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Original Article

Operationalization of physical work ability of young athletes in terms of psychological well-being

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Abstract
Purpose of the empirical research is to operationalize physical work ability of young athletes in the dimensions of psychological well-being. The research participants comprise Group 1 – male and female athletes in team sports (n=46; 52.87%): football and handball, and Group 2 – male and female athletes in individual sports (n=41; 47.13%): rhythmic gymnastics and boxing. **Methods:** the questionnaire "The Scales of psychological well-being" ("SPW") (Ryff, 1989; adapted by N. Lepeshinsky, 2007); Ruffier's Index (RI) was determined by the author's trial – J. Ruffier (1951), adapted by S. Vozniy and I. Malyarenko (2020); the questionnaire "Motivation for achieving success" ("MAS") T. Elers (2002). **Results.** It was established that junior athletes in team sports (Group 1) have a statistically significant advantage by two dimensions: positive relations (PR) (U=566.00; p=.001) and environment management (EM) (U=598.00; p=.003). A statistically significant advantage of junior athletes in individual sports was registered by four parameters (Group 2): self-acceptance (SA) (U=378.00; p=.000), personal growth (PG) (U=393.00; p=.000), Ruffier's Index (RI) (U=612.00; p=.005) and motivation for achieving success (MAS) (U=562.00; p=.001). We identified four statistically significant correlations by ($p \leq .01$) Ruffier's Index in Group 1 with the following parameters: motivation for achieving success, psychological well-being, purpose in life, positive relations; three statistically significant correlations ($p \leq .05$; $p \leq .01$) in Group 2: motivation for achieving success, positive relations and autonomous position. It was found that the respondents with a high level of physical work ability (Group I) have an advantage by the parameters PWB (U=651.500; p=.021) and MAS (U=46.500; p=.000). **Conclusions.** The research focuses on permanent orientation of the representatives of individual sports (Group 2) towards internalized personal development that makes them strongly dissatisfied with their personal achievements and high indexes of physical work ability do not result in psychological well-being (rs=.182; p>.05). The study highlights that a high level of physical work ability of young athletes (Group I) is accompanied by high indexes of motivation for achieving success and psychological well-being. It was generalized that operationalization of physical work ability in the dimensions of psychological well-being allowed discovering a number of important scientific facts which should be introduced into educational and training process of juniors.
Key words: health-maintaining technologies, mental health, competitiveness, self-actualization, adolescence, self-acceptance, Ruffier's Index.

Introduction

Operationalization of two important dimensions of juniors' sporting activities is highly topical. The phenomena of "physical work ability" and "psychological well-being" in adolescence are considered differently and undergo complex value-related transformations (Halian, 2022). Obtaining material and spiritual benefits is not always associated with physical efforts for young athletes (Hulias & Hoian, 2022). Sometimes ideal conditions for training, up-to-date sports equipment, innovative educational-training and rehabilitation programs do not have a desirable effect. It can be caused by a lack of developed motivation for achieving success and psychology of a winner. It is worth mentioning that sometimes young people are characterized by a low energy level that, in turn, is a reflection of a low level of physical work ability of the latter. Rapid socio-economic transformations and shocks make people instantly set priorities and create competitive technologies in youth sports (Popovych et al., 2021c; Hudimova et al., 2021). Work ability of adolescents is a mental and physical resource used for growth and development a professional athlete, educational qualification, self-realization and self-actualization of an individual in everyday life. In addition to sporting activities, young people take a great number of responsibilities in public life. All these are through physical work ability. Therefore, the issue of

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operationalizing physical work ability of young athletes in the dimensions of psychological well-being is topical and the solution to this problem can affect a number of tactical operations of education and training process for adolescents.

