

Temperament and achievement motivation among athletes in team and individual disciplines

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Purpose: This study aimed to examine differences in temperament and achievement motivation, as well as to determine the relationship between these variables among athletes in team and individual sports.

Methods: The diagnostic survey method was employed using psychological questionnaires. Achievement motivation was measured with the Achievement Motivation Inventory LMI-K, and temperament was assessed using the Temperament Questionnaire PTS. The study involved a random sample of 80 adult men and women representing Poland in national and international competitions. The first group, consisting of team sport athletes ($n=40$), had a mean age of 25.17 ± 4.12 years. The second group, comprising individual sport athletes ($n=40$), had a mean age of 25.13 ± 3.41 years. The professional experience of the surveyed athletes ranged from 8 to 16 years, with a mean of 12.13 ± 2.31 years.

Results: The results revealed statistically significant differences in temperament. Team sport athletes exhibited higher levels of excitability strength ($M Rank=48.0$; $R=-.114$; $P=.024$), inhibitory strength ($M Rank=48.0$; $R=-.108$; $P=.031$), and neural mobility ($M Rank=46.5$; $R=-.243$; $P=.004$) compared to athletes participating in individual sports. A strong positive relationship was observed between neural mobility and overall achievement motivation ($Rho=.345$, $P=.002$).

Conclusions: Studies have shown that team sport athletes exhibit more effective nervous system adaptation to dynamic competition conditions than individual sport athletes. The lack of differences in achievement motivation between the two groups suggests that the type of sport does not determine the level of ambition. A strong correlation between the mobility of nervous processes and motivation indicates its key role in athletes' effectiveness. The results may be useful in developing adaptive skills and regulating nervous processes in sports practice.

Keywords: temperament, achievement motivation, sport

Introduction

In today's world, the significance of psychological processes plays a crucial role, enabling us to better understand ourselves and others, and cope more effectively in crisis situations. Furthermore, both in personal and professional spheres, psychological mechanisms open a wide range of development possibilities through interpersonal skills, leadership abilities, soft skills, internal motivation, and personality predispositions. Research conducted in 2015 confirms a correlation between temperament traits and athletes' goal achievement.¹ In the context of achievement motivation, individuals with strong motivation undertake challenges that require commitment and employ their own skills and abilities. They do not avoid responsibility, and their goals are ambitious yet realistic and attainable. They demonstrate reliability and effectiveness in fulfilling their duties while tolerating moderate risks. Furthermore, they strive for continuous improvement in the quality of their actions, competing with their internal standards at the highest level. They think prospectively and shape long-term goals.²

Previous studies on tennis players show that athletes who later reached international levels exhibited significantly higher achievement motivation than players who never reached international levels.³ These results suggest that athletes in the international group generally possess very high achievement

motivation. This implies that high achievement motivation influences the career development of international-level players and is one of the reasons for their success. In the process of talent identification, measuring achievement motivation at the early stages of a tennis career is crucial because it strongly determines future outcomes. Without the desire for success, athletes may not have as much impact on performance.⁴ Interestingly, achievement motivation significantly influences physical preparation, technique, tactics, and even lifestyle.⁵ Understanding individual differences among athletes allows better and, above all, more effective adaptation of training strategies to individual needs and shaping the mentality and development of athletes, which translates to results. Therefore, it is essential to pay attention to psychological factors and incorporate them at every stage of the sports path, both during the training process and crucial moments.

Temperament

Temperament is a comprehensive concept, yet most scientists agree that it pertains to relatively stable personality traits present in humans from early childhood, having their counterparts in the animal world. Initially shaped by innate neurobiological mechanisms, temperament undergoes gradual changes due to the maturation process and unique interactions between genotype and the environment.⁶

The Regulatory Temperament Theory (RTT) emerged from

a deep conviction, based on nearly a century of research tradition, that character traits present in humans from infancy, as well as observed in the animal world, are primarily associated with formal behavioural characteristics. In contrast to content expressing attitudes towards oneself, others, and the world – is characteristic of personality traits other than temperament.

