Online ISSN: 3107 - 7676

IJMR 2026; 2(1): 08-13

2026 January - February

www.allmultiresearchjournal.com

Received: 08-10-2025

Accepted: 09-11-2025

Published: 01-01-2026

Exercise, Excess and Self-Regulation: Neurobiological and Pedagogical Perspectives on ADHD

Alessandro Bozzato

Faculty of Medicine, National President of UNIPED, Unione Pedagogisti, Università Politecnica delle Marche, Venezia, Italy

Corresponding Author; **Alessandro Bozzato**

Abstract

Physical activity is increasingly recognized as a non-pharmacological resource in the management of attention-deficit/hyperactivity disorder (ADHD), particularly for its effects on executive functions and self-regulation. From a neuropedagogical perspective, however, movement cannot be understood solely in terms of performance or symptom reduction, but as a regulatory device whose effects depend on measure, context, and educational mediation. While a growing body of evidence supports the benefits of structured and well-dosed exercise, less attention has been paid to the potential risks associated with excessive or rigid engagement in physical activity.

This article adopts a conceptual and narrative integrative approach to examine physical activity in ADHD as a double regulatory device, capable of supporting adaptive self-regulation or, conversely, contributing to forms of hyper-regulation. By bringing into dialogue evidence from experimental and review studies on structured exercise interventions with epidemiological data on excessive exercise in adults with a history of ADHD, the paper highlights the ambivalent nature of movement. The analysis focuses on shared neurobiological mechanisms—such as catecholaminergic modulation, arousal regulation, and synaptic plasticity—that underlie both beneficial and potentially disadaptive outcomes.

The findings suggest that physical activity can support executive functioning when embedded within intentional and measured frameworks, but may become excessive and interfere with daily functioning when it operates as an unmediated compensatory strategy. From an educational standpoint, these results emphasize the importance of shifting the focus from quantity to quality of movement, framing physical activity as a situated formative practice that requires awareness, modulation, and meaning.

Keyword: ADHD, Physical Activity, Self-Regulation, Executive Functions, Excessive Exercise, Neuropedagogy

1. Introduction

Movement, from a neuropedagogical perspective, can be understood as a primary device of self-regulation. It represents the first language of the body, the original form through which human beings enter into relation with the world and with themselves. To move does not simply mean to occupy space; it means to construct meaning through

action, to regulate internal energy, and to measure the distance between intention and reality.

The brain learns through the elementary act of movement and continuously reorganizes its connections through action. Every gesture generates information that contributes to a new possibility of equilibrium. In this sense, physical activity cannot be reduced to mere exercise: it is a practice that involves perception, emotion, cognition, and intentionality, activating processes of awareness that justify the growing use of the concept of embodied cognition in educational contexts [1].

Movement is not an accessory to learning, but one of its constitutive conditions. This is not a metaphor, but a functional statement.

Physical activity refers to the intentional and, to some extent, programmed dimension of movement. When conducted with measure, it becomes a tool for neural plasticity and neurofunctional regulation, fostering a dynamic balance between stimulation and recovery, activation and calm. Appropriately dosed physical activity has been shown to support attention, memory, cognitive flexibility, and inhibitory control—functions that are particularly vulnerable in attention-deficit/hyperactivity disorder (ADHD) [2-4]. From this perspective, movement can be described as a form of thinking in action, sustained and shaped by bodily engagement rather than separated from it.

As with any activity that enables learning and adaptation, movement also teaches the recognition of limits. To move is to learn how far one can go and to accept that not everything can be exceeded. When the body learns its own rhythm, it also learns how to respect it, and movement becomes an education to measure. When this process fails—when bodily signals are ignored or misinterpreted and action is pushed beyond sustainable thresholds—movement risks losing its regulatory function and turning into excess. In such cases, what initially supports balance may shift toward forms of rigidity, obsession, or escape.

