

## FACTORIAL ANALYSIS OF PSYCHOLOGICAL AND TECHNICAL-TACTIC FITNESS OF TENNIS PLAYERS AT STAGE OF SPECIALIZED BASIC TRAINING

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**Abstract.** *Purpose:* determination of structure of psychological and technical-tactic tennis players' fitness by method of main components. *Material:* in the researches 24 tennis players of 14-15 years old age participated. For determination of personalities' psychological components of junior tennis players the following methodic were used: Dembo- Rubinstein's (self assessment), Burdon-Anfimov's (attention), test by G. Izenko (type of temper), T. Elers's (motivation), Sbilberger-Khanin's (level of anxiety). *Results:* we have determined the structure of psychological and technical-tactic fitness of tennis players at stage of specialized basic training. For psychological fitness it was determined five factors, for technical-tactic fitness – three. High level of inter-factor interconnections was observed only if structure of technical-tactic fitness. Between five factors of psychological fitness we did not find any significant links. *Conclusions:* the determined peculiarities of factorial structure of tennis players' fitness can be used for planning of psychological training programs and in the training process of junior tennis players.

**Key words:** competitions, psychology, technique, tactic, physical, factorial, loads.

### Introduction

High sport results are impossible without consideration of individual-typological features of sportsmen's nervous functioning, which makes psychological and psycho-physiological basis of behavioral and cognitive processes and their vegetative provisioning [1-5, 6, 9, 39]. Psychological features of tennis players' functioning are conditioned by objective peculiarities of competition struggle on the court and are characterized by quickness of sudden game situations, strict time limit for their perception and taking decision in conditions of multiple choice and responsibility for effectiveness of game technique's fulfillment [2, 4-6, 10-15, 17-19, 21-29, 40]. Competition functioning in tennis goes in extreme conditions and not stationary environment, which is formed by own actions of a sportsman and his (her) adversary. In comparison with other kinds of sports tennis is characterized by very high emotional and intellectual tension. It puts forward high requirements to sportsmen's physical and psychic qualities [1, 16, 20, 30-38]. Recent time specialists in different kinds of sports have been widely using method of factorial analysis, which permits to determine complex of dominating components. It conditions sport result, determines character of interconnections between indicators; it also permits to determine contribution of specific factors in total result [7, 8, 11, 12].

Determination of factorial structure of fitness at different stages of many years perfection in tennis is rather urgent. But these questions are not paid sufficient attention to in special literature. Determination of factorial structure of psychological and technical-tactic fitness at stage of specialized basic training is extremely important task. Just if this sportsmen's age future foundation of further sport achievements is embedded; tennis players' training becomes still more specific [5-7]. Determination of leading components of junior tennis players' fitness will permit to significantly increase effectiveness of their training and competition functioning.

### Purpose, tasks of the work, material; and methods

*The purpose of the work:* determination of structure of psychological and technical-tactic tennis players' fitness by method of main components.

*The tasks of the research* were determination of leading factors in structure of psychological and technical-tactic fitness of junior tennis players. Besides we determined inter-factorial interconnections of the studied components of sportsmen's fitness.

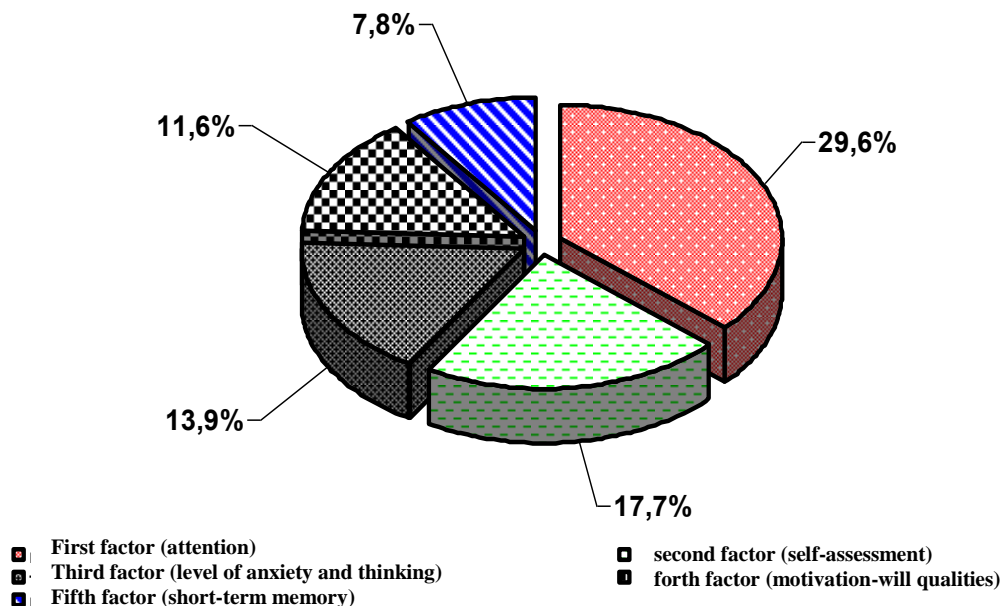
*The methods of the work:* analysis and generalization of data of special scientific methodic literature, questioning, method of experts' assessment, pedagogic observation, pedagogic testing, Psycho-diagnostic methods, methods of mathematical statistic, analysis of Internet data.