In the context of behaviour within different time frames, certain temperament traits were distinguished in the initial phase of the study, with a special role of the ability to dynamically change behaviour according to the environment - defined as behavioural mobility. Bogdan Zawadzki and Jan Strelau⁷ identified 6 temperament traits:

1. **Alacrity** (a tendency for quick reactions, maintaining a high pace of action, and easy adaptation of behaviour to changes in the environment).
2. **Perseveration** (a tendency to continue and repeat behaviours).
3. **Sensory Sensitivity** (the ability to react to sensory stimuli of low stimulus value).
4. **Emotional Reactivity** (a tendency to intensely react to emotionally evocative stimuli, expressed through high sensitivity and low emotional resilience).
5. **Endurance** (the ability to provide adequate reactions in prolonged or intensely stimulating situations, as well as in conditions of strong external stimulation).
6. **Activity** (a tendency to engage in highly stimulating behaviours or to take actions that provide stimulation from the environment).⁷

Research results indicate that individuals differ in their way of functioning, depending on the intensity of the arousal process measured by the PTS questionnaire. For those with a low level of arousal, a supportive style is characteristic, involving a greater emphasis on auxiliary actions than primary ones. On the other hand, individuals with a high level of arousal tend to have a direct-action style, characterized by the dominance of primary actions over auxiliary ones or a balance between them. Moreover, in situations of exceptionally high stimulation levels, the effectiveness of individuals with high reactivity may decrease if they are unable to reduce this excessively intense stimulation. Conversely, in individuals with low reactivity, when the arousal level is very low and there is no possibility of increasing it, the effectiveness of actions decreases.⁸⁻⁹

Research on the functional significance of the six traits identified within RTT indicates a significant role of these traits in sports and professional activities, as well as in health and illness.¹⁰ It has been found that emotional reactivity increases the impact of stressors on overall mental state, the intensity of neurotic symptoms, and individual well-being. Ewa Habrat¹¹ observed that patients with depressive disorders significantly differ from the control group in reduced endurance, alacrity, activity, and increased perseveration and emotional reactivity.

Studies on temperament in sports show that team athletes have certain personality traits, such as low neuroticism, openness, and agreeableness, compared to other athletes. Furthermore, the team sports group significantly differed from the physical education student group in higher extraversion.¹² Low neuroticism and openness, as well as high extraversion and conscientiousness, were selected from an elite wrestling team.¹³ The athletes' score in group sports in agreement, extraversion and task is significantly higher than in individual sports. Individual athletes had a high risk of neuroticism, and athletes had a lower score than men in all of the components except for neuroticism.¹⁴ In earlier studies, greater extraversion was also observed in team players compared to individual players. Increased extraversion

fosters social interactions and can help develop social skills, which is highly valuable.¹⁵

Achievement Motivation

Motivation is the orientation towards activating current life activities towards a positively evaluated end state. Various behavioural and sensory processes participate in this orientation, requiring closer scientific explanation of their interaction and possibilities of mutual influence. Strong motivation to accomplish something may indicate that someone mobilizes all their forces to achieve something specific, and nothing can stop them. They have a single goal, focus all their attention on it, and do not rest until they achieve it.¹⁶ In self-awareness, this can signify states of attraction, as well as: desire, persistent pursuit, tension, activation, and internal restlessness. Richard deCharms vividly compared motivation to a kind of mild obsession.¹⁷

Achievement motivation, as a personality variable, is utilized, among other things, in sports and professional environments. According to Heinz Schuler and Michael Prochaski¹⁸, the study of the nature and determinants of achievement motivation should align with a focus on professional work requiring personal activity and initiative. Therefore, achievement motivation is integral for specialized and professional achievements because personal activity influences the outcome. The hierarchical model of avoidance-approach achievement motivation, called the three-factor theory by Andrew J. Elliot and Marcy A. Church, presents three groups of motives: a) control motives, which focus on seeking a goal as a path to success, b) comparison motives, which goal is to perform a task at the same level or better than others, c) task goal motives, to avoid embarrassment in the eyes of others.¹⁹

According to the research of Albert Bandura, a key condition for maintaining high motivation is feedback.²⁰ Albert Bandura and Daniel Ceervone²¹ discovered that motivation remains strongest when we have specific goals and regular feedback. This aligns with the idea that we strive to maintain a certain level of performance that we have set for ourselves. Lack of feedback prevents us from understanding our progress and the need to increase our commitment.²²

