

Differences in nervous system properties, personality profiles, and mental reliability among basketball players of the Ukrainian deaflympic national team

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Abstract:

Problem statement: Deaflympic athletes often face additional psychological and neurophysiological challenges due to communication barriers and sensory limitations. While the general psychophysiological traits of hearing-impaired athletes have been explored, little is known about how participation in professional sports impacts the mental reliability, personality traits, and nervous system properties of Deaflympic athletes within the same national team. The importance of examining differences in nervous system characteristics, personality profiles, and mental reliability between basketball players of the Ukrainian Deaflympics national team who compete for professional clubs (n=6) and those who play only for the national team (n=5). **Purpose:** This study aimed to identify the differences in mental reliability, typological features of the nervous system, and personality profiles between Ukrainian Deaflympic basketball players who compete only for the national team and those who also play for professional clubs. **Method:** The study was performed in October 2024. The research instruments included the: "Mental Reliability of an "Athlete" scale, the "Typological Properties of the Nervous System" assessment, and "Cattell's 16-Factor Questionnaire". Data were collected online following individualized instructions provided to participants. Comparisons were made using Student's t-test. **Results:** The study revealed statistically significant differences ($p < 0.05$) between the groups on key psychodiagnostic scales. Athletes with additional experience in professional basketball clubs demonstrated higher scores in obstacle resistance, endurance under physical exertion, mobility of nervous processes, social boldness, self-reliance, and perfectionism. A slightly elevated tendency toward anxiety was also noted. No significant differences were observed on other scales. **Conclusions:** Basketball players of the Ukrainian Deaflympic national team with professional club experience demonstrate higher levels of mental reliability, stress endurance, and neurodynamic adaptability. They are characterized by greater self-regulation, social boldness, and autonomy, alongside a slightly increased tendency toward anxiety. These differences justify the inclusion of club-level athletes in national team selection and highlight the need for additional psychological support for those without professional experience. Further research is recommended across genders and Deaflympic sports to deepen understanding of psychophysiological profiles in this population.

Key Words: elite deaf athletes, psychophysiological assessment, cognitive-emotional stability, typological traits, sports psychology, team performance, sensorimotor reactivity, neurodynamic characteristics.

Introduction

For people with hearing impairments, sport serves not only as a means of motor activity and self-realization but also as a powerful vehicle for social integration and communication. At the pinnacle of this process lies Deaflympic sport, where elite athletes with hearing impairments demonstrate not only physical excellence and technical precision, but also exceptional psychological adaptability and resilience in overcoming communicative and environmental barriers (El-Saleh, 2014; Gawel et al., 2024). Deaflympians exemplify the human capacity to surpass perceived limitations, becoming role models both within and beyond the sports community. Their achievements inspire inclusive approaches in sports and education and reflect how dedication, innovative training, and team support can mitigate the limitations posed by auditory deprivation (Akoğlu & Kocahan, 2019; Akoğlu & Cengiz, 2024; Liu et al., 2025).

Nevertheless, participation in Deaflympic competitions requires distinctive preparation. The absence of verbal cues necessitates reliance on non-verbal communication-gestures, visual signals, and conditional commands-which redefine the roles of coaches, athletes, and officials in the competitive environment (Cobanoglu et al., 2021; Bonna et al., 2021). This specificity has spurred growing interest in the psychophysiological and psychological profiles of hearing-impaired athletes. Studies have shown that individuals with hearing loss exhibit adaptive mechanisms such as enhanced visual processing, spatial orientation, and coordination (Kazakov et al., 2023; Akinoğlu & Cengiz, 2024). İlkım and Akyol (2018)

demonstrated that hearing-impaired athletes performed similarly or even better than their hearing peers in motor functions like balance and reaction time, emphasizing that hearing loss does not hinder athletic development.

Additional findings confirm that auditory deprivation may contribute to heightened sensorimotor performance and cognitive control, possibly due to neuroplasticity and compensation mechanisms in the brain's visual and somatosensory systems (Bonna et al., 2021; Liu et al., 2025). Consequently, understanding the neurodynamic and personality foundations of deaf athletes is critical for the optimization of training and talent development. Basketball, as a high-intensity, decision-dependent sport, imposes unique challenges on Deaflympic athletes. Research has shown significant differences between hearing and deaf basketball players in psychophysiological features-especially in the response to incentives and motor coordination-due to the lack of auditory cues (Kozina et al., 2013; Kozina et al., 2016). These disadvantages are often counterbalanced by superior peripheral vision, heightened motivation, and better visual concentration (Sobko, 2013; Prokhorenko et al., 2023).