### Results of the research

For determination of the most significant factors of junior sportsmen's psychological and technical-tactic fitness we used method of main components. Advantage of this method was that it was possible to use only the most informative main components and exclude other in the process of analysis. It permitted to significantly make simplify interpretation of the received data.

According to algorithm of method of main components confidence of researches' results is valid only if percent of a sample of interconnected elements is not less than 60% from general dispersion. During analysis of factorial structure of junior tennis players' psychological fitness this indicator was 80.6%; in structure of physical and technical-tactic fitness it was – 79.5%.

Procedure of factorial analysis permitted to form system of factorial loads and determine five factors of psychological fitness, own values of which exceeded one (see fig.1).

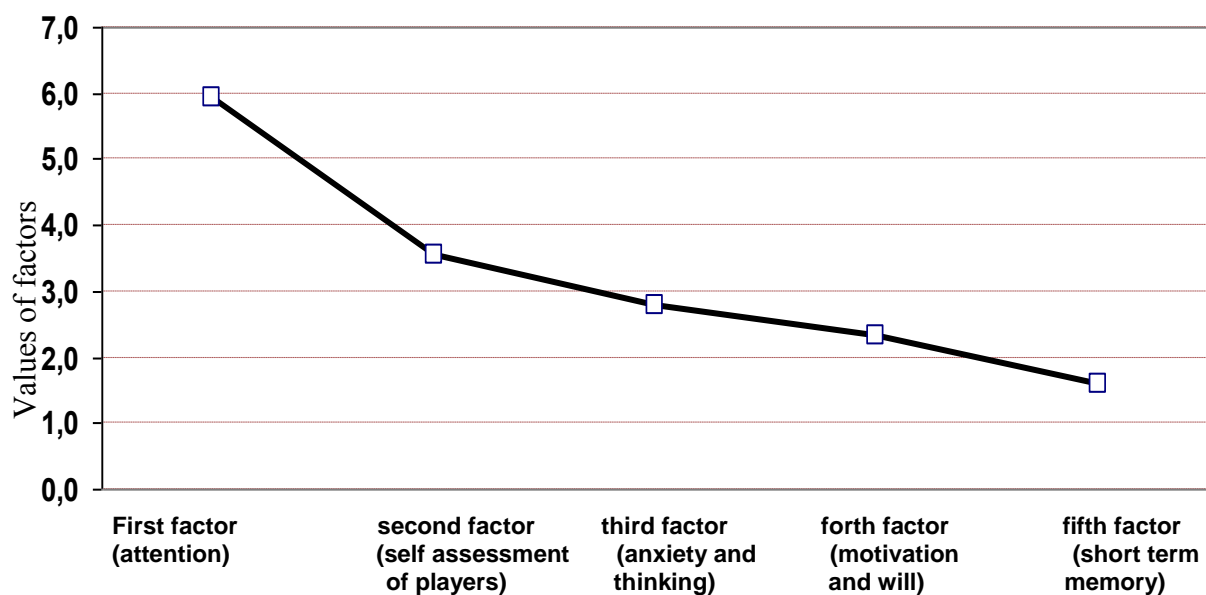


*Fig.1 Factorial structure of psychological fitness of 14-15 years' old tennis players:*

General factor (contribution of which in general dispersion is 29.6%) includes indicators, which characterized level of sportsmen's attention (accuracy of work,  $r = 0.960$ , coefficient of mental workability,  $r = 0.961$ , effectiveness of work,  $r = 0.749$ ). The second factor consisted of indicators, which reflected level of sportsmen's self assessment (contribution in general dispersion was 17.7%).