One interesting study on motivation focused on the Canadian National Hockey League (NHL) and aimed to examine how various factors influence the motivation of ice hockey players. The study involved surveys conducted among 175 players from 10 NHL teams. Players were asked to assess different components affecting their motivation, such as autonomy, skills, challenges, task performance capability, and the ability to discover new things. Coaches and team managers also filled out the same surveys but in the context of their teams. The study results showed that autonomy, the sense of control over one's actions and decision-making ability, is a crucial factor influencing players' motivation to play hockey. Furthermore, the findings indicated that players who perceived a lower level of autonomy in their game exhibited lower motivation. Additionally, the study revealed that challenges and skill development also play a significant role in players' motivation.²³

The aim of the study was to explore the temperament traits of athletes in team and individual sports and how they correlate with overall achievement motivation. The specific objective of the study was to examine whether there are statistically significant differences between the level of overall achievement motivation and temperament traits among athletes in team and individual sports.

Based on the presented research problem, the following hypotheses were formulated:

H1: There are differences in temperament among athletes in team and individual sports.

H2: There are differences in overall achievement motivation among athletes in team and individual sports.

H3: There is a relationship between temperament and overall achievement motivation among athletes in team and individual sports.

Methods

Participants

The study involved a total of 80 adult athletes (40 team sport athletes, 40 individual sport athletes) who were active competitors at national and international levels. The characteristics of team sport athletes were as follows: age 25.17 ± 4.12 years, stature 180.00 ± 6.32 cm, body mass 78.00 ± 7.12 kg, and training experience 8.41 ± 2.38 years. For individual sport athletes, the characteristics were: age 25.13 ± 3.41 years, stature 177.00 ± 5.93 cm, body mass 74.60 ± 6.81 kg, and training experience 9.12 ± 2.71 years. Inclusion criteria included active participation in competitive sports at the national or international level, a minimum of five years of training experience, and no reported major injuries in the past six months. Exclusion criteria involved prior diagnoses of neurological disorders or significant psychological impairments that could affect temperament assessment.

The diagnostic survey method was employed using psychological questionnaires. The study involved a random, representative (probabilistic) sample drawn from the population frame, consisting of 80 adult women and men practicing individual sports and team sports in Poland. The athletes who were selected represented different ages and years of club experience; however, the criterion for selection was that they were representatives of Poland in national and international competitions. Thus, this is a representative random sample, selected according to the EPSEM principle (Equal Probability of Selection Method). The sampling frame consisted of representatives of Poland in national and international competitions. The athletes' study was conducted through a paper-based method. Each research participant was informed about the purpose of the analyses, the anonymity of the study, the scientific nature of the research, and the right to withdraw from participation at any stage. After expressing consent to participate in the study, each person received measurement tools and a questionnaire along with instructions. The questionnaire completion time was approximately 15 minutes.

For the purposes of the study, the researchers decided to use a scale measuring the level of overall achievement motivation

and three temperament scales. The Achievement Motivation Inventory LMI-K, second edition from 2018 by Waldemar Klinkosz and Andrzej Sekowski²⁴, was used to measure overall achievement motivation. The short version comprises 30 items. To assess temperament, the Temperament Questionnaire PTS²⁵ by J. Strelau and B. Zawadzki was employed. The questionnaire consists of 57 statements, and participants evaluate the truthfulness of each statement about themselves on a four-point scale (from "strongly agree" to "strongly disagree"). The items form three basic scales: Strength of Excitation Processes (SEP), Strength of Inhibition Processes (SIP), and Mobility of Nervous Processes (MNP). Additionally, the balance of nervous processes is determined, expressed as the ratio of SEP to SIP. The tool predicts the functioning of the participants in challenging situations.

