

# Digital Competences, Dependencies Between Mental Indicators and Defensive Tactical Performance Indicators for Students Playing Basketball

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**Abstract** – The purpose of this article is to present the results of a survey of the strength, character, and direction of the links between: (1) indicators determining mental performance and (2) indicators of tactical actions in defence of students playing basketball. This survey is conducted in 2016 with 30 male students playing basketball at the Sports Club at the University of Economics Varna. Tests are carried out to assess effective and ineffective group tactical actions in defence. The results show some interesting dependencies among the two groups of indicators. Mental indicators moderately influence some tactical actions in defence.

**Keywords** – basketball, students, collective sports.

## 1. Introduction

The tactical performance indicators in defense of students sporting basketball depend on both sports' preparation and the mental qualities they have.

The verification of the existence of links between (1) mental performance indicators and (2) tactical performance indicators is the interest of the research in the current work.

The purpose of this article is to present the results of a survey of the strength, character, direction of the links between: (1) indicators determining mental performance indicators and (2) indicators of tactical actions in defense of students playing basketball.

The specifics of basketball imprint the development of one or other countries of the athlete's psyche and his perception, attention, memory, thinking, emotions, moral-will qualities, reactions, and others. Therefore, to determine and specify the tasks and content of the psychological training of basketball players, it is necessary to study the psychological characteristics of his activity. Knowledge of these features will help to purposefully nurture those mental qualities that are necessary for their successful participation in a competition.

Training activity in students sporting basketball is necessary to plan and conduct, considering the influence of certain factors that can determine the success of the game.

Actively sporting students prepare to participate in competitions, which significantly changes the purpose of basketball training in universities and leads to the establishment of specialized models for the training of students in basketball.

Enhancing the role of psychological training is one of the leading trends that characterize the development of modern sport. A prerequisite for success in collective sports, such as basketball, is the ability to interact, determined by extraversion. Temperament and its influence on the activities of sports players is manifested in the increase in neuro-mental arousal, which is accompanied by considerable anxiety. Potential opportunities of sports people sometimes hinder the achievement of good results.

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## 2. Literature review

It is necessary to determine the typical errors that special attention should be paid to in the training process to improve the game efficiency of the players from the student basketball teams [1].

The use of modern techniques in the practical activities of basketball coaches and sports specialists makes it possible to objectify the process of monitoring the training process and use performance indicators to monitor and correct the functional fitness of athletes [2].

Tsvetkov [3] looked at the factors determining the extreme conditions in sports games: the decision of game tasks by the team of athletes, a solution to game tasks by each athlete. Significant physical tension associated with the pace and rhythm of play, with overcoming the resistance of an opponent and the "success-failure" factor. Tensions related to the social characteristics of the game and modern sport. the basketball activity tracks the change in the mental functions of basketball players in the training process and offers a specially developed program of exercises to purposefully influence basic mental functions.

According to Rohleva [4], the effectiveness of the game depends on the training equipment (athletic and specialized) ensuring the high level of technical and tactical preparedness of the players.

Pritykin [5] in his article presents the results of mathematical modeling of the flight parameters of a ball to create criteria for basketball shots from the reflection of the ball from the dashboard. It is necessary for shooters to strive to create parameters necessary to control the flight of the ball.

Chernov [6] develops a complex of methodical rules for improving the adaptation to sports activity of young basketball players in their transition to high sports craftsmanship.

Kasabova [7] reveals the state of physical fitness and technical and tactical skills of students playing basketball at the University of National and World Economy (in Sofia) based on variation analysis.

According to Tatarova [8], it is advisable to focus on improving shooting from the penalty line by using a special complex of exercises to stretch muscles at the beginning of training and at the end of the main part of the workout.

According to Gorshenina [9], the readiness of students playing basketball to group interactions should be understood as integrative education, characterizing the presence of basic predispositions and needs for personal and constructive interactions in the process of teamwork, manifested in special knowledge, skills and methods and important personality characteristics.

In his study Simeonova [10] confirms that the successful prediction of the result of the motor action leads to an improvement in the focus, sustainability, intensity, and productivity of attention.

