 kg) forward throw) of the women between 18 and 30 years old (Osiński, 2003). The results obtained by the EET and first-year students were calculated into the points between 1 and 100 in order to determine the level of the EET's motor abilities examined in the applied motor tests (Tab. 3). Based on the obtained results and relevant points, a 5-point scale (very poor, poor, average, good, very good) was created, which is shown in Table 4

Table 4

The level of EET's motor abilities according to the 5-point scale for the 3 min. Burpee Test and the medicine ball (4 kg) forward throw

3 min. Burpee Test						
Level of MF	*Tolerance range*		N	%	*Average total*	
	Cycles	Points			Cycles	Points
Very poor	below 30	1 ÷ 20	9	4.14	26	13
Poor	30 ÷ 35	21÷ 40	23	10.59	33	33
Average	36 ÷ 50	41÷ 60	159	73.27	44	52
Good	51 ÷ 56	61÷ 80	26	11.98	52	65
Very good	above 57	81÷ 100	0	0	0	0
Medicine ball (4 kg) forward throw						
Level of MF	*Tolerance range*		N	%	*Average total*	
	Result [cm]	Points			Result [cm]	Points
Very poor	below 356	1 ÷ 20	7	3.22	283	9
Poor	356 ÷ 435	21÷ 40	18	8.29	400	31
Average	436 ÷ 595	41÷ 60	162	74.65	516	50
Good	596 ÷ 674	61÷ 80	26	11.98	625	70
Very good	above 675	81÷ 100	4	1.84	718	90
Motor test		*Result*			*Assessment*	
					Points	*Level*
3 min. Burpee Test [No of cycles]		43.26 ± 6.760 (20 ÷ 56)			50	Average
Medicine ball forward throw [cm]		515.40 ± 79.717 (200 ÷ 760)			50	Average

The results in Table 4 show that both in the 3 min. Burpee Test and in the medicine ball (4 kg) forward throw the EET who achieved an average result (73.27% and 74.65% respectively) constituted the highest percentage. Precisely, the average results in the 3 min. Burpee Test was obtained by the women who performed about 44 cycles (52 points), whereas in the medicine ball forward throw by the women who threw a 4 kg medicine ball as far as 516 cm (50 points). In the 3 min. Burpee Test none of the women received a very good result, whereas in the medicine ball (4 kg) forward throw – only 4 (1.84%). A distinct percentage of the examined EET gained very poor and poor results in both tests (the 3 min. Burpee Test: 4.14% and 10.59%; the medicine ball (4 kg) forward throw: 3.22% and 8.29%). In general, all the tested women obtained an average level of endurance-strength and strength abilities (50 points respectively) (Tab. 4).

Table 5 presents the results of the variance analysis for the applied motor tests comparing the results of the EET to those of the pre-school and early school children.

Table 5

The variance analysis of the results obtained in the 3min. Burpee Test and the medicine ball (4 kg) forward throw

3 min. Burpee Test [number of cycles]			
Groups under study	*Mean ± stand. dev. (min. ÷ max.)*	*Tests results*	
EET	43.26 ± 6.760 (20 ÷ 56)	*z*	p
Pre-school girls	36.85 ± 9.530 (14 ÷ 67)	9.2109	0.0000
Pre-school boys	41.67 ± 9.792 (15 ÷ 66)	2.3961	0.0166
1st-year girls	42.28 ± 10.246 (12 ÷ 65)	0.6756	0.4993
1st-year boys	39.56 ± 12.720 (12 ÷ 66)	3.1902	0.0000
2nd-year girls	50.90 ± 9.554 (19 ÷ 70)	-9.7896	0.0000
2nd-year boys	52.23 ± 12.143 (18 ÷ 70)	-8.9678	0.0000
3rd-year girls	50.43 ± 11.492 (22 ÷ 72)	-8.3979	0.0000
3rd-year boys	54.97 ± 9.850 (26 ÷ 71)	-12.5026	0.0000
1st-year female students	48.94 ± 7.958 (16 ÷ 64)	-8.4823	0.0000
Medicine ball (4 kg) forward throw [cm]			
EET	515.40 ± 79.717 (200 ÷ 760)	*z*	p
Pre-school girls	130.53 ± 33.096 (74 ÷ 230)	20.1981	0.0000
Pre-school boys	157.92 ± 38.888 (80 ÷ 290	19.8031	0.0000
1st-year girls	167.03 ± 69.650 (60 ÷ 390)	18.0667	0.0000
1st-year boys	208.97 ± 60.233 (80 ÷ 490)	17.4340	0.0000
2nd-year girls	243.78 ± 48.196 (145 ÷ 375)	17.7445	0.0000
2nd-year boys	283.61 ± 73.568 (110 ÷ 470)	17.0794	0.0000
3rd-year girls	246.80 ± 71.996 (100 ÷ 480)	17.8017	0.0000
3rd-year boys	333.76 ± 69.325 (130 ÷ 551)	16.2052	0.0000
1st-year female students	588.23 ± 100.599 (330 ÷ 890)	-8.0837	0.0000