This tension between equilibrium and dismeasure is particularly relevant in the context of ADHD. Physical activity is widely acknowledged as a non-pharmacological resource capable of alleviating some ADHD- related difficulties, especially in childhood and adolescence. By contrast, evidence concerning adulthood remains more limited, and even less attention has been devoted to the potential risks associated with excessive or inflexible engagement in physical exercise. Emerging epidemiological findings suggest that, for some individuals, movement may operate not only as a regulatory resource, but also as a compensatory strategy that tends to rigidify over time [5].

At the threshold between regulation and excess, the educational meaning of movement becomes decisive. It is not sufficient to increase quantity or continually raise performance demands; it is equally necessary to learn when "enough" has been reached and when it is time to stop. Understanding this threshold requires moving beyond a purely quantitative logic and considering physical activity as a situated practice, embedded in personal histories, neurobiological constraints, and educational contexts.

On this basis, the present article explores physical activity in ADHD as a double regulatory device. By bringing into dialogue evidence from structured exercise interventions and epidemiological data on excessive exercise, the paper aims to clarify how the same neurobiological mechanisms can support adaptive self- regulation or, conversely, contribute to forms of hyper-regulation. Through this integrative perspective, a neuropedagogical reading of movement is proposed, emphasizing measure, context, and educational mediation as central elements in promoting balance rather than dismeasure.

2. Materials and Methods

2.1. Study Design and Methodological Approach

The present work adopts a conceptual and narrative integrative review design, aimed at examining physical activity in attention-deficit/hyperactivity disorder (ADHD) through the lens of self-regulation and excess. The article does not report original experimental data, nor does it propose a systematic or quantitative synthesis of the literature. Rather, it offers an interpretative integration of existing empirical evidence, with the specific goal of clarifying how physical activity may function as a regulatory device or, conversely, evolve into a compensatory and potentially maladaptive strategy.

This methodological choice responds to the nature of the research question, which concerns not only outcomes, but also thresholds, meanings, and contextual conditions under which movement supports or compromises regulation. Given the heterogeneity of existing studies and the limited standardization of exercise protocols in ADHD research, a narrative integrative approach was considered the most appropriate framework to address the complexity of the topic without reducing it to a purely quantitative comparison.

2.2. Literature Identification and Selection

The literature considered in this review was identified through a focused search of peer-reviewed publications addressing the relationship between physical activity and ADHD. Particular attention was given to studies published in international journals in the fields of psychiatry, neuroscience, sports medicine, and education.

The selection process was guided by conceptual relevance rather than by a formal systematic protocol. Two main strands of literature were intentionally brought into dialogue:

1. Experimental and review-based studies evaluating the effects of structured physical activity interventions on cognitive, behavioral, and neurobiological outcomes in individuals with ADHD. Within this strand, the umbrella review published in eClinicalMedicine (2023) was selected as a central reference, as it synthesizes a large body of evidence and provides an updated assessment of intervention efficacy and methodological limitations.
2. Observational and epidemiological studies examining patterns of physical activity and excessive exercise in populations with ADHD. In this context, the study by Berger *et al*. (2014) was selected as a key contribution due to its large sample size, its focus on adult populations, and its distinction between different developmental trajectories of ADHD (childhood-only vs persistent).

Additional studies were included to support the neurobiological and pedagogical interpretation of the findings, particularly those addressing executive functions, arousal regulation, embodied cognition, and self- regulatory processes.

2.3 Analytical Framework and Criteria of Interpretation

The analysis of the selected literature was conducted using an interpretative framework centered on the concept of self-regulation, understood as a neurofunctional and educational

process involving the modulation of arousal, executive control, and bodily awareness.

To ensure conceptual replicability, the reviewed studies were examined according to the following criteria:

- Type of motor engagement - distinguishing between structured, programmed physical activity and spontaneous or self-directed exercise behaviors;
- Dosage parameters - including intensity, frequency, and recovery, when such information was reported;
- Primary outcomes - with particular attention to executive functions (attention, inhibition, cognitive flexibility);
- Indicators of excess or interference - such as rigidity, loss of flexibility, or negative impact on daily functioning.

