

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

Makuts T.B., Vysochina N.L.

Lvov State University of Physical Culture

National University of Physical Education and Sport of Ukraine

Abstract. *Purpose:* to determine the structure of tennis players' psychological and technical-tactic fitness with principle component method. *Material:* 24 tennis players of 14-15 years' age participated in the researches. For determination of personal psychological features of junior tennis players we used the following methodic: by Dembo-Rubinstein (testing of self-assessment), by Burdon-Anfimov (attention), by G. Ayzenk (type of temper), by T. Elers (motivation, Spilberg – Khanin (level of anxiety). *Results:* we have determined the structure of tennis players' psychological and technical tactic fitness at stage of specialized basic training. For psychological fitness we found five factors, for technical-tactic – three factors. High level of inter-factorial connections was observed only in structure of technical-tactic fitness. We did not detect significant connections between five factors of psychological fitness. *Conclusions:* the determined features of factorial structure of tennis players' fitness can be used for planning of psychological training programs and learning-training process of junior players.

Key words: competitions, psychology, technique, tactic, physical, factorial, load.

Introduction

Achievement of high sport results is impossible without consideration of individual-typological peculiarities of sportsmen's supreme nervous system, which compose psychological and psycho-physiological basis of behavioral and cognitive processes and their vegetative provisioning [1-5, 6, 9, 19]. Psychological peculiarities of tennis players' functioning are determined by objective peculiarities of struggle on court and are characterized by quickness and suddenness of game situations, severe limit of time for their perceiving, taking decisions in conditions of multiple choice and responsibility for effective fulfillment of game technique [2, 4-6, 10-14, 20]. Competition functioning in tennis takes place in extreme conditions and in non-stationary environment, which is formed by own actions of sportsman and by actions of his (her) opponent. In comparison with other kinds of sports tennis is characterized by high emotional and intellectual tension. It sets high requirements to physical and psychic qualities of sportsmen [1, 15-18]. Recent time, specialists in different kinds of sports have widely been using method of factorial analysis, which permits to detect complex of dominating components. It conditions sport result, determines character of interconnections between indicators. Besides, it permits to see contribution of different factors in general result [7, 8, 11, 12].

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

Purpose, tasks of the work, material and methods

The purpose of the work is to determine the structure of 14-15 years' old tennis players' psychological and technical-tactic fitness with principle component method.

The tasks of the research were: determination of leading factors in structure of junior tennis players' psychological and technical tactic fitness as well as detection of inter-factorial connections of the researched components of sportsmen's fitness.

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

Results of the research

For determination of the most important factors of junior sportsmen's psychological and technical-tactic fitness we used principle component method. The advantage of this method was possibility to use only the most informative, principle components and exclude other ones from analysis; it permitted to significantly simplify interpretation of the obtained data.

According to algorithm of principle component method confidence of results of research is achieved only if percentage of sample of interconnected elements is not less than 60% from total dispersion. In our analysis of tennis players' psychological fitness factorial structure this value was 80.6%: for structure of technical-tactic fitness it was 79.5%.

The 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).

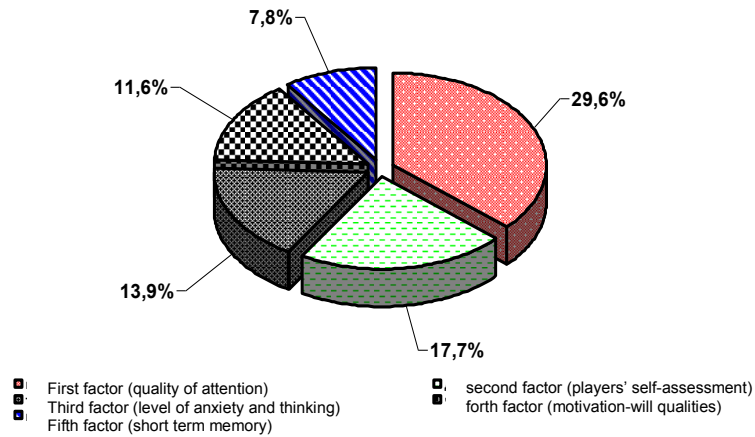


Fig.1. Factorial structure of 14-15 years' age tennis players' psychological fitness:

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

Third factor (13.9%) combined indicators of situational and personal anxiety ($r = 0.875$ and $r = 0.873$ accordingly). In forth factor (11.6%) there are loads, higher than threshold ones, which had variables, reflecting tennis players' motivation-will sphere (motivation for avoiding failures $r = -0.717$, bent to risk $r = 0.948$). The fifth factor characterized quality of tennis players' short-term memory ($r = 0.755$).