***Notes**: z* – value of statistics, p – probability of exceeding the calculated value

Based on the statistical analysis of the 3min. Burpee Test it was observed that the EET obtained significantly worse results than the second-year ($p = 0.0000$) and third-year ($p = 0.0000$) girls and boys, and the first-year university students ($p = 0.0000$). However, their results were significantly better than those of the pre-school children (girls: $p = 0.0000$, boys: $p = 0.0166$), and the first-year boys ($p = 0.0000$). No significant differences in the 3 min. Burpee Test were observed only between the EET and the first-year pre-school girls ($p = 0.4993$). In the case of the medicine ball forward throw trial, the EET obtained significantly worse results than the first-year students ($p = 0.0000$), whereas significantly better results than the examined pre-school and early school children ($p = 0.0000$).

Discussion

According to candidates who intend to study physical education, a P.E. teacher should be characterized most of all by a love of sport and physical activity, (Dodds et al., 1992; Smith, 1993), professional expertise, and ought to display an adequate level of motor fitness in order to serve as a role model to their students (Melville & Cardinal, 1997; Pagnano & Langley, 2001). In view of the above, theoretical knowledge and motor skills acquired by EET during their university education are insufficient to properly conduct P.E. lessons with children. Early education graduates are, in fact, inadequately prepared both theoretically and practically to teach physical activities. Their contact with physical culture is more often than not limited to compulsory P.E. classes at university. Moreover, they might be even physically impaired or/and exempted from any forms of physical exercise for health reasons during their university education (Podstawski & Borysławski, 2014). The lack of adequate criteria for admission to early education studies as well as a limited scope of physical education in the teaching program result in a low level of EET's competence, which also manifests itself in a low level of their motor fitness.

Such assumptions have been confirmed by the results presented in this work, which clearly indicates that the level of strength and endurance-strength abilities in the women under investigation proved to be average or in some cases (the 3 min. Burpee Test) significantly worse than that of early school, 2nd and 3rd-year children and 1st-year female students (in both motor tests). In addition, of 721 women asked to participate in the experiment, as many as 167 (23.16%) were unable to perform any exercises due to permanent damage to their locomotive apparatus confirmed by medical certificates. Such results would have considerably lowered the level of the EET's strength and endurance-strength abilities. A similar percentage of women (25%) with a certified permanent disability was observed in the preliminary studies, which showed that in the vast majority of trials in the applied motor tests the EET displayed the lowest (very poor) level of motor abilities and motor skills (Podstawski, Górnik, & Romańczuk, 2013).

Some of the differences in the applied motor tests between the results obtained by the EET and the children can be logically explained. The EET were expected to perform significantly better than the pre-school and early school children in the medicine ball (2 kg – children and 4 kg EET and university students) forward throw, since in such motor tasks great values of anthropometric features such as body height and mass play a major role, as it is in the case of pitchers, discus and javelin throwers and other related sports disciplines (Mondal, Majumdar, & Pal, 2011; Thorland, Johnson,

Tharp, & Hammer, 1981). A negative influence of the EET's body mass and height on their level of endurance-strength abilities was clearly noticeable in the 3 min. Burpee Test. In endurance-strength efforts the ability to overcome resistance largely depends on the level of organism's cardio-respiratory fitness (Ramsbottom, Currie, & Gilder, 2010; Sands, Irvin, & Major, 1995).

