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CORRELATION OF THE INDIVIDUAL`S PSYCHOPHYSIOLOGICAL CHARACTERISTICS AND THE SUCCESS OF PROFESSIONAL CURLERS

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Correlation of the individual`s psychophysiological characteristics and the success of professional curlers

Abstract. The article examines the relationship between the individual psychophysiological characteristics of girls involved in professional curling and the success of their performances. As part of the study, a tapping test was conducted to determine the strength of the nervous system, and a personality questionnaire by G. Eysenck, which allows assessing the type of temperament and the level of neuroticism. The results showed that the success of curling girls' performances correlates with their psychophysiological characteristics, such as the strength of the nervous system and emotional stability. It was found that players with a strong nervous system and low levels of neuroticism show more stable results in their playing positions. The data obtained emphasize the importance of taking into account individual psychophysiological characteristics when forming teams and distributing roles in women's curling. The results of the study can be used to optimize the training process and improve the performance of professional curling athletes.

Key words: psychophysiology, curling, professional athletes, team performance, temperament, neuroticism.

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Кәсіби керлингшілердің жеке психофизиологиялық ерекшеліктері мен жетістіктерінің өзара байланысы

Аңдатпа. Мақалада кәсіби керлингпен айналысатын қыздардың жеке психофизиологиялық ерекшеліктерінің олардың қойылымдарының сәттілігімен байланысы зерттеледі. Зерттеу барысында жүйке жүйесінің күшін анықтауға бағытталған теппинг-тест және темперамент түрі мен нейротизм деңгейін бағалауға мүмкіндік беретін Г. Эйзенктің жеке сауалнамасы жүргізілді. Нәтижелер керлинг қыздарының өнерінің сәттілігі олардың жүйке жүйесінің күші мен эмоционалды тұрақтылығы сияқты психофизиологиялық сипаттамаларымен байланысты екенін көрсетті. Күшті жүйке жүйесі бар және нейротизм деңгейі төмен ойыншылар өздерінің ойын позицияларында тұрақты нәтижелер көрсететіні анықталды. Нәтижелер командаларды қалыптастыру және әйелдер керлингіндегі рөлдерді бөлу кезінде жеке психофизиологиялық ерекшеліктерді ескерудің маңыздылығын көрсетеді. Зерттеу нәтижелерін жаттығу процесін оңтайландыру және кәсіби керлинг спортшыларының өнімділігін арттыру үшін пайдалануға болады.

Түйін сөздер: психофизиология, керлинг, кәсіби спортшылар, командалық өнімділік, темперамент, нейротизм.

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Взаимосвязь индивидуальных психофизиологических особенностей и успеха выступлений профессиональных кёрлингистов

Аннотация. В статье исследуется взаимосвязь индивидуальных психофизиологических особенностей девушек, занимающихся профессиональным керлингом, с успешностью их выступлений. В рамках исследования были проведены теппинг-тест, направленный на определение силы нервной системы, и личностный опросник Г. Айзенка, позволяющий оценить тип темперамента и уровень нейротизма. Результаты показали, что успешность выступлений девушек-керлингисток коррелирует с их психофизиологическими характеристиками, такими как сила нервной системы и эмоциональная устойчивость. Было выявлено, что игроки с сильной нервной системой и низким уровнем нейротизма демонстрируют более стабильные результаты в своих игровых позициях. Полученные данные подчеркивают важность учета индивидуальных психофизиологических особенностей при формировании команд и распределении ролей в женском керлинге. Результаты исследования могут быть использованы для оптимизации тренировочного процесса и повышения эффективности выступлений профессиональных спортсменок-кёрлингисток.

Ключевые слова: психофизиология, кёрлинг, профессиональные спортсмены, командная результативность, темперамент, нейротизм.

Introduction. In modern conditions of improving athletic performance in curling, there is a need to create a training system that takes into account the interaction of all components: physical, tactical, technical, theoretical and psychological training. In professional sports, alongside physical preparation, the level of psychological readiness plays an equally important role. In competitive curling, the leading factor is the ability of the central nervous system to regulate states of excitation and inhibition. This process determines the characteristics of personal behavior in non-standard situations during competitive activities [1-11].

