

ORIGINAL RESEARCH PAPER

A MULTIDIMENSIONAL FACTOR MODEL FOR TEAM PREPARATION IN BASKETBALL

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Abstract

Aim of the research: development of a scientifically proven multidimensional factor model for team preparation for youth basketball championships and evaluation of its contents in youth basketball team cohesion and psychological stability for its optimisation.

Methods of the research: Group Environment Questionnaire test (adapted version), players' psychological stability test, discussion, testing, documental material analysis, pedagogical experiment and mathematical statistics. The research was carried out from year 2007 to year 2009 (N=131). During the research, a statistically credible, mutually correlative link was determined between team cohesion, players' psychological stability, overall physical training and game performance indices, as well as between the three factor structure multidimensional model for team preparation for youth basketball. Team cohesion structure consisted of three components with weight in factors above 0.5 (GI-T $r=0.839$; GI-S $r=0.853$; ATG-T $r=0.577$; ATG-S $r=0.726$). Psychophysical factor structure consisted of two components: overall physical condition ($r=0.701$) and emotional stability ($r=0.652$). Self-regulatory factor structure consisted of two components – self-regulatory skills ($r=0.787$) and motivational component ($r=0.823$). The multidimensional factor model team training for championships optimises team cohesion, players' psychological stability and, therefore, also team performance is improved. It was concluded that in both experimental and control group there were no statistically credible differences between teams ($p>0.05$), this verifies that the teams were homogeneous. In the experimental group (before and after the experiment) there were statistically significant differences in all team cohesion and psychical stability scales. The changes in indices are statistically significant ($p<0.05$).

Key words: *multidimensional factor model, team cohesion, players' psychological stability.*

Introduction

Basketball is one of the most popular sports, not only in Latvia and Lithuania, but also in other parts of the world. In high ranking competitions psychical tension increases and players are not always capable of concentrating their attention during the championship, sometimes not even during a single game and are not able to eliminate the stress caused by various elements during the most important moments of the game. Sports scientists mention a players' ability to regulate one's own psychical condition as one of the criteria of a player's psychological stability (Мильман, 1990; Moran, 2004; Jowett, Lavalley, 2007; Malinauskas, 2010).

Term "psychological stability" characterises a player's ability to deal with stress, not give up when they are facing difficulties and bad luck, their ability to continue playing till the end of the game even in extreme situations (Блюменштейн, Мильман & Худадов, 1997). Psychological stability consists of the player's emotional stability, self-regulatory skills, motivational energy component and performance stability, which is characterised by the player's ability to concentrate for longer periods of time in action. The basis of psychological stability consists of a player's physical training, former championship experience, level of self-regulatory skills development, belief in oneself and ability to structure one's aims (Malinauskas, 2001). In psychological stability development a wide variety of methods are used. The different tasks are: autogenic training, visual relaxation, self-suggestion, psychological consulting, methods of dialogue, neuromuscular relaxation, and training under a high level of tiredness (Morris, Summers, 2003).

In team and other sports, cohesion is considered to be a major factor in promoting team efficiency; sports specialists frequently link a team's success to it. Team cohesion level and, therefore, also their results in championships is a matter of major importance in modern dynamic sports, when different ways of improving results are constantly sought. Research shows that team cohesion correlates positively with team performance (Carron, Widmeyer & Brawley, 2002; Vazne, Rudzitis; 2007; Vazne, 2008; Vazne, Rudzitis & Larins, 2008; Vazne, 2010). Team players' faith in their ability to reach their goals, as those players are able to keep their concentration ability even if they score less, maintain power of concentration and fighting spirit even if the circumstances are bad (Feltz,

Lirgg, 1998). Meanwhile cohesion might not just improve team work, but also it can increase the level of team cohesion after a successful game.

Nowadays basketball is characterised by a dynamic playing style, high level of movement activity and growing tension in the most important moments of the game, it requires the players to use their maximum speed, power and functional mobilisation.