There are studies substantiating that systematic sporting activities have a positive effect on physical and intellectual development of students, encourage them to follow a daily regimen and hygiene requirements (Horodynska & Stepaniuk, 2012). It was also established that regular sporting activities have a positive effect on hormonal state of the human body. Systemic physical loads slow down production of stress hormones. It leads to less depressive states and, consequently, makes an individual calmer and happier (Gümüşdağ et al., 2022). Such conclusions can be an evidence of a probable significant statistical correlation of physical activity with psychological well-being. The assumption of researchers H. Huang and B. Humphreys (2012) that physical culture and systemic sporting activities are able to have positive effects on mental health is considered to be interesting in the context of our research. It, in turn, reduces depressiveness of participants who go in for sports and can affect their psychological well-being. P. Dolan et al. (2008) state that there is a statistically significant correlation of sporting activities and the indexes of a higher level of psychological well-being. At the same time, they do not reveal psychological content parameters and peculiarities of such interdependence. Undoubtedly, motivation of participants plays a key role in systemic sporting activities and psychological well-being. The empirical research by T. Öktem and Y. Çingöz (2023) discovers presence of a correlation between motivation for sporting activities and psychological well-being. The researchers draw a conclusion that aspiration for psychological well-being can motivate for sporting activities.

Analysis of scientific literature on the issues of psychological well-being allowed identifying a health-maintaining function as one of the key functions (Karpenko & Klympush, 2023; Ryan & Deci, 2001). Mental health of adolescents was examined in the dimensions of the parameters of psychological well-being (Popovych et al., 2022e). It was empirically found and substantiated that systematic sporting activities, in particular, trainings and competitions in football (boys) and volleyball (girls) lead to positive changes in psychological content parameters of health. Competitiveness, being an ability to actively compete for a place in the core team and an important factor in self-actualization, acquires special significance for young athletes (Popovych et al., 2022c; 2022g). The research subject should not only consider a great number of relevant parameters, but also reflect a dynamic component of the formation of a young athlete's personality. Self-regulation readiness combining the stages of planning, organizing, motivating, coordinating and controlling one's own actions determines operational ability to perform expected activity (Boryshevsky, 2010; Popovych et al., 2022f).

Operationalization of physical ability of young athletes in the dimensions of psychological well-being involves establishing statistically significant differences, correlations, advantages and explaining them in the context of methodological support and organization of education, training and competition preparation of young athletes. The obtained operational elements can create a competitive advantage over competitors.

Hypothesis: 1) the examined parameters of physical work ability, psychological well-being and motivation for achieving success will not have statistically significant differences between the samples of juniors of individual and team sports; 2) physical work ability by Ruffier's Index (RI) will have statistically significant correlations with the examined parameters of psychological well-being and motivation for achieving success; 3) there will be statistically significant differences between the sample of respondents with high indexes of physical work ability and the sample with low indexes by the examined parameters.

Purpose of the empirical research is to operationalize physical work ability of young athletes in the dimensions of psychological well-being.

Material and methods

We developed a program of the summative research with elements of comparison. According to the research program, an additional variable was introduced – motivation for achieving success. This initiative is substantiated by the fact that sporting activities are obviously result-oriented, therefore it is necessary to trace correlations of the dependent and independent variables in the dimensions of the resultant component – motivation for achieving success. The research program was developed taking into consideration scientific achievements of modern empirical research: 1) determinants of adaptive potential of an individual (Blynova et al., 2022a; 2022b; Fomych, 2023; Kalenchuk et al., 2023; Nosov et al., 2021a; Zhuravlova et al., 2023); 2) anticipative content of sporting activities (Plokhikh, 2023; Prokhorenko et al., 2023); 3) psycho-physiological and tactical-technical component of juniors' sporting activities (Cretu et al., 2021; Kozina et al., 2019; Strykalenko et al., 2019; 2021); 4) using coping strategies in extreme life (Khraban & Silko, 2022) and professional situations (Mamenko et al., 2022; Nosov et al., 2020; 2021b; Popovych et al., 2022a; Zinchenko et al., 2022a; 2022b); 5) modern studies using comparison strategies (Kobets et al., 2021a; 2021b; Zinchenko et al., 2021).

Participants. The research participants were male and female athletes in team sports (n=46; 52.87%), who played professional football and volleyball. They comprised Group 1. The research also involved male and female athletes in individual sports (n=41; 47.13%) who did professional rhythmic gymnastics, weight-lifting and boxing. They comprised Group 2. On the whole, the research included n=87 junior athletes, females (n=49;

56.32%) and males (n=38; 43.68%). The respondents were participants of the leading National and International sports competitions. The research participants were 14 – 20 years old (Me=18.00).

Organization of research. The empirical cross-section was performed from September, 2021 to January, 2022. The research organizers followed ethical requirements for experimental research, agreed with the Ethics Committee. The respondents and their trainers were informed about the survey in advance and the athletes took part in the research voluntarily. Confidentiality of the participants' empirical data was maintained.