Moreover, deaf athletes are frequently driven by intrinsic motivations linked to self-fulfillment and social belonging (El-Saleh, 2014; Soslu, 2022; Mazin & Byrka, 2022), which often results in increased levels of stress resistance and attentional control (Akoğlu et al., 2024). However, limitations in verbal communication still pose challenges for team cohesion and mutual understanding during gameplay (Sobko, 2014).

To enhance athletic performance, scholars recommend specialized training programs focusing on visual processing, non-verbal communication, and coordination (Sobko, 2015; Gawel et al., 2024; Markov-Glazer et al., 2025). Recent advances also highlight the relevance of psychological profiling, including the assessment of mental toughness, emotional control, and personal traits that contribute to performance consistency (Vural, Altintas & Ozdemir, 2016; Gavrilesco & Vizireanu, 2017). Of particular relevance is the concept of mental reliability-a composite of psychological traits that contribute to an athlete's resilience, volitional regulation, and consistency under pressure (Akoğlu et al., 2024).

Equally important are typological properties of the nervous system, such as endurance to prolonged and intense exertion and the mobility of nervous processes (Kozina & Cieśllicka, 2023), along with stable personality features identified through the 16PF framework (Cattell & Mead, 2008).

Despite the growing volume of research, few studies have investigated how these psychological and neurodynamic characteristics vary among Deaflympic basketball players based on their level of professional experience. In Ukraine, the national Deaflympic basketball team includes athletes with contracts in professional basketball leagues, as well as players whose competitive exposure is limited to national representation.

The purpose of the research: is to examine the differences in mental reliability, nervous system characteristics, and personality profiles between basketball players with hearing impairments who represent the Ukrainian national Deaflympic team-distinguishing between those who also play for professional clubs and those who exclusively represent the national team.

Research Objectives:

1. To assess the typological properties of the nervous system, the level of mental reliability, and the personality traits of basketball players with hearing impairments.

2. To determine the psychological and neurophysiological differences between athletes who are engaged in professional club basketball and those who compete solely for the national team of Ukraine.

By analyzing and comparing two subgroups within the Ukrainian Deaflympic national basketball team-those with and without professional club experience-this research contributes to optimizing coaching strategies and improving psychological resilience among elite athletes with hearing impairments. The findings may also inform best practices in inclusive sports development and athlete support systems.

Materials and Methodologies

Participants

The participants of this study were athletes from the men's Deaflympic national basketball team of Ukraine (n = 11). The sample was divided into two subgroups: those who played exclusively for the national team (n = 5), and those who, in addition to the national team, also had contracts with professional basketball clubs (n = 6). The study was conducted under conditions of full anonymity.

Research Design

The study was conducted in October 2024 and involved the one-time collection of data using standardized psychodiagnostic instruments. The assessments were carried out online. Questionnaire links were distributed to the respondents via messaging platforms following prior individual instructions. After data collection and processing, comparisons were made between the two subgroups.

Data Collection Instrument

The following tools were used:

The "Mental Reliability of an Athlete" methodology (Milman, 1983; by Samokhvalova, Andreieva, & Matlash, 2016) is a psychodiagnostic tool designed to assess an athlete's capacity to maintain consistent performance under stress and competitive pressure, without disturbances in psychophysiological functioning. It evaluates four key components: Competitive Emotional Resilience (CER), Self-Regulation (SR), Motivational and Energetic Component (MEC), and Stability and Obstacle Resistance (SOR).

The “Questionnaire of Vital Manifestations of Typological Properties of the Nervous System” (Nerova, Kapinus, & Hryshchyn, 2016) is aimed at identifying individual neurodynamic traits, including Endurance to Prolonged Exertion (EPE), Endurance to Intensive Exertion (EIE), Sensitivity to Low-Intensity Stimuli (S), Emotional Reactivity (ER), Mobility of Nervous Processes (MNP), Strength of the Inhibitory Process (SIP), and Energy (E).