Statistical Analysis

To test the formulated hypotheses, statistical analyses were performed using IBM SPSS software (Version 29.0). The authors conducted their work on an Acer Swift 3 N19C4 laptop, based in New Taipei City, Taiwan, at 1F, No. 88, Sec. 1, Xintai 5th Rd., Xizhi District. The system operated on Microsoft Windows 11 Home (Redmond, Washington, U.S.). The software was utilized to perform analyses of basic descriptive statistics, Shapiro-Wilk tests for normal distribution, the non-parametric counterpart of the Student's T-test – Mann-Whitney *U* test for independent samples, and Spearman's *r* Correlations between overall achievement motivation and temperament for both groups. The non-parametric Mann-Whitney *U* test was applied to compare differences between the two groups, as most of the variables deviated from a normal distribution, making parametric tests inappropriate. This test was used as a non-parametric alternative to the Student's *t*-test. ANOVA was not applied, as it is used for comparing means across three or more groups. Moreover, ANOVA assumes normality and homogeneity of variances, which were not met in this case, further justifying the use of the Mann-Whitney *U* test. Regarding the effect size measurement, the Glass rank-biserial correlation (*R*) was used as a non-parametric equivalent of eta squared or Cohen's *d*. This choice was based on the fact that Cohen's *d* relies on means and standard deviations, making it sensitive to deviations from normality. In contrast, the Glass rank-biserial correlation (*R*) is more suitable for non-parametric tests, as it is based on ranks rather than raw values, making it more robust to deviations from a normal distribution.²⁶

Results

Table 1. Distributions of temperament dimensions divided between individuals practicing individual sports ($n=40$) and team sports ($n=40$)

Variable	Group	<i>S-W</i>	<i>P</i> value
Excitement Process Strength	Team sports	.87	<.001
	Individual sports	.86	<.001
Inhibition Process Strength	Team sports	.94	.048
	Individual sports	.88	<.001
Mobility of Nervous Processes	Team sports	.79	<.001
	Individual sports	.88	<.001
Balance of Nervous Processes	Team sports	.75	<.001
	Individual sports	.87	<.001

Legend: *S-W* – Shapiro-Wilk test statistic for normality; *P*– significance level

Since the distributions of all variables in both groups were not close to a normal distribution, the non-parametric equivalent of the Student's *t*-test, the Mann-Whitney *U* test, was applied.

The Shapiro-Wilk test results demonstrated that none of the examined variables in either group followed a normal distribution, as indicated by the *P-values* presented in Table 1. Excitement Process Strength: Team sports (*S-W*= .87, *P*< .001); Individual sports (*S-W*= .86, *P*< .001). Similarly, Inhibition Process Strength did not conform to normality in the individual sports group (*S-W*= .88, *P*< .001), whereas a marginally higher

P-value was observed in the team sports group (*S-W*= .94, *P*= .048). The Mobility of Nervous Processes and Balance of Nervous Processes in both groups also exhibited non-normal distributions (*P*< .001 for most cases, as shown in Table 1). Given these findings, the non-parametric Mann-Whitney *U* test was employed for further analyses.

Table 2. Comparison of individuals engaging in team sports and individuals engaging in individual sports in terms of temperament dimensions

Variable	Group	<i>M Rank</i>	<i>U value</i>	<i>P value</i>
Excitement Process Strength	Team sports	48.0	501.50	.004*
	Individual sports	33.0		
Inhibition Process Strength	Team sports	48.0	498.50	.004*
	Individual sports	33.0		
Mobility of nervous Processes	Team sports	46.5	559.50	.020*
	Individual sports	34.5		
Balance of nervous Processes	Team sports	38.9	734.50	.527
	Individual sports	42.1		

Legend: *P*< .05; *M Rank* – Mean Rank; *U*– Mann-Whitney *U* test value; *P*– significance level

The results revealed significant differences in the levels of the analysed temperamental traits between individuals participating in team and individual sports. Statistically significant differences were demonstrated between the groups. Individuals engaged in team sports (*M Rank*= 48.0; *R*= - .114; *P*= .024) showed significantly higher levels of excitement process strength compared to those involved in individual sports (*M Rank*= 33.0). It was also revealed that athletes in team sports (*M Rank*= 48.0; *R*= - .108; *P*= .031) possessed significantly higher levels of inhibition process strength than athletes in individual sports (*M*

Rank= 33.0). Furthermore, individuals engaged in team sports (*M Rank*= 46.5; *R*= - .243; *P*= .004) achieved higher scores in the mobility of nervous processes compared to individuals engaged in individual sports. As the distribution of inhibition process strength was close to a normal distribution, while the distributions of other variables – excitement process strength, mobility of nervous processes, balance of nervous processes, and overall achievement motivation – were not close to normal distributions, nonparametric Spearman's rho correlation was applied.