Stavrev [11] established the influence of basketball activities on the intellectual qualities of students necessary for the economic profession. Too much importance is given to attention mainly in those types of sport where adapting to variable conditions (ball games) plays a leading role. Mental factors are extremely important for the sport and its successful practice. Stavrev prepares a methodology for complex assessment of the psychophysical qualities of students and on-line platform for wider use.

In her study, Shumova [12] conducted a comparative analysis of the relationship of personality structure with the performance of basketball players from Russian and Chinese student teams. With the help of 6 psychodiagnostics methods, which are widely used in practice, 82 indicators are obtained.

Brestnicki [13] has conducted a comprehensive comparative analysis of certain motor qualities in male and female students practicing basketball in the training activities of "Physical Education" at the University of National and World Economy in Sofia.

Evaluation of digital competencies, mental activities and sporting performance is studied by many authors (e.g. in [14], [15], [16], [17], [18], [19] and [20]). Sometimes heuristic approaches are applied for finding ambiguous dependences between sport activity and mental activity [21]. Web applications may help in finding some dependencies (e.g. in [22], [23], [24] [25] and [26]). Specific research on some digital skills of students is done in many areas (e.g. in [27], [28], [29], [30] and [31]). Predicting students' performance is a difficult task (e.g. in [32], [33], [34], [35], [36], [37] and [38]). Even though specific surveys are done. Specific digital skills are oriented to studying databases (e.g. in [39], [40], [41], [42], [43] and [44]).

## 3. Methods

The aim of the study is to establish the strength, character, and direction of the links between: (1) the indicators determining the mental performance and (2) the indicators of tactical actions in defense of students playing basketball. We will try to determine the level of basic mental qualities and the effective and ineffective tactical actions in defense of students sporting basketball. We will try to establish the degree of influence and nature of the dependencies established in a correlation-structural model.

This survey is conducted in 2016. It is attended by 30 male students sporting basketball at the Student Sports Club Varna at the University of Economics – Varna. In the overall course of the experimental study, two stages can be distinguished in terms of realized, exploratory, organizational and research work.

The first stage covers the period from the end of April to May 2016, during which the following activities took place: Organizing and conducting laboratory testing to establish the level of basic mental qualities.

Stage two covers the time from May to June 2016 during which the following activities took place:

Pedagogical monitoring and registration of group tactical actions in defense of video recording of basketball matches.

Fourteen tests are used to determine the mental performance of college basketball players. Ten indicators have been used to determine defensive tactical actions. In our view, basic and most used group tactical actions are covered in defense.

We assume that there are links between (1) mental performance and (2) basketball defense indicators. In case of open links, an expert in basketball checks for the cause of the connections themselves and comments on the results.

We assume that, finding the connection and influence of the psychological factors determining the effectiveness of group tactical actions in defense, basketball training will be intensified in the context of university education with sports improvement groups.

The **first group of tests** – tests for assessment of intellectual qualities (tests 1-5). All tests are in Table 1.

Test No.1. Concentration of attention

Five Schulte tables are used with digits from 1 to 25 in different combinations, which are given sequentially. They are 16x16 cm in size, with a network for the figures 3x3 cm and a size of the figures 1x1 cm. The person surveyed is required to find on the tables, list aloud and display in ascending order each digit of the corresponding series. The time in seconds to complete the task shall be reported using a stopwatch. The results of the first table are excluded. The concentration indicator is obtained as the arithmetic mean of the time obtained on the other four tables.

Test No.2. Resistance to attention

It is examined with the same test and methodology for examining the concentration of attention. The indicator of resistance to attention is the addition of the times in the second and fifth table.

Table 1 Mental performance indicators

№	Indicators	Units of measure	Accuracy of measurement	Direction of growth
1.	Concentration of attention (Kvn)	s	1	–
2.	Sustainability of attention (UVN)	s	1	–
3.	Operational thinking – moves (Omh)	Count	1	–
4.	Operational thinking – time (Omv)	s	1	–
5.	Operational thinking – coefficient (Omk)	Balls	0,01	–
6.	Personality anxiety (Lt)	Balls	1	–
7.	Reactive anxiety (RT)	Balls	1	–
8.	Extroversion/introversion (E/I)	Balls	1	+
9.	Neuroticism (H)	Balls	1	–
10.	Deductive thinking (IST 2000 R) *Supplement sentences	IQ points	5 IQ points	+
11.	Verbal inductive thinking (IST 2000 R) *Relationship Search	IQ points	5 IQ points	+
12.	<i>Algorithmic Thinking (IST2000R)</i> *Number rows	IQ points	5 IQ points	+
13.	<i>Abstract Logical Thinking (IST2000R)</i> *Matrices	IQ points	5 IQ points	+
14.	Short-term memory (IST 2000 R) *Figure memory	IQ points	5 IQ points	+
15.	<i>Ability to reason, analyze and solve problems (IST 2000 R)</i> *Total IST 2000 R result	IQ points	5 IQ points	+