One of the main tasks in youth athletes' training is development of optimal physical ability, because based on good physical condition they will also be able to perform at other tasks better. Physical training is one of the most important parts of the basketball training process. On the one hand, it promotes an athlete's personality development, body strength, development of physical qualities and improvement of functional possibilities; on the other hand, it also develops the qualities which are necessary to achieve great results in this kind of sport.

In basketball, physical training is linked closely to other kinds of training – technical, tactical and also psychological (Moran, 2004). Physical training, if it is focused and carried out according to didactical requirements, has effect on every age and qualification group – it improves players' skills, it also acts as a basis of players' psychological stability (Озеров, 2002).

Insufficient strength and speed will not allow the player to use the methods of basketball of our times; those must be done in high speed. Lack of strength will make the player feel tired faster and, therefore, create problems with skilled movements. The player will lose throw accuracy, height of jumps and start speed.

Basketball coaches' practical experience shows that it is difficult to maintain team cohesion and players' psychological stability during championships. Especially, in Olympic Games, world championships and other tournaments, the competing teams are usually equally well trained, both physically, technically and tactically.

Research aim: development of a scientifically proven multidimensional factor model for team preparation for youth basketball championships, and evaluation of its contents in youth basketball team cohesion and psychical stability for its optimisation.

Subject of the research: youth basketball team cohesion and players' psychological stability development in the process of training for championships.

Material and methods

Research methods consisted of: test, discussion, documental material analysis, pedagogical experiment and mathematical statistics. This research was carried out from year 2007 to year 2009, total number of

respondents was 131. Group Environment Questionnaire test (to determine team cohesion in sports). To determine team cohesion level a Group Environment Questionnaire (GEQ) test developed by Canadian psychologists A. Carron, L. Brawley and Widmeyer was used (Widmeyer, Brawley, Carron, 1985; Carron, Widmeyer, Brawley, 2002). Theoretical basis of the GEQ test consists of sports dynamics (Carron, Widmeyer, 1997; Murphy, 2005). GEQ helps to research impact of environment (group and individual) on team cohesion (Brawley, Carron, Widmeyer, 1985), this is one of the most widely used methods in the world to research team cohesion. GEQ has been used in cohesion researches of many teams and the results prove that GEQ can be used to obtain varied information in sports science also those results indicate high validity of obtained results (Carron, Bray & Eys, 2002; Brawley, Carron & Widmeyer, 1987; Sprink, Carron, 1992; Dion, Evanss, 1992).

During this research the Group Environment Questionnaire, developed by the Canadian scientists was adapted for usage in the Latvian environment. After adaptation, the adapted test version in Latvian was used. In the research cohesion evaluation criteria were used, developed by the author during its standardisation process (Vazne, 2008). The evaluation criteria respondent base consisted of Latvian youth basketball league team players of 2007 and 2008, who participated in the European basketball championship (Cronbach's alpha coefficient 0,762).

Psychological Stability test (Мильман, 1990) was used. Psychological Stability test helps to evaluate a specific player's personality trait such psychological stability. This test is based upon a multidimensional model; it consists of four scales: emotional stability in championships, self-regulatory skills, energetic component of motivation, and performance stability during championships (Malinauskas, 2008). Analysis of the test results helps to determine the dominant emotional reactions during the training period, before an important championship in long term.

Discussions were carried out based on standardised questions; results were used as a supplementary aid of quality data interpretation.

Testing (overall physical condition determination tests was used). In years 2007 and 2008 a check-up of basketball players' physical condition during training period for European championship was carried out. The result evaluation was based upon criteria developed at the Latvian Academy of Sport Education (Rudzītis, Lāriņš, 2008).

In order to evaluate players' performance during championships, a championship technical protocol analysis was carried out. Twelve Latvian

youth basketball teams' games technical protocol analysis was carried out after the European championship (six teams after championship in year 2007 and six teams after championship in year 2008). The efficiency coefficient calculation was based upon a formula developed by Preobrazhensky (Преображенский, 1970).