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

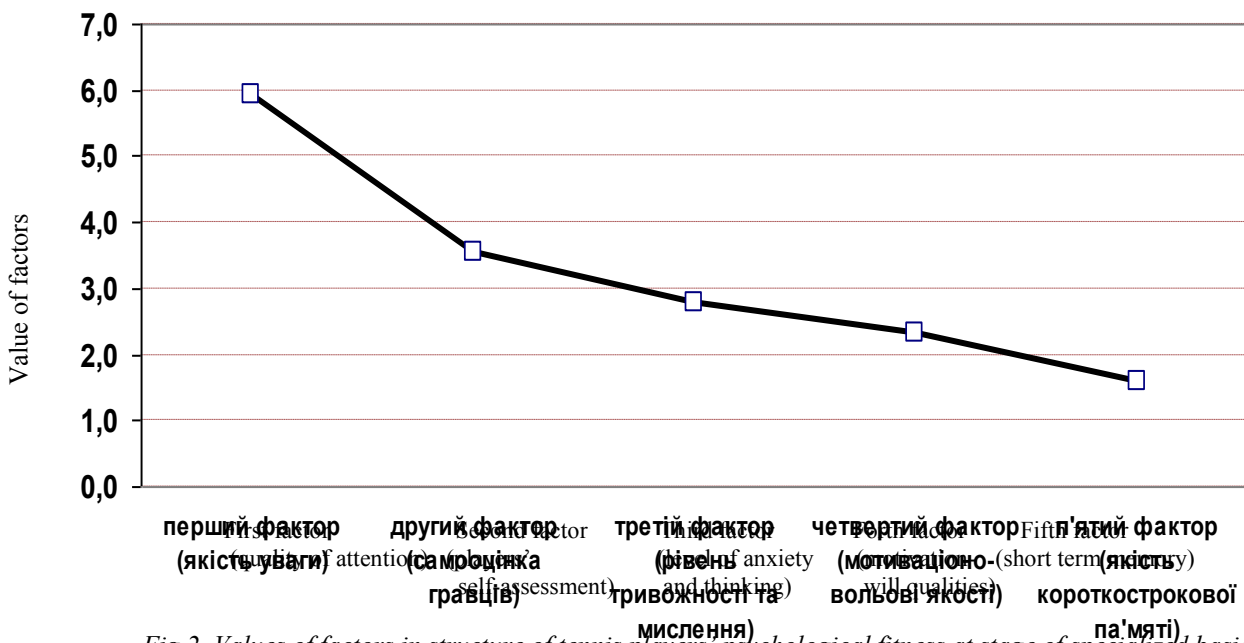


Fig.2. Values of factors in structure of tennis players' psychological fitness at stage of specialized basic training

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

Table 1

Inter-correlation connections of tennis players' psychological fitness factors 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 physical matrix of physical and technical-tactic fitness permitted to find out three factors, own values of which exceeded “one” (see fig. 3).

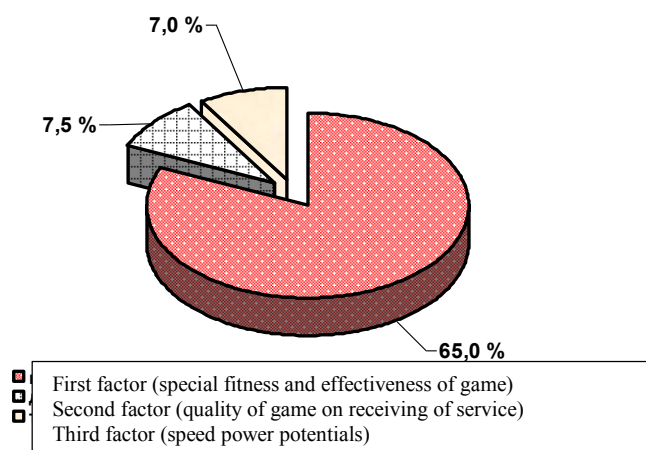


Fig.3. Factorial structure of general physical and technical-tactic fitness of 14-15 years' age tennis players:

The first and the most significant factor (65.0%) included variables, which characterized special technical-tactic fitness (fulfillment of shortened blows, tests “smash” and “weir”) as well as indicators of competition functioning, which reflected quality of games at the moments of rebound (coefficient of stability, coefficient of effectiveness, complex indicator of efficiency) Second factor (7.5%) combined variables, which characterized quality of game at receiving of service (coefficient of stability, $r = 0.753$, coefficient of effectiveness, $r = 0.896$, complex indicator of efficiency, $r = 0.830$). Third factor included indicators of general physical fitness, which showed speed-power and quickness potentials. Own values of each of three detected factors of physical and technical-tactic fitness are shown in fig. 4.