Test No.3. Operational thinking – moves

A test modified by Yanev [45] is used to assess the level of operational thinking.

The research solves a complex of a series of combinations having different complexity. Each combination is measured by accuracy (number of moves) and speed (time to solve actions/moves).

The experimenter monitors and records the resolution moves of each series and measures the time spent with a stopwatch with accuracy in seconds.

Test No.4. Operational thinking – time

Test No5. Operational thinking – coefficient

These metrics of move and time are transformed by formula into a coefficient of operational thinking: (Indicator 3 + Indicator 4)/64.

The **second group** of tests (7-9) are tests for anxiety.

To assess the state of anxiety in both components – reactive anxiety and personality anxiety, a test methodology "Reactive and Personality Anxiety Scale" is used. Spielberg [46] adapted the Russian version by Hanin, a modification for Bulgarian conditions by Yanev [45].

Test No.6. Reactive anxiety (RT)

Test No7. Personality anxiety (LT)

For the study of the personality of students playing basketball, a standard methodology is used – the Eysenck Personality Questionnaire [47] – a form with 57 questions.

Test No.8. Extraversion – introversion (E-I)

Test No.9. Neuroticism (H)

For the study of the personality characteristics of students playing basketball, the standard methodology was used – a questionnaire of Eysenck – a form, containing 57 questions. The study, after reading the instruction, answered 57 questions with "yes" or "no", depending on what more corresponds to its characteristic behavior or feeling.

Indicators of extraversion, introversion and neuroticism have been recorded. The indicators of each of the two scales are in the range from 1 point to 24 points. The middle of each scale (12 points) is a critical value for extroversion and neuroticism and based on it the following degrees are determined for these properties of temperament:

from 1 to 6 points – low level of extroversion and neuroticism.

from 7 to 9 points – below the average level of extroversion and neuroticism.

from 10 to 14 points – average level of extroversion and neuroticism.

from 15 to 17 points – above average level of extroversion and neuroticism.

from 18–24 points – high level of extroversion and neuroticism.

The **third group of tests** are cognitive assessment tests (10-15):

Test No 10. Deductive thinking (IST 2000 R)

Test No.11. Verbal inductive thinking (IST2000R)

Test No12. Analytical Thinking (IST2000R)

Test No. 13. Abstract Logical Thinking (IST 2000 R).

Test No14. Short-term memory (IST 2000 R).

Test No15. Ability to reason, analyze and solve problems (IST 2000 R).

Modules from the I-S-T 2000 R intelligence structure test of Amthauer are used [48]. IST 2000 R is the latest version of the cognitive ability assessment test. It is designed to assess the quality and speed of thought processes and, with its help, examines all the basic cognitive functions. It contains 180 tasks divided into nine equal groups. The format of tasks simulates the thought processes that occur in solving real problems. Each module, groups of tasks have a certain time to perform. Administration is a type of "sheet and pencil".

The **fourth group of tests** assess effective and ineffective group tactical actions in defence of students playing basketball (16-26). See Table 2.

Table 2 Defense tactical performance indicators of students playing basketball (16-26)

No	Indicators	Units of measure	Accuracy of measurement	Direction of growth
16.	Minutes played	s	1	+
17.	Closing a corridor with successful	Count	1	+
18.	Closing a corridor unsuccessful	Count	1	-
19.	Welcoming a player successful	Count	1	+
20.	Welcoming a player who is unsuccessful	Count	1	-
21.	Countering a shelter with successful	Count	1	+
22.	Countering a shelter failed	Count	1	-
23.	Duplication "Sandwich" successful	Count	1	+
24.	Duplication "Sandwich" unsuccessful	Count	1	-
25.	"Trap" successful	Count	1	+
26.	"Trap" unsuccessful	Count	1	-

**4. Results**

Correlation analysis is used. A search for correlations between (1) mental indicators (*tests 1-15*) and (2) defense tactical indicators (*tests 16-26*) is done. Intercorrelations within these two big groups are not studied in this paper. Some correlations ( $p < 0.05$ ) are found. Where significant correlations (at  $p < 0.05$ ) are found, the strength is mainly moderate.