These criteria allowed for a systematic comparison of studies that differ substantially in design and aims, making it possible to identify convergences and divergences in how physical activity operates as a regulatory factor in ADHD.

2.4 Statistical Analyses

No original statistical analyses were conducted for the purposes of this study. Quantitative results reported in the manuscript derive exclusively from the primary studies and reviews cited and are presented as originally described by their authors. Measures of effect size, odds ratios, confidence intervals, and significance levels are reported where relevant to contextualize the findings, without reanalysis or recalculation.

2.5 Ethical Considerations

This study does not involve new interventions on human or animal subjects, nor does it include the collection or analysis of original personal data. All data discussed are drawn from previously published studies that received ethical approval in accordance with the regulations applicable in their respective contexts. Therefore, institutional review board approval and informed consent statements are not applicable to the present work.

3. Results

3.1 Physical Activity and ADHD: Evidence from Structured Interventions

Recent evidence indicates that physical activity, when embedded within structured and well-calibrated protocols, can meaningfully support certain cognitive functions that are particularly sensitive to regulation in ADHD. In particular, the umbrella review published in eClinicalMedicine in 2023, synthesizing the results of multiple meta-analyses, provides an overall favorable picture of the effects of regular physical exercise on executive functions in children and adolescents with ADHD [4].

The findings show more consistent improvements in the domains of attention, behavioral inhibition, and cognitive flexibility. These outcomes are coherent with the activation of well-established neurobiological mechanisms, including increased catecholaminergic activity (dopamine and noradrenaline) within fronto- striatal circuits and elevated levels of brain-derived neurotrophic factor (BDNF), a key factor for synaptic plasticity and learning-related processes. In this sense, physical activity appears to act primarily as a modulator of arousal and functional efficiency within executive networks, rather than as a non-specific behavioral intervention [6–8].

The picture becomes less clear, however, when attention shifts to hyperactivity symptoms and emotional– social dimensions. In these areas, the effects of physical activity appear weaker and more heterogeneous, with variable results across the included studies. The authors of the review highlight substantial methodological heterogeneity, related to differences in the types of exercise proposed, as well as in the intensity, frequency, and duration of interventions, and in the assessment tools employed [4].

A further element of caution concerns the quality of the primary studies: only a limited proportion of randomized controlled trials meet rigorous methodological standards, and variability in exercise dosage makes it difficult to identify clear thresholds of effectiveness. Consequently, although an overall positive effect on executive functions emerges, the existing literature does not y*et al*low for a precise definition of which characteristics of motor interventions are necessary and sufficient to achieve stable and generalizable benefits [4].

3.2 Excessive Exercise in Adults with a History of ADHD: Epidemiological Evidence

When physical activity is observed not within structured protocols but as a spontaneous behavior in the general population, epidemiological studies reveal a complementary pattern. Within this framework, the study by Berger *et al*. (2014) investigated the association between ADHD symptoms and excessive physical exercise in a large sample of adults aged between 18 and 64 years [5].

The results show that individuals who reported a history of ADHD limited to childhood (coADHD) exhibited a significantly higher likelihood of displaying profiles of excessive exercise compared to the control group (9.0% vs. 2.7%), with an odds ratio of approximately 3.24. In contrast, this association was not significant in the subgroup of adults with persistent ADHD (aADHD), suggesting a meaningful differentiation between developmental trajectories of the disorder [5].

Excessive exercise was operationalized using the Exercise Dependence Scale (EDS-21), while ADHD symptomatology was assessed through standardized self-report instruments, including the Wender Utah Rating Scale (short version) for childhood symptoms and the ADHD Self-Rating Scale for current symptoms. The analyses accounted for several potential confounding variables, including sociodemographic factors, body mass index, anxiety and depressive symptoms, and disordered eating behaviors [5].

As acknowledged by the authors themselves, the cross-sectional nature of the study does not allow for causal inferences. Additional methodological limitations include reliance on retrospective recall of childhood symptoms, the absence of clinical diagnostic confirmation of ADHD, the lack of information on ongoing pharmacological or psychotherapeutic treatments, and the definition of excessive exercise based on self- reported thresholds. Moreover, the study focuses exclusively on excess, without a systematic assessment of moderate or potentially health-promoting forms of physical activity, making a dose–response interpretation difficult [5].

