Editorial

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IV Symposium on the Neuroscience of Physical Exercise: Advances and Perspectives

IV Simpósio de Neurociência do Exercício Físico: Avanços e Perspectivas

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The current editorial intends to present the IV Symposium on the Neuroscience of Physical Exercise, held on June 24th and 25th, 2024, at the Institute of Psychiatry of Federal University of Rio de Janeiro (*Universidade Federal do Rio de Janeiro* – UFRJ), under the coordination of Prof. Dr. Andrea Deslandes. The event aimed to promote a national meeting for the dissemination of scientific research, intervention programs, debates, and exchange and dissemination of general knowledge about the Neuroscience of Physical Exercise. The event counted on the participation of renowned researchers from 16 Higher Education Institutions in Brazil, more than 500 participants, and the presentation of 54 papers, representing all macro-regions of Brazil, and strengthening the nucleation, social impact, and training of qualified human resources within the scope of Postgraduate studies.

The event considered aspects of innovation and technology, with approaches to translational themes and the presentation of research models that seek to solve problems through the neuroscience of physical activity. The free and hybrid event marked the launch of the first free distance learning extension course on the Neuroscience of Physical Exercise, as well as two meetings: 1) the 2nd Meeting of the National Network of Neuroscience and Physical Activity (ReNAF), a network of researchers created in 2022 that aims to disseminate and strengthen research, teaching, and extension actions in this area[1] and 2) the 1st Meeting of Brazilian researchers of The UNIversity student LIFEstyle and Mental health (UNILIFE-M), a prospective cohort study of lifestyle and mental health in university students, with the publication of unprecedented results from this network that includes 11 universities in Brazil and more than 60 centers worldwide[2]. The event was supported by the PAEP/CAPES Notice, the Brazilian Society of Physical Activity and Health (*Sociedade Brasileira de Atividade Física e Saúde* - SBAFS), the South American Network of Physical Activity and Sedentary Behavior (*Rede Sul-Americana de Atividade Física e Comportamento Sedentário* - SAPASEN), and the Federation of Experimental Biology Societies (*Federação de Sociedades de Biologia Experimental* - FeSBE).

Below is a summary of the 26 topics covered in the six thematic panels of the event. The panels served as a forum for discussion on advances and directions in the area of physical activity, physical exercise, and sport from the perspective of Neuroscience.

Relationship between muscle and brain

The first thematic panel discussed the neurobiological mechanisms of physical activity and its effects on the brain, aligned with the concept of

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exposome and brain health. The high metabolic demand of the brain makes it vulnerable to endogenous and exogenous factors, with physical exercise playing an important role in modulating molecular pathways, improving brain function and neural plasticity. Exercise stimulates the production of signaling molecules, such as brain-derived neurotrophic factor (BDNF), essential for synaptic plasticity and neuronal survival, in addition to regulating antioxidant enzymes via factor erythroid 2-related factor 2 (Fator nuclear eritroide 2-relacionado ao fator 2 - NRF2). Lactate and irisin also contribute to brain health by stimulating BDNF and NRF2. The endocannabinoid system, activated by exercise, helps modulate pain, inflammation and mood, contributing to post-exercise well-being. Physical exercise plays an important role in the prevention of neurodegenerative diseases, standing out for its ability to mitigate oxidative stress and promote neural resilience.

Physical activity and cognitive performance

The second panel addressed the impact of physical activity on cognitive performance across the lifespan, showing evidence of improvements in executive functions, such as inhibitory control and cognitive flexibility, from childhood to old age. Physical activity can also improve memory consolidation, especially after learning. The Erguer/Aracaju project showed how integrating movement into classrooms can enhance learning and cognitive performance in students. Interventions that combine motor coordination and cognitive challenges are especially effective in improving executive functions and preventing cognitive decline in older adults.

Lifestyle, neuroscience and brain health

The lifestyle panel discussed how environmental factors influence brain health. Diet, sleep quality, stress, and physical activity shape individual characteristics through the interaction between genes and the environment, modifying gene expression through epigenetic alterations. Modern life, with its continuous demands, has caused changes in lifestyle, such as sleep patterns and circadian rhythm, resulting in chronic sleep debt, which promotes mood alterations and negative impacts on physical and cognitive performance. In addition, diets rich in ultra-processed foods increase the risk of mental disorders, while anti-inflammatory diets reduce depressive symptoms. Mindfulness and grounding practices were highlighted as effective strategies to prevent stress overload. The need for public policies that promote a healthy lifestyle was emphasized, highlighting the urgency of accessible and equitable interventions.