Procedures and instruments. The questionnaire "The Scales of psychological well-being" ("SPW") (Ryff, 1989) is the key psycho-diagnostic instrument. The version of the questionnaire adapted by N. Lepeshinsky (2007) was applied. We used the integral scale – "psychological well-being" (PWB) and six main scales: "positive relations" (PR), "autonomous position" (AP), "environment management" (EM), "self-acceptance" (SA), "personal growth" (PG), "purpose in life" (PL). Additional scales of the method were not used. "SPW" (Ryff, 1989) combined eighty-four statements. Homogeneity was identified by α-Cronbach, it was registered at a medium level .856. Ruffier's Index (RI) was determined by the author's trial – J. Ruffier (1951). The research applied the adapted version by S. Vozniy and I. Malyarenko (2020). The scale "motivation for achieving success" of the method "MAS" T. Elers (2002) having the same name was used to establish the research parameter. Since one scale was used, a high level (.923) was registered by α-Cronbach.

Statistical analysis. Using the program of the summative research with elements of comparison meant applying the statistical program "SPSS" version 23. In order to create a correlation pleiade, the graphical editor MS "Word" was used. We established descriptive statistics and coefficients of statistical significance: α-Cronbach, Mann-Whitney U-test, Spearman's (rs) and ranking (R). The levels $p \leq .05$, $p \leq .01$ were considered to be relevant.

Results

Descriptive frequency characteristics of the examined parameters of the three psycho-diagnostic instruments were found: "SPW" (Ryff, 1989; by adapted N. Lepeshinsky (2007); Ruffier's Index (Ruffier, 1951; by adapted S. Vozniy and I. Malyarenko, 2020) and "MAS" (Elers, 2002). In order to perform qualitative analysis of the sample, the following descriptive frequency characteristics were given: M (mean); Me (median); Mo (mode); SD (squared deviation); SD2 (dispersion); min (minimum value) and max (maximum value). The selection was represented by two independent samples: Group 1 – junior athletes in team sports (n=46; 52.87%) and Group 2 – junior athletes in individual sports (n=41; 47.13%). The non-parametric Mann-Whitney U-test was used to identify differences in the examined parameters. Tabl. 1 gives the results of comparison of the examined parameters in Group 1 and Group 2.

Table 1. Results of comparison of the examined parameters in Group 1 and Group 2

Groups	DFC	Parameters								
		PWB	**PR**	**AP**	**EM**	**SA**	**PG**	**PL**	**RI**	**MAS**
Group 1	M	362.35	63.80	60.17	65.17	58.35	61.43	62.57	3.80	21.09
	Me	*359.00*	*65.00*	*57.00*	*67.00*	*59.00*	*62.00*	*61.00*	*3.21*	*22.00*
	Mo	332.00	65.00	55.00	59.00	54.00	59.00	60.00a	3.21	17.00a
	SD	25.14	5.73	5.46	5.31	3.59	3.59	3.15	1.68	3.39
	SD^2	632.05	32.80	29.84	28.23	12.85	12.87	9.94	2.82	11.46
	min	323.00	49.00	55.00	50.00	53.00	55.00	59.00	.92	16.00
	max	402.00	74.00	75.00	69.00	66.00	69.00	69.00	7.21	27.00
Group 2	M	374.15	60.70	60.39	59.35	64.51	67.85	66.54	2.64	23.54
	Me	*378.00*	*62.00*	*58.00*	*59.00*	*65.00*	*67.00*	*64.00*	*3.11*	*23.00*
	Mo	392.00	65.00	65.00	68.00	70.00	64.00	59.00a	1.12	20.00a
	SD	34.03	4.47	5.72	7.66	7.54	7.60	7.18	1.37	2.68
	SD^2	1157.78	19.96	32.74	58.65	56.86	57.83	51.51	1.87	7.21
	min	322.00	54.00	52.00	53.00	48.00	52.00	58.00	1.01	20.00
	max	425.00	69.00	69.00	76.00	74.00	78.00	77.00	4.45	27.00
Mann-Whitney U-test	U	620.00	566.00	928.00	598.00	378.00	393.00	737.00	612.000	562.00
	p	.061	.001	.898	.003	.000	.000	.078	.005	.001

Note: Group 1 – the sample of junior athletes in team sports; Group 2 – the sample of junior athletes in individual sports; DFC – descriptive frequency characteristics; M – mean; Me – median (*given in italics*); Mo – mode; SD – squared deviation; SD2 – dispersion; min – minimum; max – maximum; U – values by Mann-Whitney U-test; p – level of significance; PWB – psychological well-being; PR – positive relations; AP – autonomous position; EM – environment management; SA – self-acceptance; PG – personal growth; PL – purpose in life; RI – Ruffier's Index; MAS – motivation for achieving success; a – a few modal values were registered, the least is shown.