Logical and natural in our opinion is the connection ( $r = 0.463, n = 30, p < 0.05$ ) between the registered moves to solve the task (No 3), giving an idea of the accuracy of thinking and successful countermeasure against shelter (No 21).

The following link reveals to us that the accuracy of thinking in the case is the mane of the decision to counter shelter and the possibility of choosing between execution without change, with a shift and with a false shift is of utmost importance in this tactical action.

The registered connection ( $r = 0.377$ ,  $n = 30$ ,  $p < 0.05$ ) between deductive thinking (No 10) revealing to us the following of logic and the unsuccessful attempts in the opening of a corridor (No 18), clearly reveals to us that a good defender is necessary to read the movement, space, direction and speed of movement of the attacker knows how, where and when he/she needs to apply the necessary standing in defence, observing the basic principles of protection in playing basketball.

The established moderate dependencies between the indicator deductive thinking (No 10) with the introduction of a player with a pole (No 19) and a player's non-pole thinking (No 20) are impressed, respectively  $r = 0.381$ ,  $n = 30$ ,  $p < 0.05$  and  $r = 0.376$ ,  $n = 30$ ,  $p < 0.05$ .

Looking at the issue of following the logic in the course of implementing defensive actions in welcoming a player, it is clear that the preparation of alternative solutions in the requirements for a limited time in the counter-attacking of the attacker is of utmost importance. and accurate solutions after the processing of the information from the situations created.

Moderate in their significance are the correlations between abstract logical thinking (No 12) with the use of a corridor of non-stop (No 18) and countering against shelter unsuccessful (No 22), respectively  $r = 0.369$ ,  $n = 30$ ,  $p < 0.05$  and  $r = 0.379$ ,  $n = 30$ ,  $p < 0.05$ . They inform us of the students' ability to view the situation in its fullness and unsuccessful attempts to reflect the over-the-counter actions of the advantaged attacker during the closure of a corridor and countering a shelter.

## 5. Discussion

The results of the study show that the basic mental indicators moderately influence basic tactical actions in defense and reveal the possibility of establishing the influence of important components and guidelines for improving the control and management of sports training.

Based on the data from the resulting correlations between mental qualities and defensive tactical actions, the following conclusions can be drawn about theory and practice.

Regarding indicators characterizing intellectual qualities, the accuracy of thinking measured by the number of moves influences tactical actions in defense.

The impact of quality and speed of thought processes on defensive tactical actions have: "Deductive thinking" (following logic) and "Abstract logical thinking" (students' ability to view the situation in its fullness).

## 6. Conclusion

Correlations between: (1) indicators determining mental qualities and (2) indicators of tactical actions in defense of students playing basketball are studied.

One of the found connections is the one between operative thinking and successful countermeasure against shelter.

Another discovered connection is between deductive thinking and unsuccessful attempts in the opening of a corridor.

Abstract logical thinking is directly connected with "Closing a corridor unsuccessful" and "Countering a shelter failed".

The mental indicators moderately influence the tactical actions in defense and reveal the possibility of establishing the influence of important components and guidelines for improving the control and management of sports training.

Based on the data obtained from the correlations between mental qualities and defensive tactical actions, the following conclusions can be drawn for theory and practice. The three main domains (intellectual, personal and cognitive) moderately influence the main defensive tactical actions. As for the indicators characterizing intellectual qualities, the accuracy of thinking, measured by the number of moves, affects tactical actions in defense. The influence of the quality and speed of thought processes on defensive tactical actions is exerted by: "Deductive thinking" (following logic) and "Abstract logical thinking" (the ability of students to consider the situation in its entirety).

Future research may focus on finding correlations among variables within the main two groups. Another research may make a replication of the applied tests with other student playing basketball.

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