Physical activity in the prevention and treatment of central nervous system diseases

The role of physical activity in promoting brain health and preventing and treating mental disorders and diseases of the central nervous system was highlighted in two thematic tables at the event. In addition to promoting brain health, physical activity is an additional strategy to pharmacological treatment for many highly disabling, prevalent neuropsychiatric conditions, with major economic and social impacts, such as neurological diseases, especially Alzheimer's, Parkinson's, and other dementias. Physical exercise has

been shown to be a protective factor against neuropsychiatric diseases, being essential in reducing functional disability and improving mental health. Activities that combine physical and cognitive stimuli, such as dance and exergames, are promising for older people with dementia or cognitive decline. Exercise is also effective in preventing relapse in substance use disorders, promoting psychological and physical well-being. Promising results have been shown in models of traumatic brain injury and physical exercise. In patients with epilepsy, for example, exercise can reduce the frequency and severity of seizures, and improve mood and quality of life.

Sports neuroscience

The psychological preparation of athletes is important to improve performance and maintain mental health, especially in high-pressure environments and situations of media exposure, which was highlighted in the Neuroscience of Sports panel. Sports Psychology has integrated advanced neurotechnologies for the assessment, intervention, and mental training of high-performance athletes. The concepts of parasports and Paralympic sports were also discussed at the event, given the importance of scientific production for sporting success. The barriers and facilitators of sports training for people with physical, visual, and intellectual disabilities were discussed, and how behavioral aspects are part of the development process of athletes with disabilities. Evidence suggests that Paralympic athletes have lower levels of self-acceptance and purpose in life when compared to Olympic athletes. In addition, relatively high levels of anxiety, depression, and pain are often observed in Paralympic athletes.

The Sports Neuroscience panel also addressed the interaction between sports and the environment on brain health. The concept of "Blue Mind" explores the neuroscience of outdoor sports and immersion in nature, highlighting numerous psychological, cognitive, and physiological benefits. Among the main psychological benefits, exposure to green and blue spaces has been shown to significantly reduce anxiety and stress levels, promote relaxation and mental recovery, and improve mood. From a cognitive perspective, immersion in nature can induce a state of mindfulness and attention, benefiting cognitive health, although more research is needed to confirm these effects.

Adherence to physical exercise

Despite the well-established benefits of exercise, adherence remains a challenge. Emotional, affective, and motivational factors play an important role in adopting an active lifestyle. Creating enjoyable exercise environments that provide social support can increase adherence, while programs that incorporate positive feedback, rewards, and extrinsic strategies are more effective. Findings from behavioral neuroscience and the Unified Theory of Physical Activity indicate the role of the essential elements of physical activity (feeling, exploring, transforming, and connecting) in emotional and motivational regulation, favoring adherence to exercise. Promoting body literacy was also highlighted as essential to encourage the practice of physical activity throughout life. Self-Determination Theory can contribute to the understanding of intrinsic motivation factors for adherence to physical activity, and health professionals can promote support for the needs of competence, autonomy, and connection during exercise. Furthermore, the Reflexive Affective Theory attempts to explain active behavior based on two processes, one automatic and the other reflexive. However, despite decades of literature demonstrating the relationship between physical exercise and affective responses, understanding of the mechanisms that explain this relationship still requires further investigation.

Final considerations

The 4th Symposium on the Neuroscience of Physical Exercise highlighted the growing importance of neuroscience in understanding the effects of physical exercise on mental and cognitive health. Discussions ranged from molecular aspects to practical implications for public health, highlighting the need for an interdisciplinary approach. Future prospects include deepening research into the neurobiological mechanisms of exercise benefits, developing personalized interventions, increasing appreciation of the behavioral aspects of exercise, and promoting public policies that encourage physical activity in all age groups.

The continuity of events with this characteristic and the maintenance of collaboration networks in Brazil are essential to promote the exchange of knowledge, strengthen partnerships, develop strategies for the training and qualification of professionals, and promote innovative research.

Conflict of interest

The authors declare no conflict of interest.

Authors' contributions

Silva DRP and Schuch FB: Conceptualization; Data curation; Supervision; Data presentation design; Writing of the original manuscript; Writing - review & editing; Approval of the final version of the manuscript.: Conceptualization; Data curation; Supervision; Data presentation design; Writing of the original manuscript; Writing - review & editing; Approval of the final version of the manuscript. Aguiar Junior AS, Silva A, Moraes CEF, Pires DA, Portugal EMM, Conde EFQ, Jesus-Moraleida FR, Moura HF, Moraes HS, Siqueira IR, Bento-Torres J, Mello MT, Bento-Torres NVO, Galvao-Coelho NL, Mello-Carpes PB, Pinheiro PTM, Monteiro-Junior RS, Pinho RA, Arida RM, Matias TS, Santos TM and Fernandes VR: Conceptualization; Data curation; Supervision; Writing-review & editing; Approval of the final version of the manuscript. Deslandes AC: Conceptualization; Data curation; Supervision; Data presentation design; Receipt of funding; Writing of the original manuscript; Writing-review & editing; Approval of the final version of the manuscript.