The age between 20 and 30 is marked by the greatest potential in terms of human motor skills (Leversen, Haga, & Sigmundsson, 2012; Wilmore, Costill, & Kenney, 2008). Thus, the EET should have possessed a significantly higher level of strength and endurance-strength abilities than the pre-school and early school children, and similar to that of the 1st-year students. Since the results obtained by the EET in both motor tests were significantly worse than those of the 1st-year students, it can be assumed that the level of endurance-strength and strength abilities of the female postgraduates declines considerably as a result of a decreased amount of PA oriented at endurance and strength exercises. The fact that some EET proved to be overweight, apparently as a consequence of their poor eating habits, might have enlarged the regress in the level of their endurance-strength abilities.

Because the lack of endurance and strength abilities greatly impairs the EET's motor skills, it is highly likely that the investigated teachers will be unable to properly demonstrate a wide range of physical exercises. Teachers without required motor skills perform their duties in a dull and ineffective way (Podstawski & Borysławski, 2014), having little influence on positive changes in the motor development of children (Melville & Cardinal, 1997; Pagnano & Langley, 2001), whose PA nowadays is generally restricted to participating in the obligatory P.E. classes.

At present, in Poland physical education in early education (as a component of integrated teaching) is conducted by EET, a vast majority of whom (99%) are female, but merely 9% of them are fully qualified to teach physical education (SIO, 2009). Meanwhile, in Poland there is an excessive number of graduates in physical education who are not employed to teach early school children as this work is assigned to EET (Jaworski, 2012).

Limitations and practical aplications

One of shortcomings relating to the issue of EET's MF is a total lack of publications in this field, preventing appropriate comparisons. Our research was conducted only in one voivodeship in Poland (Warmia & Mazury). For the above reasons, the research should be continued and its scope expanded into other regions of Poland and abroad. The results of our research and the classification norms based on the results enable to assess

and compare the level of endurance-strength and strength abilities of women aged 18-30. The classification norms that we constructed constitute a reference system determining the level of women's endurance-strength and strength abilities as compared to their peers in a given age group (Pilich, Przewęda, Dobosz, & Nowacka-Dobosz, 2002). Such norms also complement fitness trials included in Podstawski's Test, designed in order to determine students' motor fitness (Podstawski, 2006).

Conclusions

For the reason that motor fitness is important in EET's everyday work, it is worrisome that the teachers under investigation were proved to be at an average level of MF in the range of strength and endurance strength abilities. There was also a relatively big number of teachers who were exempted from physical exercise on health grounds, which may suggest an urgent need for changes in the teacher's lifestyle concerning their daily PA and proper nutrition. Furthermore, it is necessary to outline and implement new enrolment criteria for admission to early education studies including fitness tests, and to expand the curriculum of early education studies by increasing the number of practical P.E. classes.

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ORIGINAL RESEARCH PAPER

OUTDOOR RECREATION AND WELL-BEING OF 45-55 YEARS OLD PEOPLE

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Abstract

Physical activity plays a fundamental role not only in improving the physical health, but also in increasing the well-being (Biddle, Mutrie, 2002, 2007). The aim of the study was to discover how the natural means for outdoor recreation (biking, Nordic walking, cross-country skiing) influence the positive and negative emotions of the 45-55 year-old people. Methods of research: "FaceReader 3.0" (testing positive and negative emotions), pulsometry, case study, analysis of qualitative data and mathematical - statistical methods of data processing. The obtained results after carrying out recreational activities indicate a tendency to increase. The most significant increase in the percentage of positive emotions was observed in those participants who performed a ride on a bike – increase in emotion of joy +266.4%, increase in emotion of surprise +140.6% and decrease in negative emotions – sadness -41.0%; anger -56.3%; disgust -71.2% (p> 0.05). Nordic walking, increases the level of joy by +121.0%, surprise level by +13.4% (p>0.05). An increase in positive emotions was observed in cross-country skiers – in joy emotions + 19.3% and in surprise emotions + 2.9% (p> 0.05). Analyzing the FR negative emotions data, a decrease was observed – in sadness -24.7% and in anger – 21.7% (p> 0.05). Physical Recreation – cycling, Nordic walking and cross-country skiing outdoors, with applied load of 50 minutes with intensity of 65 – 70% of maximum heart rate, improves the positive emotions.