3.3 Summary of Results

Considered as a whole, the findings point to two distinct but complementary ways in which physical activity relates to ADHD. On the one hand, experimental and review-based studies indicate that structured and appropriately dosed motor activity can meaningfully support executive functions

that are particularly sensitive to cognitive regulation. On the other hand, epidemiological evidence suggests that, in a subset of individuals with a history of childhood ADHD, movement may take excessive forms and interfere with the organization of daily life [4, 5].

These results do not point to a contradiction between the two strands of research, but rather outline a continuum between adaptive regulation and compensatory excess, in which the meaning of movement depends on context, dosage, and the ways in which bodily experience is integrated. The same criteria could be applied by other researchers to alternative samples of the literature addressing physical activity and ADHD [4, 5].

Table 1: A comparative overview of the two strands of evidence, highlighting their complementary outcomes and implications.

Comparison Axis	Umbrella Review (2023)	Berger *et al*. (2014)	Interpretative Synthesis
Aim	To evaluate the therapeutic efficacy of structured motor interventions on cognitive and behavioral outcomes in individuals with ADHD.	To analyze the association between ADHD and excessive exercise (EXD) in the general population.	From therapy to compensation: two uses of the same regulatory mechanism.
Design	Umbrella review of meta-analyses (evidence-based), with emphasis on study quality, risk of bias, heterogeneity, and prediction intervals (PI).	Cross-sectional epidemiological study (n = 1,615; age range 18–64 years) using standardized self-report instruments (WURS-k, ADHD-SR, EDS-21).	Complementary approaches: experimental vs. descriptive, causality vs. correlation.
Main Outcomes	Consistent positive effects on attention, inhibition, and cognitive flexibility; weaker or inconsistent effects on hyperactivity and socio-emotional domains.	Excessive exercise more frequent in individuals with childhood ADHD (coADHD: 9.0% vs. 2.7%; OR ≈ 3.24); no significant association in adult ADHD (aADHD).	Physical activity operates as a double device: symptom regulation on one side and symptom expression on the other.
Neurobiological Interpretation	Increased catecholamine availability (dopamine, noradrenaline), increased BDNF, enhanced neuroplasticity, and improved activation of fronto-cingulate and striato-cerebellar networks.	Self-regulation through dopaminergic stimulation, potentially leading to compensatory or compulsive patterns of behavior.	Two poles of the same mechanism: adaptive modulation vs. hyper-control.
Pedagogical Implications	Importance of structuring and dosing physical activity (intensity, frequency, recovery), and integrating movement with awareness and educational objectives.	Early identification of excessive patterns (interference with daily life, compulsivity, physical or mental overload).	Education should promote balance rather than performance, with continuous monitoring and evaluation.

Source: authors' elaboration based on Berger *et al*. [5] and the Umbrella Review [4].

Notes and abbreviations —
coADHD: childhood-only ADHD; aADHD: persistent ADHD; EXD: exercise dependence / excessive exercise; EDS-21: Exercise Dependence Scale; WURS-k: Wender Utah Rating Scale (short form);
ADHD-SR: ADHD Self-Rating Scale; DA/NA: dopamine/noradrenaline; BDNF: Brain-Derived Neurotrophic Factor; PI: prediction interval.

4. Discussion

4.1 Physical Activity as a Double Regulatory Device: Between Balance and Excess

The results presented outline a framework that invites moving beyond a univocal reading of physical activity in ADHD. Movement emerges as an ambivalent device: it can support processes of cognitive self-regulation when embedded within structured and mindful frameworks, but it can also become rigid and take on
excessive compensatory forms when it operates as an unmediated spontaneous strategy. This is not a contradiction within the data, but rather the expression of two modes of functioning of the same regulatory mechanism [4, 5]. On the one hand, evidence from programmed motor interventions shows that physical activity, when calibrated in terms of intensity, frequency, and recovery, contributes to improving certain executive functions that are particularly sensitive to regulation in ADHD. On the other hand, the study by Berger *et al*. highlights how, in a subset of individuals with a history of childhood ADHD, movement may assume a compensatory function that tends to exceed the threshold of functionality, configuring itself as excessive exercise [4, 5].