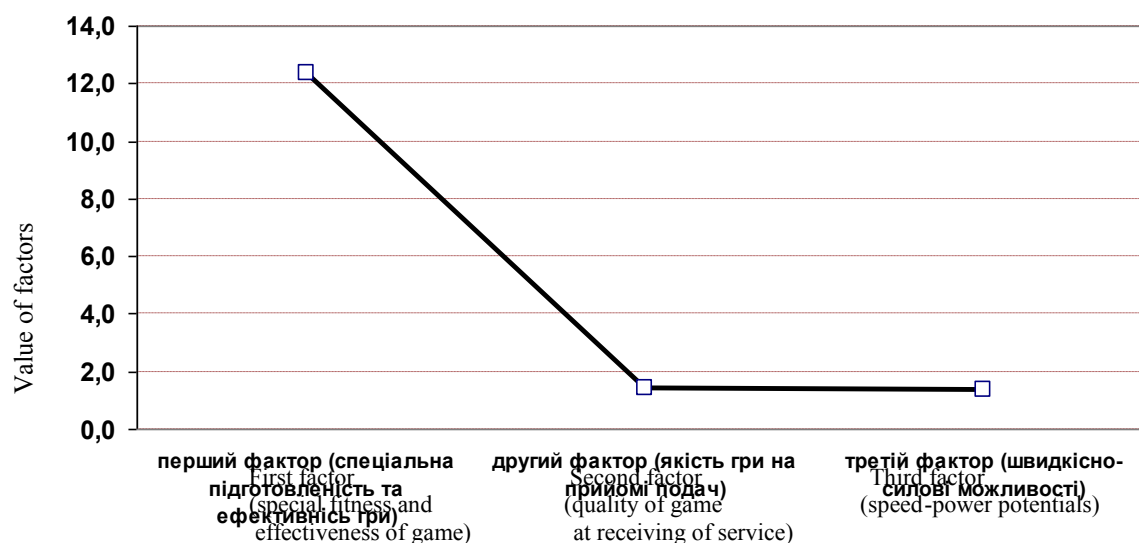


Fig.4. Values of factors in structure of tennis players' physical and technical-tactic fitness at stage of specialized basic training

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

For example, correlation between first and second factors was $r = 0,704$; between first and third – 0.813; between second and third - $r = 0.606$. It witnesses about great influence of factors each on other. The received data permitted to find out leading components in structure of tennis players’ fitness and to determine the character of their internal correlations.

Table 2

Inter-correlation connections of tennis players’ physical and technical-tactic factors 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 received results confirm data of other authors (A.V. Alexeyev, 2005; S.P. Belits-Geyman, 1989; A.A. Bodalev, 1999; T.V. Diubina; T.S. Ivanova, 1999; Yuan Zhaohui; Weihai Qiong, 2011; Zhang Hailong, Lv Huimin, Cui Lei, 2011) about influence of tennis players’ individual psychological characteristics on effectiveness of training and competition functioning and their significance in it.

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

Conclusions:

- 1) The fulfilled factorial analysis permitted to determine the structure of tennis players’ psychological and technical-tactic fitness at stage of specialized basic training. For example, as a result of analysis of psychological fitness we found out five factors; in case of technical-tactic fitness – three factors, own values of which were more than “one”. First (general) factor of psychological fitness characterized tennis players’ attention (contribution in general dispersion 29.6 %), second – level of players’ self-assessment (17.7 %), third – anxiety and operative thinking *трепін* (13.9 %), forth – tennis players’ motivation-will qualities (11.6 %) and fifth – quality of short-term memory (7.8 %). 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. Connection between first and second factor was $r = 0.704$, between first and third – 0.813, and between second and third - $r = 0.606$, that witnesses about high influence of one factor on another. Between five factors of psychological fitness significant correlations were not detected. The highest correlations were observed between first (quality of attention) and third factors (anxiety and operative thinking) $r = 0.336$, as well as between forth (motivation-will qualities) and fifth (short-term memory) factors $r = 0.437$, though they were not statistically confident.

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

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Conflict of interests

The authors declare that there is no conflict of interests.

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Information about the authors:

Makuts T.B.; <http://orcid.org/0000-0002-2329-7527>;
tmakuts@mail.ru; Lvov State University of Physical Culture;
Kostyushko str. 11, Lvov, 79007, Ukraine.

Vysochina N.L.; <http://orcid.org/0000-0001-6098-9699>;
nasp2@yandex.ua; National University of Physical Education
and Sport of Ukraine; Fizkultury str. 1, Kiev, 03680, Ukraine.

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