Key words: *well-being, physical recreation, positive and negative emotions.*

Introduction

The Western societies are becoming more and more urbanized, the work that people are doing is becoming less and less related to farming, agriculture or cattle-breeding. The need of a human being to move is rapidly

decreasing, and in fact, it can be argued that a person's physical activity in everyday life disappears. The human body is not just the bones, joints and muscles; it's not just the blood or the transportation system of other body fluids. Human beings have always been curious on the question of what is the good life. Often a good life is directly related to the well-being and happiness. Quality of life, physical activity and health are inter-related factors (Morgan, 1997; Lee, Russell, 2003; Biddle, Mutrie, 2002, 2007; Crone, Smith, Gough, 2006; Landers, 2010). Well-being is a dynamic and multi-faceted concept. There are several types of well-being: physical, social and psychological, as well as sometimes the "spiritual" well-being is also being added (Cummins, 1999; Maxwell, Henderson, McCloy, Harper, 2011; Šķestere, 2012). Maxwell and other resarchers (Maxwell, Henderson, McCloy, Harper, 2011) provides five key recommendations for improving the well-being and all of these five factors listed here can be implemented by doing a physical recreation activities, thus enhancing the level of well-being.

Material and methods

Research was done in Madona – at the Sport Centre "Smeceres sils". In this study a total of 16 participants were tested − four participants who performed Nordic walking recreational activity, six participants who took a ride on a bike and six participants who did cross-country skiing.. As the first method applied on the participants was testing of emotions using "Face Reader 3.0" (FR): the facial expressions were analyzed with the help of this method – 6 basic emotions – joy, anger, sadness, surprise/astonishment, fear, disgust and neutral emotional state. Emotional state dynamics were determined: testing separately six basic emotions diagnosed by the FR − joy, surprise, sadness, anger, disgust and fear; combining emotions in the groups: positive emotions – joy and surprise, and negative emotions – sadness, anger, disgust and fear. The statistical reliability of the increase of indicators was calculated using Student's criterion-related groups. The short interview was used, which consisted of two questions: "How do you feel now?" and "What is the cause of your sensations at the moment"? Interview with FR lasted an average of 60 sec and its length was dependent on each individual's response length. After FR test each study participant was equipped with a pulsometer/heart rate monitor ("Polar RS100x"), which had a personalized heart rate frequency 65 – 70% of $HR_{max.}$ The study participant was issued the necessary equipment (skis, poles, bicycle), which was previously adapted to individual needs of each participant. Then each study participant went on doing a physical exercise, which lasted for 50min

(10min warm-up and 40min of the exercise itself in the given range of the pulse). The exercise was followed by a re-interviewing, using FR (questions and the test conditions were the same as previously). Data processing mathematical – statistical methods: MS. Excel attachment program "Statistics 3.1" was used. The software function "Descriptive statistics" was used for normal data distribution. The descriptive statistical methods were used to describe the values and representativeness of the problem to be investigated.

Results

The aim of the study was to discover how the natural means for outdoor recreation (biking, Nordic walking, cross-country skiing) influence the positive and negative emotions of the 45 – 55 year-old people. Testing of the emotional state was performed before and after physical recreation activities. The obtained results after carrying out recreational activities indicate a tendency to increase. The average results of the group for the emotion of joy has increased by almost half – before the recreational activities the emotion of joy was estimated at 5.6 ± 1.8% level, while after recreational exercise the test results have increased to 10.1 ± 3.2%. A total increase in the percentage of the emotion of joy in the group is 135.56% ($p > 0.05$). A similar situation was observed while analyzing such positive emotion as surprise, a universal emotion of which is joy. Before carrying out recreational activities the average percentage of the surprise emotion in study participants is 16.5 ± 3.4%, while after performance of recreational activities, it has already reached 23.1 ± 3.1% margins (Fig. 1).