This double polarity suggests that movement is neither inherently therapeutic nor intrinsically maladaptive. Rather, its meaning depends on the relationship the individual establishes with bodily experience and on the educational context in which that experience unfolds. The gesture may become regulation or control, care or rigidity, depending on whether it remains in dialogue with the person's overall experience or becomes detached from it. In this respect, regulation can easily shift into forms of normalization when practices aimed at balance become rigid and prescriptive—a dynamic consistent with Foucault's analysis of the transformation of regulatory practices into mechanisms of control [15].

4.2 A Shared Neurobiological Ground: Regulation and Hyper-Regulation

At the neurobiological level, the two sets of findings do not operate on separate planes, but instead share a common ground. The mechanisms involved—catecholaminergic modulation, arousal regulation, increased BDNF expression, and support of synaptic plasticity—are the same both in the beneficial effects observed in structured interventions and in the excessive exercise behaviors described in epidemiological contexts [6–9].

The difference therefore lies not in the circuits involved, but in the mode of activation and the degree of control exerted over those circuits. From this perspective, physical exercise can be interpreted as a form of neurofunctional self-regulation that, in the absence of educational mediation, risks transforming into hyper- regulation. What initially reduces internal restlessness and improves attentional control may become rigid, demanding ever greater intensity, time, and dedication, eventually interfering with other domains of life [6, 9].

This neurobiological continuity between adaptive regulation and compensatory excess helps to explain why physical activity can be both effective and problematic in ADHD: the body relies on the same channels in its attempt to achieve

balance, but without a framework of awareness, this regulatory effort may push beyond the measure. In this sense, regulation does not emerge from isolated effort, but from relational processes that sustain balance through mutual adjustment—a view consistent with Kropotkin's idea of mutual aid as a basic organizing principle [16].

4.3 From Movement to Meaning: Pedagogical Implications of Self-Regulation

When read through a pedagogical lens, these findings indicate that motor activity cannot be reduced to a mere tool for cognitive enhancement or symptom management. Movement represents a form of embodied thinking, a language through which the individual learns to recognize internal states, personal rhythms, and limits. From this perspective, educating through movement means educating to measure, rather than to performance [10–13].

Motor interventions become genuinely formative when they do not simply generate activation, but accompany the individual in developing bodily and relational awareness. The risk of excess, as highlighted by the study by Berger *et al*., is not only a clinical issue but also an educational indicator: it signals that the regulatory strategy has ceased to engage in dialogue with the person's global experience and has transformed into a ritual of control [5, 11].

Early recognition of signs such as compulsive engagement with training load, reduced capacity for recovery, irritability when activity is interrupted, or interference with school, work, and relational life thus becomes an integral part of a pedagogy of movement. The aim is not to limit action, but to restore its meaning.

4.4 Limits of the Evidence and the Need for Educational Mediation

The limitations highlighted in the literature—heterogeneity of protocols, the small number of high-quality randomized controlled trials, and difficulties in defining shared dosage thresholds—call for caution in interpreting the results and prevent physical activity from being considered a standardizable therapy. At the same time, these very limitations reinforce the need for educational mediation [4, 17].

If movement acts as a regulator only within certain thresholds, then the task of education is not to maximize the intensity of experience, but to help individuals recognize when activation supports balance and when it begins to undermine it. From this perspective, physical activity becomes a situated intervention, one that requires listening, adaptation, and continuous recalibration in relation to the person and the context [11, 13].