Statistically significant differences were registered in the given results by the following parameters: PR (U=566.00; p=.001); EM (U=598.00; p=.003); SA (U=378.00; p=.000); PG (U=393.00; p=.000); RI (U=612.00; p=.005) and MAS (U=562.00; p=.001). The junior athletes in team sports have a statistically significant advantage by two dimensions: positive relations (PR) and environment management (EM). The junior athletes in individual sports have a statistically significant advantage by four parameters: self-acceptance (SA), personal growth (PG), Ruffier's Index (RI) and motivation for achieving success (MAS). The obtained results allow stating that the first hypothesis was disproven.

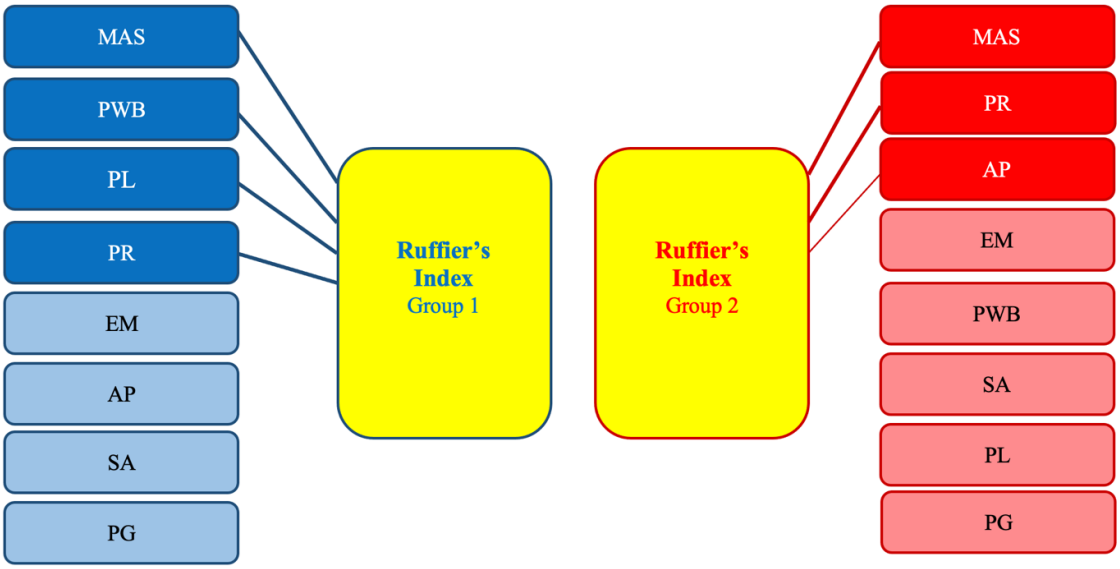
In order to operationalize the research parameters, we established correlations of Ruffier's Index (RI) by the non-parametric Spearman's correlation coefficient (r_s) with all the dimensions. According to the program of the summative research, the results of correlation are given by the research samples – Group 1 and Group 2 and the obtained statistical correlations are ranked (Tabl. 2).

Table 2. Matrix of correlation of Ruffier's Index (RI) with the examined parameters

Parameters	Ruffier's Index (RI)			
	Group 1		Group 2	
	r_s	R	r_s	R
PWB	.568**	2	.182	-
PR	.401**	4	-.551**	2
AP	-.052	-	-.315*	3
EM	-.124	-	.225	-
SA	.051	-	.171	-
PG	.026	-	.116	-
PL	.528**	3	-.168	-
MAS	.969**	1	.894**	1

Note: Group 1 – the sample of junior athletes in team sports; Group 2 – the sample of junior athletes in individual sports; r_s – Spearman's correlation; R – ranking (figures indicate ranks of statistically significant correlations); * – p<.05; ** – p<.01; PWB – psychological well-being; PR – positive relations; AP – autonomous position; EM – environment management; SA – self-acceptance; PG – personal growth; PL – purpose in life; MAS – motivation for achieving success.