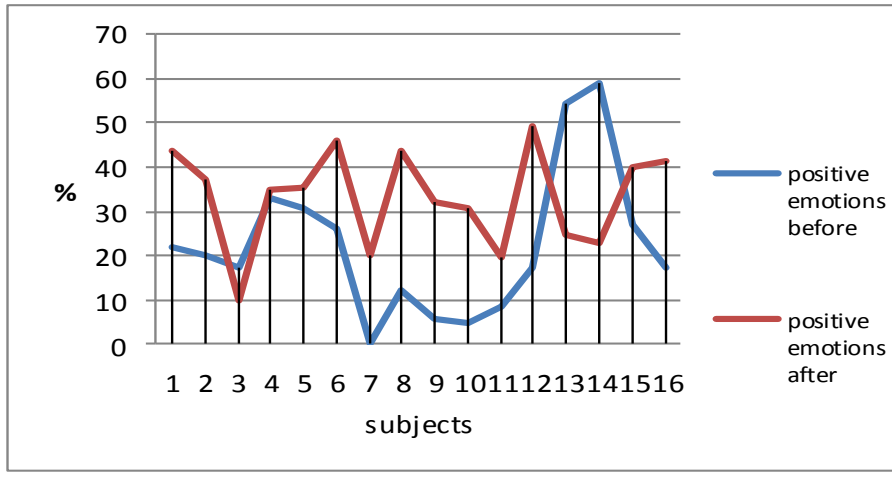

Figure 1. Positive emotions before and after outdoor recreation activities

The average increase in percentage is 52.30% ($p > 0.05$). By grouping together the positive emotions – joy and surprise, the results indicate statistically significant increase. This means that the recreational activities have had a statistically significant impact on positive emotions – they have increased as a result of such activities.

In order to clarify the trends of changes in the negative emotions – fear, disgust, anger and grief as a result of recreational activities, a detailed evaluation of these emotions was carried out. Adding up the sum of indicators of such emotions, the average indicator of the negative emotions of participants before and after recreational activities was obtained. Before the physical exercise the average negative emotion ratio is 29.5% ± 6.1, but after it - 28.2% ± 5.4 ($p > 0.05$). The average decrease in the percentage points of negative emotions - 1.3% (Fig. 2).

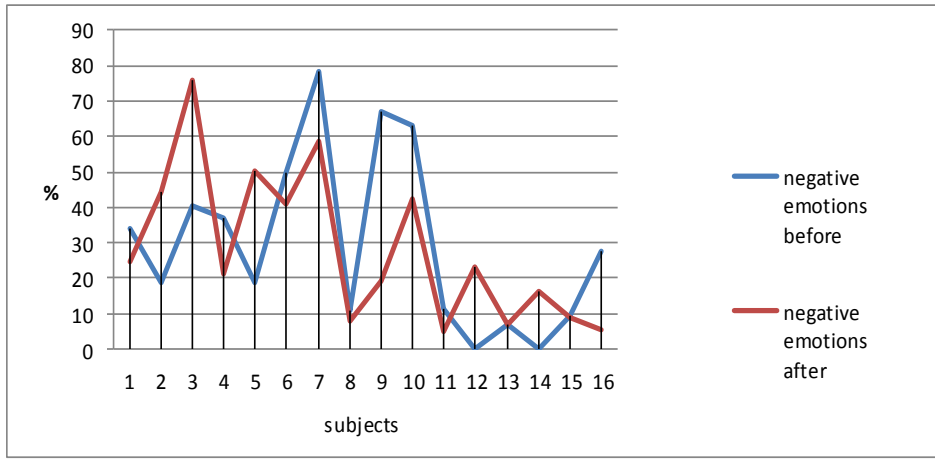

Figure 2. Negative emotions before and after outdoor recreation activities

By analyzing separately the average changes of negative emotion in the group, FR results demonstrate the reduction of average indicators of sorrow, anger, disgust (sorrow -1.3%; anger -3.3% and disgust -2.8%, $p > 0.05$). The most significant increase in the percentage of positive emotions was observed in those participants who performed a ride on a bike – increase in emotion of joy +266.4%, increase in emotion of surprise +140.6% and decrease in negative emotions – sadness -41.0%; anger -56.3%; disgust -71.2%. The only negative emotion that increased in cyclists according to the data diagnosed by FR, was fear (+11 percentage points), but the results are not statistically significant ($p > 0.05$). A form of a physical recreation − Nordic walking, increases the level of joy by

+121.0%, surprise level by +13.4% ($p > 0.05$). In the members of this group, after employing the objective diagnostic methods of emotions, using FR, a slight increase in negative emotions was observed ($p > 0.05$). An increase in positive emotions was observed in cross-country skiers – in joy emotions +19.3% and in surprise emotions +2.9% ($p > 0.05$). Analyzing the FR negative emotions data, a decrease was observed – in sadness -24.7% and in anger -21.7%. The only negative emotion that increased according to FR diagnosed data, was fear (+3.7 percentage points) ($p > 0.05$).