The third factor (13.9%) combined indicators of situational and personal anxiety ( $r = 0.875$  and  $r = 0.873$  accordingly). In the fourth factor (11.6%) load higher than threshold had variables, which reflected motivational-will sphere of tennis players (motivation for avoiding failures  $r = -0.717$ , bent to risk  $r = 0.948$ ). The fifth factor characterized short term memory of tennis players ( $r = 0.755$ ).

In fig. 2 we present factors of tennis players' psychological fitness in comparison with threshold value, which equals to one. For example, value of general factor (attention) was – 5.96, factor “self assessment” – 3.54, factor “anxiety and thinking” – 2.79. The fourth factor “motivation-will” was – 2.32. and the fifth factor “short-term memory” – 1.57.



*Fig.2 Values of factors in structure of tennis players' psychological fitness at stage of specialized basic training*

At the same time conducted by us correlation analysis did not show statistically significant inter-factorial interconnections in structure of psychological fitness (see table 1). The highest level was observed between first (attention) and third (anxiety and thinking)  $r=0.336$ , between forth (motivation and will) and fifth (short term memory) factors  $r=0.437$ . However, these interconnections were not confident.

Table 1

*Internal correlation connections of factors of tennis players' psychological fitness at stage of specialized basic training*

Factor	1	2	3	4	5
1	1.000				
2	0.198	1.000			
3	0.336	0.244	1.000		
4	0.195	0.351	0.032	1.000	
5	0.032	-0.004	0.021	0.437	1.000

Analysis of factorial matrix of structure of physical and technical tactic fitness permitted to find out three factors with own values more than one (see fig. 3).

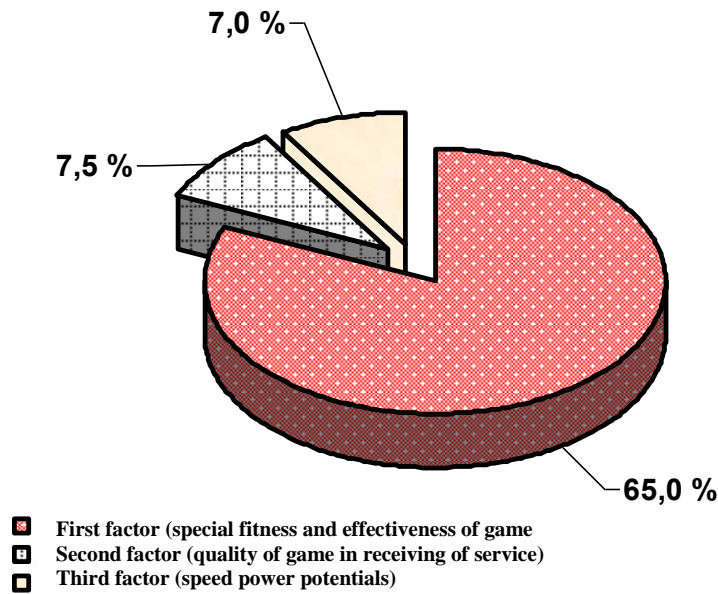


Fig. 3 Factorial structure of general physical and technical tactic fitness of 14-15 years' old tennis players:

The first and the most significant factor (65.0%) included variables, which characterized level of special technical-tactic fitness (fulfillment of shortened blows, tests “smash” and “vier”) as well as indicators of competition functioning, which reflected effectiveness of game in fulfillment of blows from rebound (coefficient of stability, coefficient of effectiveness, complex indicators of efficiency). The second factor (7.5%) combined variables, which characterized quality of game during receiving of services (coefficient of stability,  $r= 0.753$ , coefficient of effectiveness,  $r= 0.896$ , complex indicators of efficiency,  $r= 0.830$ ). Third factor included indicators of general physical fitness of sportsmen, which determined their quickness and speed-power potentials. Own values of each of the three factors of physical and technical-tactic fitness are given in fig. 4.