The Cattell 16 Personality Factor Questionnaire (16PF) (Cattell et al., 1970; Cattell & Mead, 2008) is used to identify core personality traits relevant to behavior in a wide range of life situations. The instrument includes 16 primary factors-such as Warmth (A), Reasoning (B), Emotional Stability (C), Dominance (E), Rule-Consciousness (G), etc.-and 5 global factors: Extraversion (F1), Anxiety (F2), Tough-Mindedness (F3), Independence (F4), and Self-Control (F5).

Statistical Analysis

The collected data were analyzed using the Student’s t-test ($p < 0.05$). Additionally, histograms were used to illustrate the distribution of responses. All statistical analyses were performed using the Statistica 10 software package.

Results

The results of the comparative analysis based on the “Mental Reliability of an Athlete” methodology are presented in Table 1.

Table 1. Results obtained using the Mental Reliability of an Athlete questionnaire

Scale		Deaflympic national team (n=5)	Deaflympic national team and professional team (n=6)	t	p
Competitive resilience(CER)	emotional	-4.8 ± 1.56	-2.0 ± 0.93	-1.54	>0.05
Self-regulation(SR)		-0.4 ± 1.5	-0.5 ± 0.85	0,06	>0.05
Motivational and component(MEC)	energetic	2.2 ± 0.37	0.67 ± 1.09	1,34	>0.05
Stability and resistance(SOR)	obstacle	-2.8 ± 0.49	-0.33 ± 0.67	-2,98	<0.05

A visualization of the results obtained using the “Mental Reliability of an Athlete” methodology is presented in Figure. 1.

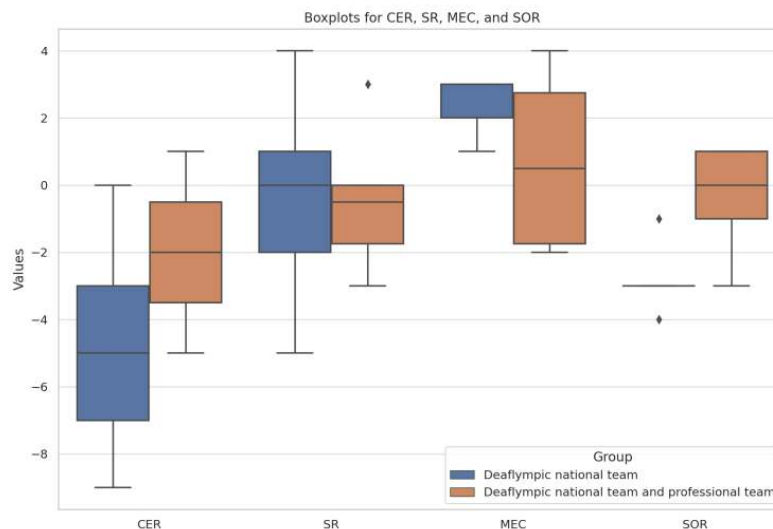


Figure. 1. Visualization of differences in the results of the questionnaire using the “Mental Reliability of an Athlete” methodology

As shown in Table 1 and Figure 1, a statistically significant difference was identified between the groups “Deaflympic national team” and “Deaflympic national team and professional club” on the Stability and Obstacle Resistance (SOR) scale ($p = 0.0221$).

These findings suggest that athletes who combine participation in the Deaflympic national team with playing in professional basketball clubs exhibit higher levels of stress tolerance, stronger capacity to counteract negative external influences, and greater psychological resilience under pressure.

The results obtained using the Questionnaire of Vital Manifestations of Typological Properties of the Nervous System are presented in Table 2

Table 2. Results of the questionnaire using the methodology “Questionnaire of vital manifestations of typological properties of the nervous system”

Scale	Deaflympic national team (n=5)	Deaflympic national team and professional team (n=6)	t	p
Endurance to prolonged exertion (EPE)	24.0 ± 1.52	29.33 ± 1.15	-2.81	<0.05
Endurance to intense exertion (EIE)	26.0 ± 0.71	31.33 ± 1.48	3.26	<0.05
Sensitivity (S)	22.2 ± 1.16	24.17 ± 1.01	-1.28	>0.05
Emotional reactivity (ER)	24.2 ± 0.73	21.67 ± 1.17	1.83	>0.05
Mobility of nervous processes (MNP)	24.2 ± 0.58	29.5 ± 1.59	-3.14	<0.05
Strength of the inhibitory process (SIP)	26.0 ± 0.84	27.83 ± 0.7	-1.68	>0.05
Energy (E)	27.0 ± 1.52	30.0 ± 0.86	-1.72	>0.05

Visualization of the results obtained using the methodology “Typological properties of the nervous system” is presented in Figure. 2.