Pedagogical experiment was carried out from January till May, in year 2008. Aim of the pedagogical experiment: team cohesion and psychological stability determination in both experimental and control groups, multidimensional factor model content for team preparation for youth basketball championships usage impact on team cohesion and players' psychical stability evaluation. Object of the pedagogical experiment: team training process for most important championships of the season. Subject of the pedagogical experiment: 17 year old female basketball players. Methods of the pedagogical experiment: questionnaire (GEQ, Psychological stability test); discussions; mathematical statistics.

Research procedure

The Group Environment Questionnaire was adapted for the Latvian sports environment (team sport). To determine test credibility Cronbach's alpha coefficient was used, for test validity determination a factor analysis was used. Pilot researches after GEQ adaptation showed that there were statistically credible correlation coefficients between players' individual cohesion scales and team performance in championships, thus proving that there is a positive mutual connection between team cohesion and performance in championships ($p < 0,01$). (Vazne, Rudzitis, 2007). Each basketball team's cohesion level, psychical stability and overall physical training levels were determined in years 2007 and 2008 during training period before the European championship. Individual profiles for each team were developed and analysed for both years 2007 and 2008 (Vazne, 2008). A three factor structure was used: "team cohesion factor", "self-regulatory factor" and "psychophysical factor" (results of respondents in years 2007 and 2008, U-18, U-20 age groups). Team cohesion structure consists of three components with its weight in factors above 0.5 (GI-T $r=0.839$; GI-S $r=0.853$; ATG-T $r=0.577$; ATG-S $r=0.726$). Psychophysical factor structure consists of two components: overall physical condition ($r=0.701$) and emotional stability ($r=0.652$). Self-regulatory factor structure consists of two components – self-regulatory skills ($r=0.787$) and motivational component ($r=0.823$) (Vazne, 2008). A multidimensional factor model was developed and its contents used for training a youth basketball team. Model contents were developed according to factor analysis' results, also by evaluation of important mutual links between team cohesion, players'

psychical stability, overall physical training and performance results in championships (efficiency coefficient and ranking) ($p < 0,05$). During the research (published in Ph.D. Dissertation by Z.Vazne) contents were developed for each of the above-mentioned factors (Vazne, 2009).

Results of the research

The “Multidimensional factor model for team preparation for youth basketball championships” has two independent and four dependent variables (Fig. 1): Two independent variables ”Socio-environmental Factors” and ”Individuality Factors” consist of “Social environment”, which consists of the micro-environment (upbringing in family, closest friends, relatives) and the macro-environment (which consists of sports club, school, society, championship level, etc); “Individuality”, which includes gender, age, athlete’s personal characteristics, etc. Four dependent variables are “team cohesion”, “self-regulatory factor”, “psychophysical factor” and “performance”. “Team performance factor” consists of four cohesion scales. “Self-regulatory factor” consists of two scales characterising player’s psychical stability – self-regulatory and motivational component. “Psychophysical factor” consists of overall physical training and emotional stability as means of player’s psychical stability. “Performance” is an integral, affected by all above-mentioned.

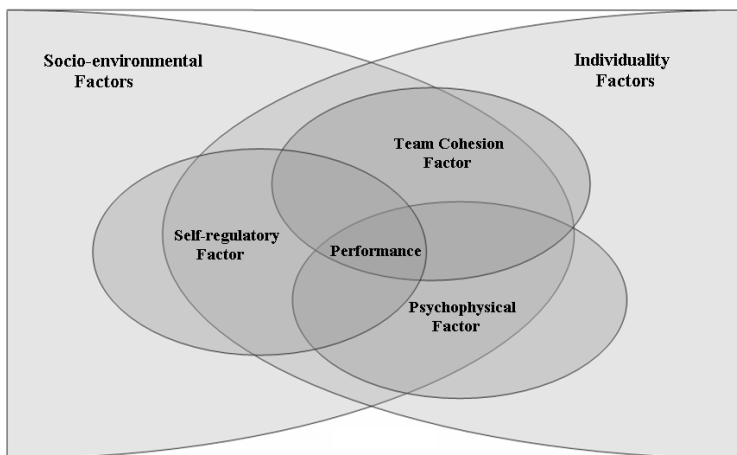


Figure 1. Multidimensional factor model for team training for basketball championships (by Vazne, 2009)