Discussion

There is substantial evidence identifying the mechanisms that lead to improvement of mood and emotions, and increase the level of human being's well-being. The mechanisms, according to which a physical activity affects the well-being, are not yet fully understood. Currently the assumptions on the relation of a physical activity to well-being can be divided into three main groups, namely: biochemical, physiological and psychological (Morgan, 1997; Lee, Russell, 2003; Biddle, Mutrie, 2002, 2007; Crone, Smith, Gough, 2006; Landers, 2010). Despite this link, there is still a lack of consensus as to which mechanism causes the relation, mentioned above.

Well-being is a dynamic and multi-faceted concept. As society itself, also the concepts of well-being and happiness are changing and evolving. Human satisfaction (one of the criteria for well-being) and thus the well-being results from the degree of the objective situations of the individual being in accordance with his or her wishes or needs. Various theories about link mechanicsms of physical activity and well-being can be found in the literature sources (Biddle, Mutrie, 2002, 2007). In the study done by Maxwell (Maxwell, Henderson, McCloy, Harper, 2011) the physical activity is ranked as one of the five key factors that improve well-being.

Recreational activities – walking, cycling and skiing – during the study in the framework were carried out at a load intensity of 65 – 70% of maximum heart rate. This heart rate range was chosen based on data available in the literature, since at a higher intensity of the physical activity negative mood changes are detected more often than after less intensive activities. Steptoe and Bolton (1988) proved that mood improves by performing a moderate, but not a high-intensity physical activity. Hardy and Rajeski (1989) found out that after a higher intensity workouts the adverse changes in mood frequently observed in comparison with those changes after less intense activities.

Results obtained the effect of recreational physical activity on the positive and negative emotions. As mentioned above, the most explicit increase of the emotions of joy was in group who did cycling recreation activity (+266.4%).

The study results suggest that additional studies during physical activity and their relationship to well-being are required, increasing the number of participants involved in the study. Proving accurately and reasonably the evidence of an association between physical recreation activities with specific intesity, the public could be motivated to perform a physical activity, thereby enhancing the overall human health and contributing to the economy.

Conclusions

Employing the means for outdoor recreation (Nordic walking, cycling and cross-country skiing) positive and negative emotions changed as follows:

The most significant increase in the percentage of positive emotions was observed in those participants who performed a ride on a bike – increase in emotion of joy +266.4%, increase in emotion of surprise +140.6% and decrease in negative emotions − sadness -41.0%; anger -56.3%; disgust -71.2%. The only negative emotion that increased in cyclists according to the data diagnosed by FR, was fear (+11 percentage points), but the results are not statistically significant ($p > 0.05$).

A form of a physical recreation − Nordic walking, increases the level of joy by +121.0%, surprise level by +13.4% ($p > 0.05$). In the members of this group, after employing the objective diagnostic methods of emotions, using FR, a slight increase in negative emotions was observed ($p > 0.05$).

An increase in positive emotions was observed in cross-country skiers – in joy emotions + 19.3% and in surprise emotions + 2.9% ($p > 0.05$). Analyzing the FR negative emotions data, a decrease was observed – in sadness -24.7% and in anger -21.7%. The only negative emotion that increased according to FR diagnosed data, was fear (+3.7 percentage points) ($p > 0.05$).

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SHORT COMMUNICATION

FAMILY AND ITS INFLUENCE ON HOW ATHLETES FUNCTION

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Abstract

This article presents an application of attachment theory in understanding the quality of sport relationships, it describes types of motivational climate and the differences between performance and mastery in the family and also shows how the beliefs of parents can influence the beliefs of a young athlete. The high quality and positive relationships between athletes and their colleagues seems to reflect the early positive bond which they had with their parents. Children with insecure attachment styles more often have low quality relationships with teammates. Other factors important in the functioning of athletes are the two main types of motivational climate: the mastery/task climate and the performance/ego climate. Both kinds of motivational climate describe which values are the most important for parents and the different influence they have on athletes. Moreover the beliefs of parents have a big impact on the involvement in sport by children, their behaviour during and after sport competitions and what they think about their motor skills and abilities. Parents who care about the sport future of their children should be educated in how important it is to build positive relationships from early childhood, how their beliefs and values create a motivational climate which can support or harm an athletes participation in sport, and how their beliefs influence the involvement in sport of their children.