The correlation pleiade (Fig. I) visualizes the parameters placed by the ranks of descending correlation with Ruffier's Index (RI), established by Spierman (r_s) correlation.



Note: ——— positive correlations with p≤.05; ——— positive correlations with p≤.01; Group 1 – the sample of junior athletes in team sports; Group 2 – the sample of junior athletes in individual sports; PWB – psychological well-being; PR – positive relations; AP – autonomous position; EM – environment management; SA – self-acceptance; PG – personal growth; PL – purpose in life; MAS – motivation for achieving success.

Figure I. Correlation pleiade of Ruffier's Index (RI) by ranks

It was found that Group 1 has four statistically significant correlations of RI with the examined parameters: MAS (.969; p≤.01); PWB (.568; p≤.01); PL (.528; p≤.01) and PR (.401; p≤.01). Three correlations are

statistically significant in Group 2: MAS (.894; p≤.01); PR (-.551; p≤.01) and AP (-.315; p≤.05). The above correlations allow stating that the second hypothesis was confirmed.

According to our research strategy, finding differences in the sample with high and low levels of physical work ability by Ruffier's Index was of scientific value. Distribution of groups by the levels of work ability was performed by the median (Me). The median index was (Me = 3.21). The sample with a low level of work ability Group I (n1 = 51; 58.62%) included the respondents with the values of Ruffier's Index (RI>3.21). The sample with a high level of work ability Group II (n1 = 36; 41.38%) included the respondents with the values of Ruffier's Index (RI≤3.21). Statistical significance of the differences between Group I and Group II was established using Mann-Whitney U-test (Tabl. 3).

Table 3. Statistical significance of differences between Group I and Group II

Mann-Whitney U-test	Parameters							
	PWB	**PR**	**AP**	**EM**	**SA**	**PG**	**PL**	**MAS**
U	651.500	859.500	834.500	834.500	765.500	794.500	903.500	46.500
p	.021	.611	.469	.470	.187	.286	.900	.000

Note: U – test Mann-Whitney; p – level of significance; PWB – psychological well-being; PR – positive relations; AP – autonomous position; EM – environment management; SA – self-acceptance; PG – personal growth; PL – purpose in life; MAS – motivation for achieving success.

We found statistically significant differences between Group I and Group II: PWB (U=651.500; p=.021) and MAS (U=46.500; p=.000), which show an advantage of the juniors with a high level of physical work ability. The third hypothesis is proven. The obtained results allow stating that the suggested summative research strategy with an additional variable introduced to operationalize the examined dimensions showed its efficiency. The selected psycho-diagnostic instruments are sensitive to the research subject that allowed registering statistically significant differences which are of scientific value.

Discussion

The problem of psychological well-being and physical work ability is one of the key issues in methodological support and organization of education, training and competition preparation of young athletes. The search of balance between systemic exhausting trainings and satisfaction with one's sports achievements plays one of the main roles in self-regulation and self-realization of an individual (Boryshevsky, 2010). The ability to anticipate a victory result (Alekseev, 2006) and reach the highest level of a dominating mental state and physical readiness, as shown in research (Popovych et al., 2019; 2021b), is not characteristic of each representative of junior sports. The complexity of the examined problem also consists in the fact that systemic trainings with medium loads are sufficient for some juniors to feel happy, others can work very hard and be strongly dissatisfied with themselves and their achievements. At the same time, psycho-emotional state affects sports achievements and forms psychology of a winner. It should also be taken into account that exhausting trainings in professional sport not always contribute to health improvement of athletes (Popovych et al., 2022d). The problem of health-maintaining technologies in professional sport, in particular, after the end of a sporting career, is one of the most topical issues.