In modern elite sports, being a highly trained athlete is not enough, possessing certain traits and types of higher nervous activity is equally important. It is also known that sports cannot significantly influence innate properties of the nervous system, including typological features of higher nervous activity. Specifically, it has been established that the strength of the nervous system, particularly in terms of excitation processes, plays a crucial role in sports. This characteristic determines personal behavior in non-standard, acute situations [1, p. 17; 12].

Curling is a sport played on ice where two teams alternately deliver sporting gear (curling stones) toward a target area ("house"). A team earns one point for each of its stones in or touching the house that is closer to the center than any of the opponent's stones. Each team consists of four players, and each player delivers two stones at each end, alternating with the opponent [13, p. 8].

Technological advancements are continuously evolving the game, while scientific data and field experience play a crucial role in accumulating knowledge on each variable, facilitating progress in both competition and athletic performance [14].

In curling, one of the key factors influencing performance is the combination of players based on various psychophysiological parameters. This importance arises from the fact that the team comprises five members, but only four interact during the game. Therefore, to achieve the best results, players must complement each other in terms of the typological features of their nervous systems.

An analysis of the scientific and methodological literature on the research topic revealed an insufficient level of research on the relationship between individual psychophysiological characteristics and the success of professional curlers, highlighting the relevance of our study.

The purpose of the research is to evaluate the characteristics of the nervous system and their impact on the performance of an elite-level women's curling team.

Research objectives:

- To analyze scientific and methodological literature and online resources on the relationship between individual psychophysiological characteristics and the performance success of professional curlers;
- To explore the fundamentals of building a training process within the curling macrocycle;
- To evaluate the characteristics of the nervous system and their impact on the performance outcomes of the elite-level women's curling team.

Materials and methods. Various methods of theoretical analysis were used in this article, including theoretical analysis, content analysis, and comparative analysis. The theoretical analysis method allowed for the identification of key themes in the research topic. The first stage involved identifying keywords, phrases, and synonyms for searching in scientific databases such as Scopus, Web of Science, and RSCI, in both English and Russian, including «psychophysiology,» «curling,» and «professional athletes.» Next, using the method of exclusion, articles with high citation levels, high journal ratings, and relevant research types were selected. In total, 45 scientific articles were reviewed, and 20 were chosen for our study. The study involved a 4–person women's curling team, the age of the athletes was 19 years old. The study was conducted on the basis of the P.F. Lesgaft National State University of Physical Culture, Sports and Health, St. Petersburg, Russia.

Two main methods were used to assess the psychophysiological characteristics of athletes: a tapping test and a personality questionnaire by G. Eysenck. The tapping test was conducted in a calm environment, during the pre-competition period, to exclude the influence of stress and fatigue on the results. Participants were asked to perform the fastest strokes on paper for 30 seconds, after which a schedule of their performance was built. This method was chosen due to its high reliability in determining the strength of the nervous system, which is a key parameter for assessing athletes' resistance to stress. G. Eysenck's personality questionnaire was used to determine the type of temperament and the level of neuroticism. The questionnaire included questions aimed at assessing extraversion, introversion, emotional stability, and a tendency to lie. Both methods were chosen due to their wide application in sports psychology and high validity.

Results. In the training of highly qualified athletes, sports training typically follows a two-cycle or three-cycle macrocycle. Each macrocycle consists of preparatory, competitive, and transitional periods, with the preparatory and competitive periods further divided into stages (Figure 1) [15].