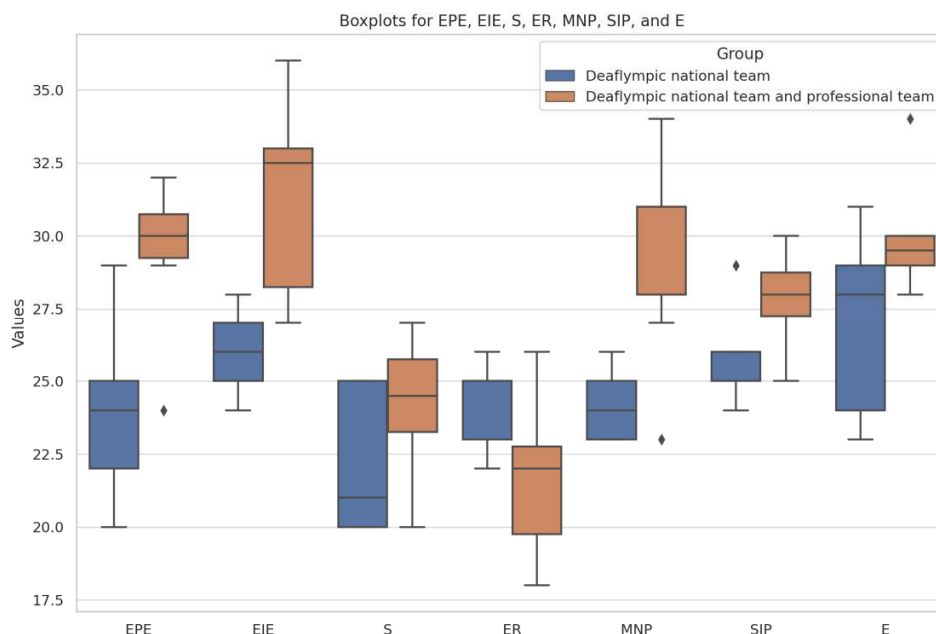


Figure. 2. Visualization of differences in the results of the questionnaire using the methodology “Typological properties of the nervous system”

As shown in Table 2 and Figure 2, statistically significant differences were observed on the following scales: Endurance to Prolonged Exertion (EPE) ($p = 0.0192$), Endurance to Intensive Exertion (EIE) ($p = 0.0061$), and Mobility of Nervous Processes (MNP) ($p = 0.0413$).

Higher scores on these scales reflect the enhanced adaptive capacity of the nervous system in basketball players who are engaged with professional clubs.

These athletes demonstrate a greater ability to cope with both prolonged physical workloads and short-term high-intensity game situations that require rapid response and elevated nervous system mobility.

The results of the comparison of data obtained using the “16PF” methodology are presented in Table 3.

Table 3. Results of the survey using the methodology “Cattell 16-factor questionnaire”

Scale	Deaflympic national team	Deaflympic national team and professional team	t	p
MD	6,20±1,24	8,16±0,48	-1,59	>0.05
A	3.4 ± 0.51	3.0 ± 0.63	0,49	>0.05
B	2.6 ± 0.75	4.33 ± 1.12	1,29	>0.05
C	5.0 ± 0.55	5.0 ± 0.68	0,0	>0.05
E	7.4 ± 0.51	7.33 ± 0.88	0,07	>0.05
F	5.2 ± 0.37	6.17 ± 0.87	-1,02	>0.05
G	6.4 ± 1.17	7.0 ± 0.52	-0,47	>0.05
H	4.8 ± 0.73	7.67 ± 0.42	-3,38	<0.05
I	3.6 ± 0.24	3.33 ± 0.88	0,29	>0.05
L	8.8 ± 0.49	7.83 ± 0.31	1,67	>0.05
M	5.0 ± 1.26	5.17 ± 0.6	0,12	>0.05
N	6.2 ± 0.8	4.67 ± 0.49	1,63	>0.05
O	6.6 ± 0.98	5.5 ± 1.2	0,71	>0.05
Q1	5.2 ± 0.58	5.17 ± 0.79	0,03	>0.05
Q2	6.0 ± 0.32	3.33 ± 0.88	2,85	<0.05
Q3	4.8 ± 0.66	7.33 ± 0.8	2,43	<0.05
Q4	5.0 ± 1.05	4.67 ± 0.8	0,25	>0.05
F1	4.8 ± 1.11	3.33 ± 0.88	1,03	>0.05
F2	4.6 ± 0.51	7.0 ± 0.77	-2,59	<0.05
F3	7.4 ± 0.4	7.5 ± 1.06	-0,09	>0.05
F4	6.4 ± 0.6	5.67 ± 0.61	0,85	>0.05