Table 3. Correlations of temperament dimensions with overall achievement motivation

Variable	Overall Achievement Motivation
Excitement Process Strength	<i>Rho</i> = .11
	<i>P</i> = .339
Inhibition Process Strength	<i>Rho</i> = .15
	<i>P</i> = .191
Mobility of nervous Processes	<i>Rho</i> = .54
	<i>P</i> < .001
Balance of nervous Processes	<i>Rho</i> = -0.04
	<i>P</i> = .752

Legend: *P*< .001; *Rho*– Spearman's nonparametric correlation coefficient; *P*– significance

The results revealed significant differences in the levels of the analysed temperamental traits between individuals participating in team and individual sports. Statistically significant differences were demonstrated between the groups. Individuals engaged in team sports (*M Rank*= 48.0; *R*= - .114; *P*= .024) showed significantly higher levels of excitement process strength compared to those involved in individual sports (*M Rank*= 33.0). It was also revealed that athletes in team sports (*M Rank*= 48.0; *R*= - .108; *P*= .031) possessed significantly higher levels of inhibition process strength than athletes in individual sports (*M Rank*= 33.0). Furthermore, individuals engaged in team sports (*M Rank*= 46.5; *R*= - .243; *P*= .004) achieved higher scores in the mobility of nervous processes compared to individuals

engaged in individual sports. As the distribution of inhibition process strength was close to a normal distribution, while the distributions of other variables – excitement process strength, mobility of nervous processes, balance of nervous processes, and overall achievement motivation – were not close to normal distributions, nonparametric Spearman's rho correlation was applied.

Correlation analysis, using Spearman's rho, demonstrated a strong positive correlation between the mobility of nervous processes and overall achievement motivation (*Rho*= .345, *P*= .002). However, no significant relationships were observed between excitability strength, inhibition process strength, balance of nervous processes, and overall achievement motivation.

A summary of research hypotheses:

Confirmed Hypothesis

H1: There are differences in temperament among athletes in team and individual sports.

H1.1: Athletes in team sports show higher scores in the excitement process than athletes in individual sports.

H1.2: In team athletes, mobility of nervous processes is at a higher level than in individual athletes.

H1.3: The strength of the inhibition process is higher in team sports athletes than in individual sports athletes.

Unconfirmed Hypothesis

H2: There are differences in overall achievement motivation among athletes in team and individual sports.

H2.1: Athletes in individual sports present a higher level of overall achievement motivation.

Partially Confirmed Hypothesis

H3: There is a relationship between temperament and overall achievement motivation among athletes in team and individual sports.

Unconfirmed Hypothesis

H3.1: There is a relationship between the strength of the excitement process and overall achievement motivation among athletes in both disciplines.

H3.2: There is a relationship between the strength of the inhibition process and overall achievement motivation among athletes in both disciplines.

H3.3: There is a relationship between the mobility of nervous processes and overall achievement motivation among athletes in both disciplines.

Discussion

Temperament is a significant factor influencing achievements of teams and individuals as well. Numerous scientific studies support this proposition. In team-based research, the strength of the excitement process is crucial for effective team functioning. According to Eduardo Salas, the level of arousal is linked to the decision-making process, coordination of actions, and communication effectiveness.²⁷ On the other hand, the higher levels of mobility are attributed to individuals, the easier and faster they react to dynamically changing situations. Possessing such a trait is associated with success in sports, and individuals with a high level of mobility tend to learn new, complex movements more quickly. Particularly, high mobility of nervous processes is of great significance in team sports.²⁸ Furthermore temperament plays a crucial role in sports, influencing athletes' performance and their overall experience in competitive environments. According to recent literature, temperament refers to constitutionally based individual differences in reactivity and self-regulation, influenced by genetic, biological, and environmental factors.²⁹ These differences impact how athletes respond to training, competition, and stress.

A significant study on temperament in sports is the interplay between temperament and academic achievement. Studies show that effortful control positively correlates with academic success, while high negative affectivity tends to have an inverse relationship with academic performance. These findings suggest that temperament influences not only sports performance but also educational outcomes, emphasizing the need for balanced development programs that address both athletic and academic skills.³⁰

The second main characteristic studied is achievement motivation. Goal setting plays a significant role in achievement

motivation. Specific, measurable, achievable, relevant, and time-bound (SMART) goals provide athletes with clear targets and a sense of direction. Effective goal-setting strategies enhance motivation, focus, and performance by breaking down long-term objectives into manageable steps.³¹

The conducted study aimed to answer research questions and verify the formulated hypotheses. Based on the examination of temperament dimensions, it is observed that athletes engaged in team sports achieved a significantly higher level of the excitement process compared to athletes in individual sports. It was demonstrated that athletes in team sports have a significantly higher level of the inhibition process than athletes in individual sports. Additionally, it was found that athletes in team sports achieve higher scores in the mobility of nervous processes compared to athletes in individual sports. No statistically significant differences were found between the groups regarding the balance of nervous processes.