This model can be regarded as a multidimensional factor model for team training for championships in basketball, because it is based upon many factor structures which are connected to each other.

First, *team cohesion factor* – team cohesion is evaluated as: multidimensional, as team sports are based on more than just one factor; dynamic, as team cohesion is not a constant, it can change as time goes by; instrumental, as it reflects team development and reasons of its existence; emotional, as it is linked to emotional factors which influence players' individual value scale and attitude.

Second, according to *psychological stability* definition, psychical stability is multidimensional, as it characterises players' abilities to: understand and know how to regulate one's own emotional conditions; carry out emotional control; know how to maintain self-confidence and believe in oneself; regulate consciously one's own psychical condition; keep up the spirit till the end of the game even if the conditions are not favourable.

Third, overall physical condition is characterised altogether by speed, strength, endurance, coordination and prowess. In this research it was estimated in grades. Emotional stability during championships is one component of psychical stability and it is characterised by players' ability to keep the fighting spirit in difficult circumstances.

Model contents were developed according to factor analysis results, also by evaluation of important mutual links between team cohesion, players' psychical stability, overall physical training and performance results in championships (efficiency coefficient and ranking; $p < 0.05$).

During the pedagogical experiment, a multidimensional factor model for players' training for championships content implementation impact on team cohesion and psychological stability evaluation in both experimental and control groups was carried out as follows: homogeneity tests in experimental and control groups, and a part of the model contents and programme for team cohesion and psychical stability components improvement was chosen. After the programme implementation the dynamics of results were evaluated in both experimental and control groups and its link to team's rank in final tournament.

Team cohesion is characterised by two scale indices: ATG-T, ATG-S (individual attractions to group task accomplishment and individual attachment to group in social tendency), GI-T, GI-S (group integration for task accomplishment and group integration in social tendency). Team's psychical stability is characterised by: emotional stability (ES), self-regulatory skills (SR), motivational component (MC) and performance stability (PS).

In the experimental group GI-T indices (26.08 ± 4.1) are regarded as low ones (Fig. 2).

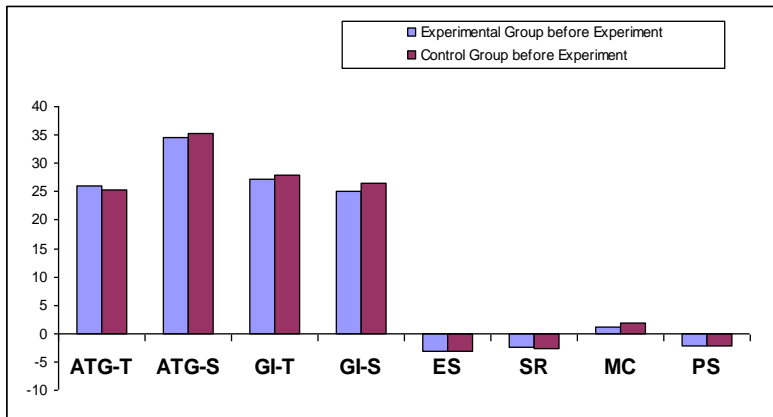


Figure 2. Experimental and control group team cohesion and psychological stability scale indices in the beginning of the experiment (n=24)

Psychological stability scale contents (ES – emotional stability; SR – self-regulatory skills; MC – motivational content). Team cohesion scale contents (ATG-T – individual attractions to group task accomplishment; ATG-S – individual attractions to group in social tendency; GI-S – group integration in social tendency; GI-T – group integration for task accomplishment).