Introduction

For long time it is known that the family is the basic unit of society. The family's influence begins with early childhood interactions and continues through adolescence and young adulthood. Parents are still likely to have the greatest single influence on the current and future behavior of their children. In this article a short review is presented of studies

concerning the most important factors connected with family and its influence on athletes.

Attachment and qualities of relationships in sport. The quality of relationships in the family influences children's development in various ways. The parent-child attachment style is a construct, which is a result of the initial attachment bond with the parent and can be a sort of template for future patterns of behavior, affect and cognition in other important and close relationships. In sport athletes are more likely to build relationships with coaches and each other, based on their attachment styles with parental caregivers. In young people good early experiences enable them to develop a secure attachment style which helps to build a positive, internal perception of themselves and facilitates positive relationships in sport. Moreover the way young people build relations with other teammates or coaches reflects the bond which they share with their parents. Young people can also internalize some strategies, for example coping with stress, developed in early relationships and reproduce them in relationships with friends from their team (Jowett & Wylleman, 2006).

According to Carr & Fitzpatrick (2011) children with an insecure attachment style in their bonding with parents are more likely to be viewed as difficult-to-like by players from their team and less likely to have high-quality and positive relationships with their best colleagues in sport. The quality of relationships in sport children and adolescents can have is a big influence on the motivation for being physically active and participating in sport, and in helping individuals to cope with stress, isolation and anxiety and development of low or high self-esteem (Carr, 2012). That's one of the reasons why the attachment style between parents and children is so important in their sports career.

The quality of parental attachment bond shows that sporting relations can't be developed in isolation from familial relationships. For improving and developing the secure attachment between sporting parents and their children, recommendations can be proposed to develop in children emotional and social capabilities which will be a benefit for their relationships and participation in sport.

Motivational climate and quality of participation in sport. Some values are more or less important for the person concerned. Motivational climate is related to the parents' own goals, the way parents evaluate and award their children and how they structure the task. There are two main types of motivational climate: mastery/task climate and performance/ego climate. Each of them reflect different values and belief systems (see Table 1).

Table 1

Comparison between performance and mastery climate

performance climate	mastery climate
demonstrates superiority in comparison to others	personal bests are here the main goal
the most important is winning	the most important is improvement and learning of new, useful abilities
children feel controlled by their parents	more authority is placed in hands of children
award pupils with material rewards for demonstrating superiority and punish them	reward their children for personal progress, learning and improving of their abilities

The performance climate is created when a parent shows to his/her child that the goal is to demonstrate superiority in comparison to others and winning. The level of ability demonstrated by the child is the most important. Such thinking is seen as the race of competition. The performance climate makes children feel controlled by their parents who chose which sport the child will get involved in, for how long, in what order etc. Children or adolescents are not involved in the decision making process and usually receive more controlling and negative feedback for example "you must", "I told you not to do that" etc. This kind of motivational climate is characteristic for parents who for example award pupils with material rewards for demonstrating superiority and punish them (verbally or physically). Performance climate is also connected with dictating the timing required for children's development in skills and progress. The mastery climate is created when parent suggests to the child that the most important reason for participation in sport is improvement and the learning of new, useful abilities. The personal bests are here the main goal. More authority is placed in the hands of children. They can say what they want to develop/practice and what not. They also decide which kind of sport they would like to participate in. Because of this they are more likely to learn about their sport discipline and themselves. In mastery climate parents reward their children for personal progress, learning and improving of their abilities. Children or adolescents can control how much time they will spend

on development of skills. This encourages important feeling of well-being such as autonomy and competence (Lorimer & Jowett, 2014).

Beliefs of parents and involvement in sport. The involvement of children in sport is determined by the parents beliefs and by how children perceive their parents beliefs. In longitudunal studies of children between 8 and 11 years researchers found that the mother and fathers beliefs about the value and utility of involvement in sport by the child explain beliefs about their children's competence and skills of sports. In other studies, it was observed that the beliefs of the parents were related to motivation for running in children and the level of performance during the running. In addition, children's beliefs, on how their parents approve of aggressive behavior in sport are associated with the intention of engaging in such aggressive behavior by children.

Parents' beliefs about gender roles determine involvement in sport among children. The gender of the child seems to be the most important moderator of these relationships. Generally parents value the commitment to sport higher in a son than a daughter. They give more support to the sport activity of a son than a daughter. They also evaluate the sport competence higher in a son than a daughter. A stronger effect of gender appeared in adolescents than children of school age and when player participates in sport on competitive level.