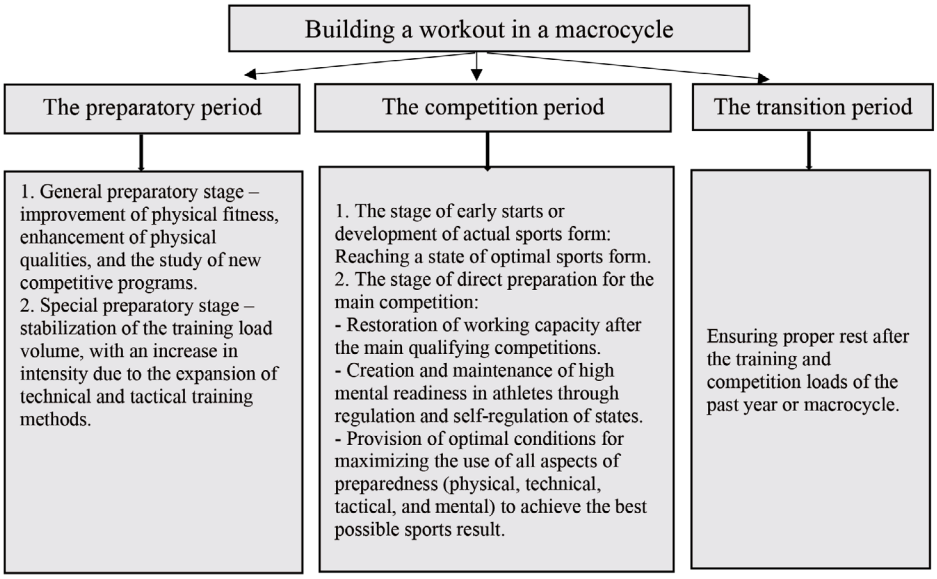

Figure 1 – Macrocycle periods (Compiled by the authors based on [15])

During the training process, the goal is to achieve between one and four peaks of athletic fitness throughout the year, with a training-to-competition load ratio of 4:1. If the total training load is 1,000 hours per year, this results in 800 training hours and 200 competitive hours. On average, the total number of tournaments is 20, with 9 of them being at the highest level of competition (2 national and 3 international), excluding the Winter Olympic Games.

At the general preparatory stage of the preparatory period in curler training, characterized by a high volume of nonspecific physical activity, the central nervous system is highly labile and active. However, the effectiveness of regulatory processes remains at an average level. The managerial function of the central nervous system is elevated, as the curlers' bodies are systematically exposed to a large volume of aerobic exercises, along with an increased proportion of strength exercises in the training process.

The special preparatory stage of the curlers' macrocycle is characterized by a significant reduction in the volume of general physical training, with an increase in the focus on special physical, technical, tactical, and psychological training. In terms of the central nervous system, there is a decrease in overall activity, a smoothing of the dominant role of one hemisphere, and, as a result, a more balanced distribution of managerial functions between the cerebral hemispheres. There is a mutual balancing of excitation and inhibition processes in the higher brain centers, optimizing the activity of the nervous system.

During the early stages of the competitive period in the curlers' macrocycle, the activity of the nervous system increases as the main qualifying stage for key competitions approaches. The role of the right hemisphere in control functions grows, which is associated with the activation of sensations that form the curlers' "sense of ice."

The direct preparation stage for the main event focuses on both preparation and participation in the competition. It is during these events that highly qualified curlers should reach their peak level of fitness, including their psychophysiological state. At this stage, there is a decrease in the overall activity of the central nervous system, with arousal being the dominant process. There is also an increase in the role of analytical processes in information processing and a more balanced functioning of the cerebral hemispheres. The current functional state of the central nervous system, its regulation accuracy, and the prognostic capabilities of the nervous system all reach their maximum levels, signifying the highest degree of readiness to solve competitive tasks.

Psychophysiological testing was conducted using the tapping test. The tests were performed during the pre-competition period under resting conditions. The subjects were in a stable psychological state, without any identified issues.

The choice of methodology was due to its widespread use in assessing the strength of nervous system processes and analyzing the performance capacity of the participants.

The tapping test results are presented in Figure 2.

The strength of the nervous system was diagnosed based on the performance graph curve analysis according to generally accepted criteria [16, p. 58].

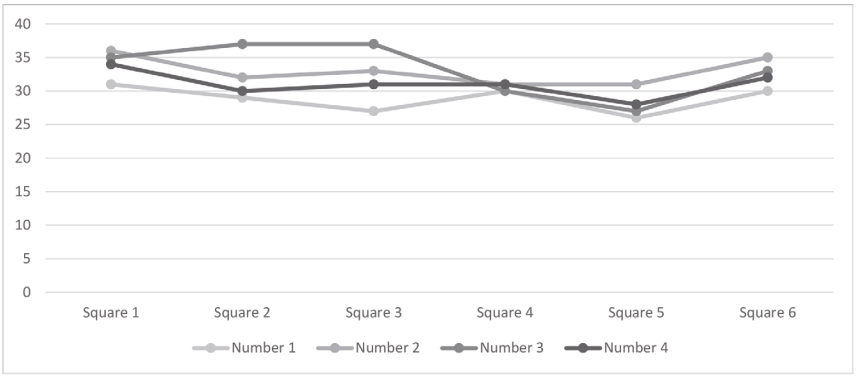

Figure 2 – Tapping test results of the main roster of an elite-level women's curling team

The test results indicate that all main roster players maintain a consistent maximum pace throughout the activity, reflecting a medium-strength nervous system type.