After analysing individual answers it can be concluded that team players have a tendency to have different points of view regarding team goals and task implementation, as well as that the team cooperation style is not open and there is a "blaming process" between the girls in case of bad performance. Other team cohesion indices are average.

In experimental group emotional stability indices (-3.08 ± 1.31) and self-regulatory skills indices (-2.5 ± 2.39) are below average. This indicates that the team is below average in understanding its emotional conditions, therefore, more prone to provocations during championships and negative emotional reactions in stressful situations. Low self-regulatory skills also affect this. Motivational component is below average (1.25 ± 2.0). Performance stability is below average, it indicates that the team players probably have problems with attention stability in long term. Control group indices are similar to those of the experimental group. T-criterion (*Independent Samples Test*) for independent team comparison (both experimental and control groups) shows that team cohesion and psychological stability indices have no significant differences between teams ($p > 0.05$), it means that the groups are homogeneous.

Before the multidimensional factor model implementation for preparing, individual discussions with each of experimental group players were carried out in order to get to know them and to determine each player's individual needs. Individual training plans were developed. After those, content implementation team cohesion and psychological stability tests were repeated and analysed.

In Figure 3 are shown experimental group indices before and after content implementation. After dynamics evaluation of the indices it can be concluded that indices have improved in all cohesion structures in the experimental group.

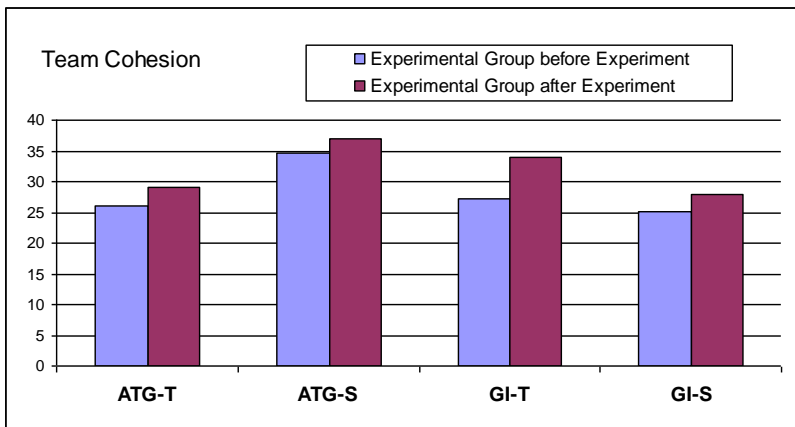


Figure 3. Team cohesion scale indices in the beginning of the experiment and at the end of the experiment

Team cohesion scale contents (ATG-T – individual attractions to group task accomplishment; ATG-S – individual attractions to group in social tendency; GI-S – group integration in social tendency; GI-T – group integration for task accomplishment).

Also, in indices of players' psychological stability, the results are higher in all its structures. Changes in the beginning of the experiment and at the end of the experiment, after the content was implemented, are statistically valid ($p < 0.05$) (Fig.4).

Before the pedagogical experiment in both experimental and control groups it was determined (using a T-test) that there is no significant difference between teams ($p > 0.05$), this indicates team homogeneity.

Analysis of results of discussions allows concluded that for players the most important influence on performance is linked to ability to "cope" with stress before important championships, and also it is linked to self-

confidence. As the most important factor in team performance improvement players mention team cohesion.