Beliefs of parents regarding the child's competence in sports are associated with the child's beliefs about his own skills and abilities and the level of sports performance sports. Beliefs of parents regarding the competence of children and adolescents connects with beliefs of children about their abilities. Stronger effects were found in fathers beliefs than mothers beliefs. Perhaps fathers beliefs are important because sports activity is classified as an activity for men. Studies conducted in children under 12 years of age showed that in this age group mothers play a key role in the beliefs about their sport competence (Łuszczyńska, 2012).

Conclusions

Taking everything into account to be a good athlete is seems to be useful to have in early childhood a positive bond with parents or caregivers, to grow up in a family where there is a mastery climate and there is personal development of motor skills and abilities and to have parents who believe in your competence and support your motivation for involvement in sport.

There is no clear answer what kind of motivational climate is more important to achieve high results in sport competition. Perhaps performance climate can support winning but in the same time it can bring a lot of

negative consequences for young athletes. Negative influence is also connected mainly with insecure attachment style and beliefs of parents that their child has low sport competence and is not good enough to participate in some kind of sport for example because of gender or low abilities. Parents' beliefs don't have to be real. The problem begins when the child's thinking also reflects the negative thinking of his/her parents. Sport psychologists and coaches should educate parents in how important a role they play in the life of young athletes and how they can support their sport achievements.

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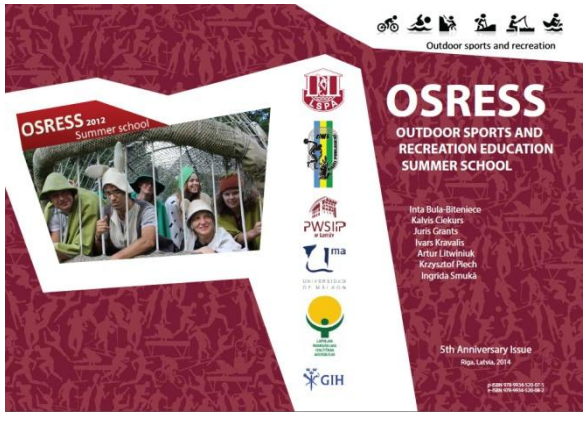
Review of I. Bula-Biteniece, K. Ciekurs, J. Grants, I. Kravalis, A. Litwiniuk, K. Piech, I. Smukā book „*OSRESS – Outdoor Sports and Recreation Education Summer School*"



On the event of the 5th anniversary of Summer School Latvian and Polish authors created a book **"***OSRESS – Outdoor Sports and Recreation Education Summer School",* aiming to reflect on the history of previous Summer Schools. In the chapter "Publications" authors shared personal practical and scientific experience in the fields of outdoor recreation didactics, outdoor folk games, and philosophic approach to recreation, biking recreation, physical activity and health.

In the book you will find both publications and practical recommendations for recreation and education outdoors. A special chapter is devoted to outdoor Latvian folk games collected by students. Each folk game and folk dance collected by students is a part of nation's cultural heritage. Nowadays when much of our lives are immersed in new technologies, everyday new achievements and material values, more and more public attention is drawn to an active lifestyle, more and more people talk about a healthy lifestyle and the importance of recreation in human life.

Results of the summer schools workshops are good examples of collected outdoor games which we can use in the work with people of different age. Summer school participants – both students and teachers – working together were able to break down barriers between the students and their teachers. Learning skills were developed in practical classes during joint bike and hiking tours. Cultural history of the environment was explored, using the methods of qualitative research.

Johnny Nilsson
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Swedish School of Sport and Health Sciences (GIH)

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Latvian Academy of Sport Education

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Claessens (2010) found evidence that attention will be given to multi-compartment models, such as the 3-water, 3-mineral and 4-compartment models, to assess percentage of body fat. However, Raslanas, Petkus and Griškonis (2010) noted that Aerobic physical load of low intensity got 35.1 % of total trainings time. Research on physical loading also focused on

identifying the basis of many years' research of physical activity (Bytniewski et al. 2010). According to Ezerskis (2010), "… heavy physical loads had the undulating character depending on the dynamics of workloads…" (p. 71) yet girls are more ascertained that the Track & Field training helps to develop courage.

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