Subsequently, testing was conducted to identify the temperament characteristics of the athletes. The results are shown in Table 1.

Table 1 – Results of personality questionnaire by G. Eysenck

	Extraversion	Neuroticism	Lies
Lead	12	23	3
Second	11	15	3
Vice skip	12	13	3
Skip	17	14	3

The personality questionnaire by G. Eysenck data indicate that the most emotionally unstable player is the first number. Therefore, in a team that achieves high results at the Russian Championships and National Tournaments, this athlete occupies this position. During the initial throws, it is challenging to significantly influence the game's outcome, mistakes are less critical, and psychological pressure and stressful situations are almost absent. Additionally, the tapping test showed that this player has a medium-strength nervous system type. As a result, minor setbacks cannot unsettle her. The "lead" position does not involve making game-winning moves or decisions that could lose the game, making it an ideal role for a player with this nervous system type.

In the presented team, the captain is the most impulsive and initiative-driven player. She is a choleric temperament type, close to sanguine, allowing her to quickly recover from failures. Her moderate level of neuroticism and average mobility of nervous processes enable her to handle stress effectively, which presents consistently [17, p. 102]. The game's victory directly depends on her throws, requiring excellent adaptation to high-pressure situations.

The roles of the second and third players are to correct the first player's mistakes and simplify the situation for the captain. Thus, they need to be balanced enough to perform their tasks consistently without undermining the confidence of the last thrower. Both players have average scores across all parameters, making them excellent choices for these positions.

Discussion. The results obtained are consistent with data from other studies on the role of psychophysiological characteristics in sports. For example, studies by Ageevets V.U. (2018) have shown that the strength of the nervous system is a key factor influencing the success of curling performances. However, unlike previous studies, this study paid special attention to the distribution of roles in a team based on the individual characteristics of the players. This allows us to conclude that not only the psychophysiological characteristics themselves are important for success, but also their combination within the team. For example, having a player with a high level of neuroticism in the lead position can be offset by a more stable captain, which creates balance in the team [18, p. 62; 19, 20]. These data emphasize the importance of an individual approach to team formation in curling.

Conclusions. A theoretical analysis of the scientific and methodological literature and Internet sources available to us has revealed the relationship between individual psychophysiological characteristics and the success of professional curlers, which affect the effectiveness of the distribution of athletes by playing positions in the competition. It is advisable to take into account the psychophysiological features of the nervous system of female athletes as a criterion at the stage of preliminary selection for the main competitions, especially when placing players on the playing field.

The study found that significant changes in the activity of the central nervous system occur in curling girls at different stages of the preparatory period of the macrocycle. At the initial stage of preparation for a responsible start, there is a high lability of nervous processes, during the basic training load they gradually balance out. During the competition period, optimal regulation is achieved, ensuring maximum readiness of athletes.

It can be concluded that in the presented elite-level women's curling team, all athletes occupy the most suitable positions based on our analysis. This allows them to achieve high results at significant tournaments over extended periods. A well-structured team composition, with the proper combination of temperaments and nervous system types, enables the team to focus on physical and technical-tactical preparation while minimizing psychological training needs. So, taking into consideration the study exploring the relationship between the type of nervous system organization and the effectiveness of team performance is important for athletes of the highest level.

The results of the study confirm that taking into account the individual psychophysiological characteristics of athletes is an important aspect of forming a successful curling team. Coaches and sports psychologists are advised to conduct regular testing of players to determine their strengths and weaknesses, as well as to take these data into account when assigning roles to the team. Future studies may consider the influence of other psychophysiological parameters, such as anxiety levels or cognitive abilities, on the success of performances. In addition, it would be interesting to study how changes in the team's composition affect its performance in the long term.

Practical recommendations.

Based on the results of the study, we can offer the following recommendations for coaches and athletes:

- Regular psychophysiological testing to assess the current state of the players;
- Consideration of individual characteristics in the allocation of roles in the team. For example, players with higher emotional stability should occupy key positions such as "skip";
- Development of individual psychological training programs for players with high levels of neuroticism to help them cope with stress;
- Conducting team training to improve interaction between players with different temperament types.

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