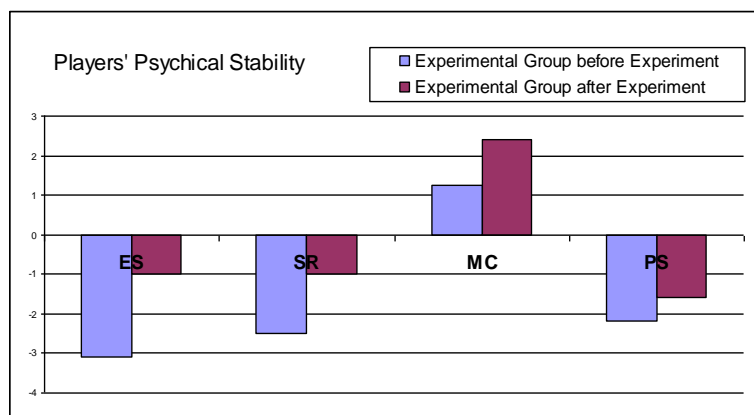


Figure 4. Players' psychological stability scale indices in the beginning of the experiment and at the end of the experiment

Psychological stability scale contents (ES – emotional stability; SR – self-regulatory skills; MC – motivational content).

In the experimental group (before and after the experiment) there were statistically significant differences in all team cohesion and players' psychological stability scales. Changes in indices are statistically valid ($p < 0.05$). In the control group there were insignificant changes, but, when tested with T-test's conditional sets, it was determined that those differences are not statistically significant

($p = 0.34 \dots 0.93$). Respondents in the experimental group, when the content was implemented, ranked as the second best in the final tournament (in previous researches it was statistically proven that there was a tight link between team cohesion, psychological stability scales and team performance). There were no changes in control group.

Discussion

By analysing the data of the basketball players in the beginning of the experiment and at the end of the experiment we established that multidimensional factor model for team training for basketball championships was confirmed.

The approbated team training system, which is based upon scientifically tested evaluation criteria, can be applied in sports science (it

is recommended to use it during team training process). Results of the research suggests to develop team performance prognosis and show "a way to go" to improve this performance. Experimentally tried and tested multidimensional factor model content can be used in team training for a championship (Vazne, 2008).

The consequences of the present study may be grounded by researchers proving that team cohesion positively correlates with team performance (Carron, Widmeyer & Brawley, 2002, Vazne, Rudzitis & Larins, 2008) and by researches proving that the players' ability to regulate one's own psychical condition as one of criterions of player's psychological stability (Morran, 2002, 2004; Jowett, Lavalley, 2007; Malinauskas, 2010).

Limitations and further suggestions

The present research not only revealed some tendencies of team training in basketball, but also discovered the perspectives for further research. Another factor that may influence youth basketball players' team training is the kind of sport - basketball. A multidimensional factor model was created and its contents used in training of a youth basketball team. It was established that in the basketball players' respondent groups (age 18 to 20) team cohesion, psychological stability and overall physical condition components determination was predominant. Multidimensional factor model team training for championships contents implementation optimizes team cohesion, players' psychological stability and also improves team performance. Correlations between model variables were established only in basketball – this is the kind of sport that requires communication between team members. We suggest analysis of tendencies of teams in sports where there is less communication required between the players.

Conclusions

Statistically credible mutually correlative link determination between team cohesion, players' psychological stability, overall physical training and performance indices, as well as the three factor structure promoted development of scientifically proven multidimensional factor model for team training in youth basketball. Team cohesion structure consisted of three components with its weight in factors above 0.5 (GI-T $r=0.839$; GI-S $r=0.853$; ATG-T $r=0.577$; ATG-S $r=0.726$). Psychophysical factor structure consisted of two components: overall physical condition ($r=0.701$) and emotional stability ($r=0.652$). Self-regulatory factor structure consists of two components – self-regulatory skills ($r=0.787$) and motivational component ($r=0.823$).

A multidimensional factor model team training for championships contents implementation optimises team cohesion, players' psychological stability and therefore also improves team performance. It was concluded that in both experimental and control groups, after evaluation of team cohesion and players' psychological stability indices, there were no statistically credible differences between teams ($p > 0.05$). This verifies that the teams were homogeneous. In the experimental group (before and after the experiment) there were statistically significant differences in all team cohesion and psychical stability scales. Changes in indices are statistically significant ($p < 0.05$).

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