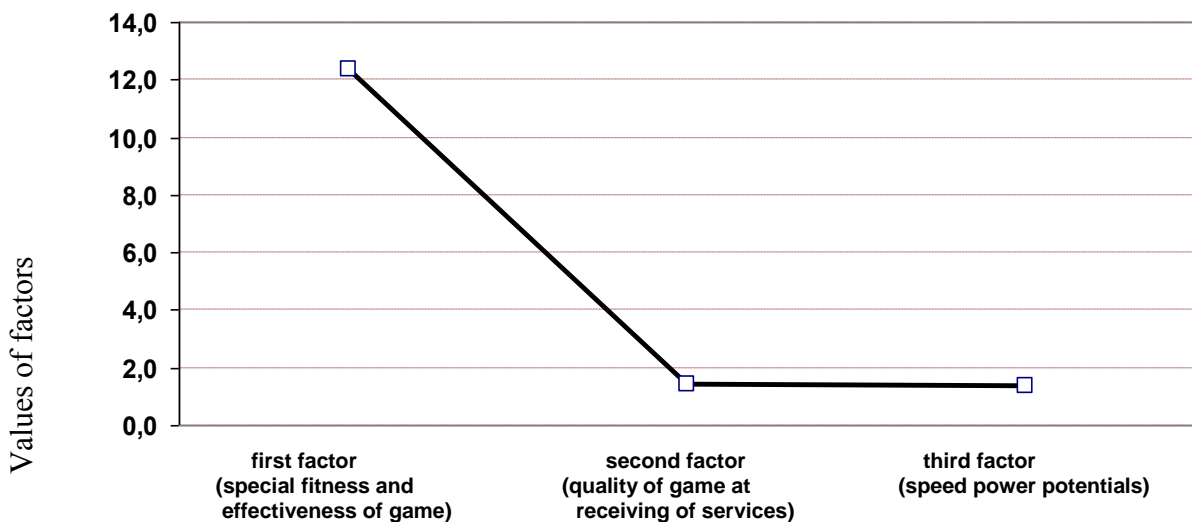


Fig.4. Values of factors in structure of general physical and technical tactic fitness of tennis players at stage of specialized basic training

For example, the most significant first (general) factor has own value – 12.35. Two other factors have approximately equal own values: “quality of game at receiving of services”- 1.44; and factor “speed power potentials” – 1.34. In contrast to psychological fitness, factors of general and special technical-tactic fitness have high (statistically significant) correlation (see table 2).

For example, correlation between first and second factors was  $r=0.704$ ; between first and third factors – 0.813; between second and third -  $r=0.606$ . It witnesses about high level of factors’ influence on each other. The received data permitted to determine leading components in structure of tennis players’ fitness as well as to know the character of their internal connections.

Table 2

*Internal correlation connections of factors of tennis players’ general physical and technical-tactic fitness at stage of specialized basic training*

Factor	1	2	3
1	1.000		
2	0.704	1.000	
3	0.813	0.606	1.000

### Discussion

The obtained results prove results of other authors (A.V. Alexeyev, 2005; S.P. Belits- Geyman, 1989; A.A. Bodalev, 1999; T.V. Diubina, 2009; T.S. Ivanova, 1999; Yuan Zhaohui; Weihai Qiong, 2011; Zhang Hailong, Lv Huimin, Cui Lei, 2011; Jagiello Marina, Jagiello Wladyslaw, 2014; Borisova O. V., 2011, 2012) about influence and importance of individual psychological characteristics of tennis players for effectiveness of training and competition functioning.

For the first time we received factorial structure of tennis players’ psychological and technical-tactic fitness at stage of specialized basic training as well as determined inter-factorial correlations. Consideration of leading components of psychological and technical-tactic fitness in practice can be an important factor of increasing of training and competition functioning’s quality.

### Conclusions:

- 1) The conducted factorial analysis permitted to determine structure of psychological and technical-tactic fitness of tennis players at stage of specialized basic training. For example analysis of psychological fitness resulted in determination of five factors; analysis of technical-tactic fitness showed three factors with own values more than one. The first (general) factor of psychological fitness characterized attention (contribution in general dispersion 29.6 %), the second – level of players’ self assessment (17.7 %), the third – level of anxiety and operative thinking (13.9%), the forth – tennis players’ motivational-will qualities (11.6%) and fifth quality of short-term memory (7.8%). The first factor of technical tactic fitness combined practically all significant variables and its contribution in general dispersion was 65 %, with own value – 12.35.
- 2) High level of inter-factorial correlations was observed only in structure of technical-tactic fitness. Correlation between first and second factor was  $r=0.704$ , between first and third – 0.813, between second and third -  $r=0.606$ , that witnesses about high level of factorial inter influence. Between five factors of psychological fitness there was not found any significant correlations. The highest correlations were observed between first (attention) and third factors (anxiety and thinking)  $r=0.336$ ; as well as between forth (motivation and will) and fifth (short-term memory) factors  $r=0.437$ , but they were not statistically confident.

*The prospects of further researches* are connected with determination of factorial structure of elite tennis players’ fitness.

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### Conflict of interests

The authors declare that there is no conflict of interests.

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