Declaration regarding the use of artificial intelligence tools in the article writing process

The ChatGPT artificial intelligence tool was used to prepare this manuscript to perform the following activities: assistance in reviewing grammar and inconsistencies. The authors declare that all material derived from this process has been reviewed and the authors assume full responsibility for the entire content of the manuscript.

Availability of research data and other materials

The contents are already available at the time of publication of the article.

References

1. Bento-Torres NV, Bento-Torres JB, Deslandes AC, Netto CA, Royes LF, Schuch F, et al. Formation of the Brazilian Network for Research and Training in Neuroscience and Physical Activity: a meeting report. Adv Physiol Educ. 2023;47(3):589-92. doi: https://doi: 10.1152/advan.00060.2023
2. Schuch FB, Waclawovsky AJ, Tornquist D, et al. The UNIversity students' LIFEstyle behaviors and Mental health cohort (UNILIFE-M): Study protocol of a multicenter, prospective cohort study. PREPRINT. 2024 Jan 16. doi: https://doi.org/10.21203/rs.3.rs-3794023/v1

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Reviewers' assessment

The reviews of this article were originally conducted in Portuguese. This version has been translated using ChatGPT and subsequently reviewed by the Chief Editors.

Reviewer A

Anonimous

Format

- Does the article comply with the manuscript preparation guidelines for submission to the Revista Brasileira de Atividade Física e Saúde?
  Partially
- Regarding formal aspects, is the manuscript well-structured, containing the sections: introduction, methods, results, and discussion (with the conclusion as part of the discussion)?
  Yes
- Is the language appropriate, and is the text clear, precise, and objective?
  Yes
- Was any indication of plagiarism observed in the manuscript?
  No
- **Suggestions/comments:**
- The manuscript is excellent and very well written. The document currently exceeds 1,500 words (it has 1,623). I believe that the decision to request a reduction in the word count is more editorial than mine as a reviewer.

Comments to the author

- Congratulations on an excellent manuscript and on organizing the symposium. Having experience in organizing international symposiums, I can imagine the level of effort involved in carrying out this work. The document is very well written, and I have included in the attachment minor comments that can be easily addressed. For example, the authors mention that "Brazil is among the five countries with the highest prevalence of depressive disorders"; however, is this at the global level, in Latin America, etc.?
- Beyond this, I noticed that most paragraphs follow a structure of presenting the panel topic, its main findings, and the key takeaways and perspectives from the discussions. Therefore, I suggested maintaining this pattern across all panels/paragraphs.
- The first reference needs to have its DOI added. The second reference is a preprint, and the journal's website does not specify a format for this type of reference. It has been formatted similarly to a published journal article, replacing the journal name with the term "PREPRINT." If this is the correct format, I suggest removing "Available at" and keeping only the DOI link, following the standard format for journal articles. Alternatively, if cited as "Other Documents," it should be formatted as: "Available at: *https://doi.org/10.21203/rs.3.rs-3794023/v1 [November 2024]."*

Comments in the article file

- First paragraph, last line: Fantastic. Would it be possible to also mention the total number of participants?
- In the "Physical Activity and Cognitive Performance" section, last line: I suggest restructuring the sentence, as cognitive decline does not seem to apply to children.
- In the "Physical Activity in the Prevention and Treatment of Central Nervous System Diseases" section, 8th line: Is this on a global scale? In Latin America?
- In the "Physical Activity in the Prevention and Treatment of Central Nervous System Diseases" section, 10th line: What does this incapacity refer to? Is it in the context of absenteeism? I suggest adding more context to the sentence.
- In the "Physical Activity in the Prevention and Treatment of Central Nervous System Diseases" section, last line: This topic is fantastic and very interesting, especially for summarizing such diverse topics and highlighting the main findings discussed by the panel. Other sections always conclude with a key takeaway message summarizing the discussion. Perhaps, due to the variety of topics, this was difficult here, but if possible, a final general and conclusive statement like the others would be beneficial.
- In the "Sports Neuroscience" section, 2nd paragraph, last line: Similar to my comment about the "Physical Activity in the Prevention and Treatment of Central Nervous System Diseases" panel, I think it would be interesting to include a final conclusive

statement, like those in other sections, for example, the last part of the "Sports Neuroscience" discussion.

Final Decision

- Minor revisions required

Reviewer B

Did not authorize the publication of the review.