A visualization of the results obtained using the 16 PF methodology is presented in Figure. 3.

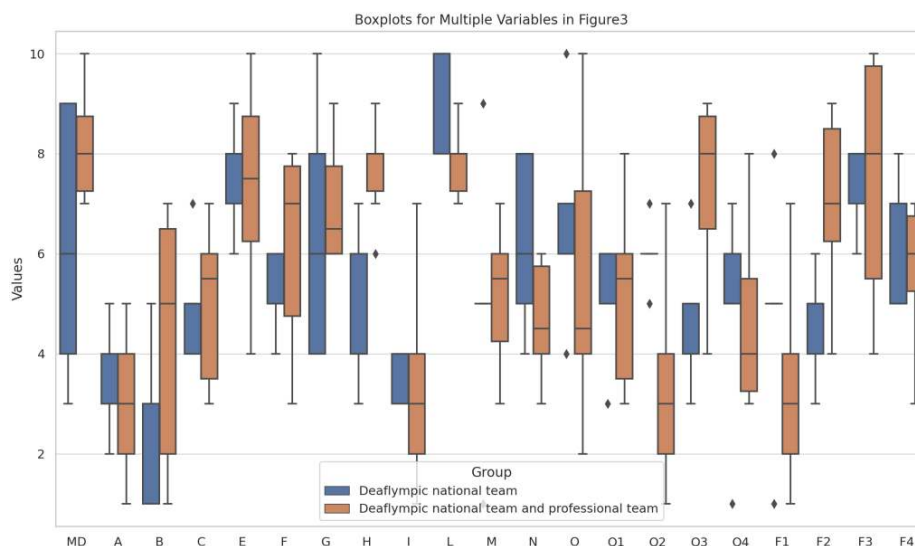


Figure. 3. Visualization of differences in the results of the survey using the “R. Cattell 16-factor questionnaire” methodology

As presented in Table 3 and Figure 3, based on the results of the 16PF assessment, statistically significant differences were identified on the following scales: H ($p = 0.0136$), Q2 ($p = 0.0083$), Q3 ($p = 0.047$), and F2 ($p = 0.031$). These findings suggest that athletes who, in addition to participating in the Deaflympic national basketball team of Ukraine, are also engaged with professional basketball clubs demonstrate higher levels of social boldness, self-reliance, and self-control. This reflects increased confidence in their actions, autonomy in decision-making, and a heightened capacity to maintain discipline and coherence, even under stress.

Such athletes exhibit a stronger inclination toward independent performance, are less reliant on external support, and can function effectively both individually and within a team setting.

However, this group also showed a slightly higher tendency toward anxiety and emotional reactivity, as reflected in their elevated F2 scores. Overall, the results indicate that athletes with experience in professional clubs, alongside their involvement in the Deaflympic national team, demonstrate statistically significantly higher indicators across several core psychological and psychophysiological dimensions. These differences span aspects of mental reliability, neurotypological features, and personality traits, thus underscoring the multidimensional psychological advantages associated with professional-level athletic experience.

Discussion

The findings of this study indicate statistically significant differences between the two groups of athletes on the following scales: “Stability–Obstacle Resistance” (Mental Reliability of an Athlete), EPE (Endurance to Prolonged Exertion), EIE (Endurance to Intense Exertion), and MNP (Mobility of Nervous Processes) from the Questionnaire of Typological Properties of the Nervous System, as well as on the 16PF personality traits H (Social Boldness), Q2 (Self-Reliance), Q3 (Perfectionism), and F2 (Anxiety). At the same time, no statistically significant differences were found across the other scales. This suggests that while the fundamental psychological characteristics of both groups are relatively similar, distinct differences are observed in traits most susceptible to the effects of long-term professional athletic experience.