Similar results can be observed in previous studies dedicated to temperament differences between athletes in team and individual sports. Studies have observed significantly higher strength of the excitement process, inhibition, and mobility of nervous processes in team sports, represented by volleyball players, compared to individual sports represented by swimmers.³² Previous research on field hockey players also confirms the assumptions of this analysis. Individuals in this group of athletes exhibit the ability to react quickly, maintain an intense work pace, and easily adapt to changing circumstances. This aligns with the mobility of nervous processes. The hypothesis regarding differences in overall achievement motivation was not confirmed, with no statistically significant differences observed between the groups. It is worth noting that both team and individual athletes may be motivated at similar levels but not necessarily in the same areas. This means that individual athletes may be strongly focused on personal results and achievements, while team athletes may be more interested in achieving team goals. In future research, it is advisable to employ different and more comprehensive tools for diagnosing motivation and its types.

The third hypothesis has been confirmed, indicating relationships between temperament and achievement motivation in both team and individual sports. Statistically significant, strong, and positive correlations were found between the mobility of nervous processes and overall achievement motivation. This implies that the higher the level of mobility of nervous processes in an individual, the higher their level of achievement motivation. The literature supports the notion that the mobility of nervous processes can influence an individual's motivation. According to Marek Batey and Adrian Furnham, individuals with high mobility of nervous processes often exhibit higher motivation levels in terms of creativity. They also show a greater propensity for risk-taking and striving to achieve goals.³³ Individuals with high mobility of nervous processes are known for the central nervous system's ability to quickly shift from one state to another in response to changing stimuli. They are typically flexible and adaptive in decision-making and responding to changing situations. High mobility of nervous processes may thus enhance achievement motivation, as individuals with such temperament are more inclined to face new challenges, experiment with new problem-solving methods, and achieve quick and efficient results. Individuals with high mobility of nervous processes are often enthusiastic, impulsive, and energetic, which can contribute to a strong motivation to achieve their goals.³⁴⁻³⁶

Practical Applications

The research results suggest that sports coaches should consider differences in temperament between team and individual athletes. Higher levels of arousal processes, inhibitory processes, and the mobility of nervous processes among team athletes indicate their better adaptation to dynamic and changing conditions, which should be taken into account in training programs. For individual athletes, training should focus on developing quick reaction times and mental flexibility. In recruitment, preferring athletes with higher mobility of nervous processes can be beneficial in sports requiring quick adaptation. Despite the lack of significant differences in overall achievement motivation, the strong correlation between the mobility of nervous processes and motivation suggests that developing this trait can positively impact athletes' motivation. Psychological support should be individualized to maximize athletes' potential, and the training environment should be tailored to specific athlete needs, improving training effectiveness and sports performance.

Conclusions

Team sports demand players to possess collaboration skills and interact with other team members, which can potentially influence psychological predispositions. On the other hand, in individual disciplines, focus is directed toward individual achievements, and training concentrates on refining technical and strength skills. Therefore, it is essential to consider not only physical abilities but also personality traits and motivational factors during team selection and formation. In each case, understanding these differences can assist coaches in tailoring their motivational strategies to the needs of their team or individual athlete.

In summary, psychological factors play a significant role in sports and impact athletic outcomes. It is crucial to pay attention to individual variances among athletes and incorporate them into the training process. A suggestion for future research could be to examine the correlation between temperament, motivation, and perfectionism. This study, given the sample size and type, should be considered exploratory. Subsequent research should focus on specific sports disciplines, involve a larger and more diverse research group categorized by training experience and gender.

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Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Ethical Committee approval

The research project received clearance from the Senate Commission of Research Studies Ethics of the University of Physical Education in Warsaw SKE 04-20/2024

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Conflicts of interest

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Author-s contribution

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