Comparison of the examined parameters in the representatives of team sports (Group 1) and individual sports (Group 2) revealed a number of statistically significant correlations (see Tabl. 1). In particular, the advantage of the representatives of team sports by the parameters of positive relations (PR) (U=566.00; p=.001) and environment management (EM) (U=598.00; p=.003) can be explained by the fact that tactical trainings in team work are based on the ability to overlap zones during defense, support each other in selection, interact in attacks and defenses and use sporting "arrhythmia". The ability to feel each other in a team game, work as a single "powerful mechanism" (Cheban et al., 2020), with a high level of tactical thinking (Popovych et al., 2021d; 2021f), contributes to the formation of sport skills which are implemented in everyday life and affect a positive interaction and environment management. Undoubtedly, tactical training for athletes in individual sports in these components considerably lags behind. At the same time, representatives of individual sports have an advantage by four parameters: self-acceptance (SA) (U=378.00; p=.000), personal growth (PG) (U=393.00; p=.000), Ruffier's Index (RI) (U=612.00; p=.005) and motivation for achieving success (MAS) (U=562.00; p=.001). High indexes of personal development of young people, as research shows (Popovych et al., 2021a; 2021e), combined with adolescent idealism, instill in them the ability develop continuously. Such juniors have a high level of self-acceptance, readiness for self-realization and are open for new experiences. In our opinion, permanent aspiration for self-improvement accounts for an advantage in physical work ability and motivation for achieving success in the respondents of Group 2. Such permanent readiness for internalized personal development in representatives of individual sports usually makes them dissatisfied with their current achievements (Popovych et al., 2022b; 2023), that is proven by a lack of a statistically significant correlation with PWB (rs=.182; p>.05). In other words, higher indexes of physical work ability by Ruffier's Index (M=2.64) do not contribute to their

psychological well-being. Ranking (R) correlations of the parameters with Ruffier's Index and giving them as comparison are representative (see Fig. I). The first rank of both samples is identical– MAS, but psychological well-being, purposes in life and positive relations are those content components which comprise sport life of young representatives of team sports. The situation is different in representatives of individual sports, though positive relations are very important, but they are dissolved in an autonomous position of the latter. Obviously, individuality, focus on one's own personality is highly important. Such generalization is confirmed in another modern study about restrictions of psychological defenses of adolescents (Plokhikh, 2022). In contrast to the sample of juniors in individual sports, it is worth mentioning that in distribution of the selection to samples with high and low physical work ability (Group I and Group II), in the sample of respondents with a high level of physical work ability there was an advantage by the parameters PWB (U=651.500; p=.021) and MAS (U=46.500; p=.000). It allows stating that a high level of physical work ability of young athletes is accompanied by high indexes of motivation for achieving success and psychological well-being.

Operationalization of physical work ability of juniors in the dimensions of psychological well-being revealed a number of important scientific facts which are substantiated and confirmed by statistically significant data.

Conclusions

1. It was substantiated that operationalization of physical work ability of young athletes in the dimensions of psychological well-being is an algorithm for identifying statistically significant differences, correlations, advantages, and explaining them in the context of methodological support and organization of education, training and competition preparation of young athletes.

2. It was found that the junior athletes in team sports (Group 1) have a statistically significant advantage by two dimensions: positive relations (PR) (U=566.00; p=.001) and environment management (EM) (U=598.00; p=.003). The junior athletes in individual sports (Group 2) have a statistically significant advantage by four parameters: self-acceptance (SA) (U=378.00; p=.000), personal growth (PG) (U=393.00; p=.000), Ruffier's Index (RI) (U=612.00; p=.005) and motivation for achieving success (MAS) (U=562.00; p=.001).

3. We registered four statistically significant correlations ($p \leq .01$) of Ruffier's Index in Group 1 with the following parameters: motivation for achieving success, psychological well-being, purpose in life, positive relations; three statistically significant correlations ($p \leq .05$; $p \leq .01$) in Group 2: motivation for achieving success, positive relations and autonomous position.

4. It was established that in the sample with high (Group I) and low physical work ability (Group II) there are statistically significant differences. The respondents with a high level of physical work ability have an advantage by the parameters PWB (U=651.500; p=.021) and MAS (U=46.500; p=.000).

5. We focused on permanent readiness of the representatives of individual sports (Group 2) for internalized personal development, that usually makes them dissatisfied with their achievements and high indexes of physical work ability do not result in psychological well-being (rs=.182; p>.05). It was emphasized that a high level of physical work ability of young athletes (Group I) is accompanied by high indexes of motivation for achieving success and psychological well-being.

6. Implementation of the obtained operational elements in sporting activities can create a competitive mental and physical advantage of juniors over their rivals.

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