These data give rise to several discussion points. First, the results support the recommendation to prioritize the selection of Deaflympic national basketball team candidates from among hearing-impaired athletes with experience playing for professional clubs. Alternatively, management may consider supporting prospective national team players in securing contracts with such clubs. This approach may enhance psychological readiness for international competition through consistent exposure to high-performance environments and structured training systems. A recent study by Szulc and Sandurska (2021) also emphasizes the performance advantages conferred by experience in competitive basketball settings, demonstrating significant differences in game-related metrics between winning and losing teams in the 2019 Deaf Basketball World Championship.

The second point concerns the significant influence of professional basketball on the neurophysiological properties of athletes with hearing impairments. Specifically, the observed improvements in endurance to prolonged and intense exertion, as well as increased mobility of nervous processes, may result from adaptive neuroplastic changes associated with high-level sports engagement. These physiological adaptations likely underpin the enhanced mental resilience and obstacle resistance detected in athletes affiliated with professional clubs. Moreover, such experiences contribute to the development of socially embedded behavioral traits, including independence from external validation and increased self-regulation. These conclusions are consistent with the findings of Orzhytskyi and Mazin (2025), who highlight the role of sports in fostering transferable soft skills such as perseverance, adaptability, and emotional regulation.

Importantly, these adaptive advantages appear to extend to personality development. Athletes with club-level experience demonstrated higher self-reliance, social boldness, and perfectionism-traits linked to self-discipline, intrinsic motivation, and autonomy, which are particularly crucial for team-based sports. The elevated anxiety scores observed in this group also merit attention, potentially reflecting heightened internal pressure and self-imposed performance standards, a pattern often noted among elite athletes. These results align with the research of Vural et al. (2016), who found correlations between personality structure, gender, and chosen athletic discipline among youth athletes with hearing impairments.

In light of these findings, targeted psychological training aimed at enhancing emotional intelligence and resilience may be especially beneficial for athletes without prior professional experience. The study by Umami Habibah and Abd Rani (2018) confirms that emotional intelligence plays a moderating role in the relationship between psychological well-being, self-esteem, and cognitive performance in hearing-impaired youth. This supports the argument that psychological preparedness for sport can be meaningfully developed through structured mental wellness interventions. Furthermore, recent typological work by Cherepiekhina et al. (2025) highlights the importance of personalized psychological support and emotional response profiling as effective tools for improving mental balance and motivation in athletes facing complex biopsychosocial challenges.

Taken together, these results underscore the pedagogical and psychological value of integrating professional sports practices into Deaflympic training systems. They also point to the necessity of continued research exploring the long-term psychological trajectories of athletes with hearing impairments, particularly in relation to motivation, emotional regulation, and stress resilience.

Conclusions

The present study leads to the following generalizations:

Basketball players of the Ukrainian Deaflympic national team who are affiliated with professional clubs exhibit superior indicators of mental reliability, particularly in terms of resilience and the capacity to withstand competitive challenges. These athletes also demonstrate more favorable typological characteristics of the nervous system, including enhanced endurance to both prolonged and intense exertion, as well as greater mobility of nervous processes. Furthermore, this group is characterized by more pronounced personality traits

such as social vitality, self-reliance, self-discipline, and autonomy from external social influences. At the same time, they tend to exhibit slightly higher levels of anxiety and emotional reactivity.

Conversely, basketball players of the Deaflympic national team who do not hold contracts with professional clubs displayed lower scores on most of the measured psychological and neurotypological scales. These findings suggest that regular participation in professional sports may serve as a significant factor in the psychological and psychophysiological preparedness of athletes with hearing impairments.

The results support the rationale for prioritizing the recruitment of players with active or prior professional club experience when composing Deaflympic national basketball teams. Additionally, the findings underscore the need for targeted psychological support and individualized mental training programs for athletes who lack such experience. Future research should expand to include the Deaflympic women's basketball team and explore similar variables across other Deaflympic sports. Moreover, further studies exploring the interrelationships between nervous system typology, personality traits, and mental reliability are warranted, as they may contribute to a more comprehensive psychological profile of high-performing athletes with hearing impairments.

Conflicts of Interest.

The authors declare no conflict of interest.

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