The findings discussed in this paper confirm that physical activity cannot be understood as a simple adjunctive tool in the management of attention-deficit/hyperactivity disorder (ADHD), nor as a practice that is inherently beneficial under all conditions. Movement emerges instead as a neurofunctional self-regulatory device whose effects depend on measure, context, and the quality of educational mediation. When physical activity is structured, calibrated, and accompanied by awareness, it can support executive functions and promote a dynamic balance between activation and control; when this framework is lacking, the same regulatory mechanisms may rigidify into compensatory patterns of excess.

The coexistence, within the literature, of evidence supporting the benefits of structured motor interventions and data indicating an increased prevalence of excessive exercise in individuals with a history of childhood ADHD should not be interpreted as a contradiction. Rather, it reflects the ambivalent nature of movement itself. The same neurobiological processes—catecholaminergic modulation, arousal regulation, and activity- dependent plasticity—can sustain adaptive regulation or contribute to forms of hyper-regulation when bodily engagement becomes inflexible and detached from broader experiential contexts.

From an educational perspective, excessive exercise should therefore not be viewed solely as a clinical problem, but as a meaningful signal. It indicates that movement has ceased to function as a dialogical practice and has instead become a strategy of control. Educating through movement thus implies educating to thresholds and limits, helping individuals recognize when action supports balance and when it begins to undermine it. In this sense, the formative value of physical activity lies not in increasing quantity or intensity, but in cultivating discernment, rhythm, and recovery.

The methodological limits of the current evidence base—heterogeneous protocols, a limited number of high- quality randomized controlled trials, and difficulties in defining shared dosage thresholds—preclude the formulation of standardized prescriptions. At the same time, these limits underscore the necessity of a pedagogical approach that treats physical activity as a situated practice rather than a universal intervention. Movement cannot be prescribed as a fixed dose; it must be accompanied as a language to be learned.

Accepting variability, limits, and uncertainty as intrinsic elements of bodily regulation allows physical activity to be re-situated within an ecological and neuropedagogical framework. Within this perspective, movement regains its original function: not as a tool for maximizing performance, but as a meaningful experience through which individuals learn to transform energy into awareness and action into balance.

5. Acknowledgments

The author wishes to acknowledge colleagues and educators with whom ongoing professional dialogue and pedagogical practice contributed to the maturation of the ideas discussed in this paper. Informal exchanges and critical conversations supported the refinement of the conceptual framework, without directly influencing the analytical decisions or conclusions presented. No personal communications requiring formal permission are included in this manuscript.

6. Funding

There are no sources of funding to declare.

7. Author contributions

Conceptualization, A.B.; methodology, A.B.; formal analysis, A.B.; investigation, A.B.; resources, A.B.; data curation, A.B.; writing—original draft preparation, A.B.; writing—review and editing, A.B.; visualization, A.B.; supervision, A.B.; project administration, A.B.

The author has read and agreed to the published version of the manuscript.

8. Conflict of interest

The author declares no conflict of interest.

9. Data availability statement

Data supporting these findings are available within the article or upon request.

10. Sample availability

The author declares that no physical samples were used in this study.

11. References

1. Rudd J, O'Connor D, Roberts S, Pesce C. Embodied cognition and motor learning in education: A critical review. Educational Psychology Review. 2024;36:45. doi:10.1007/s10648-023-09759-3.
2. Christiansen L, Beck MM, Bilenberg N, *et al*. Effects of exercise on cognitive performance in children and adolescents with attention deficit hyperactivity disorder. Journal of Clinical Medicine. 2019;8(6):841. doi:10.3390/jcm8060841.
3. Welsch L, Bruns J, Schmidt M, *et al*. The effect of physical activity interventions on executive functions in children with attention-deficit/hyperactivity disorder: A systematic review. Neuropsychology Review. 2021;31(4):593–612. doi:10.1007/s11065-020-09465-2.
4. Singh B, Olds T, Curtis R, *et al*. Physical activity and cognition: An umbrella review and meta–meta-analysis. British Journal of Sports Medicine. 2025;59(3):166–174. doi:10.1136/bjsports-2023-107728.
5. Dastamooz S, Jamali M, Jalili M, *et al*. The efficacy of physical exercise interventions on mental health, cognitive function, and attention-deficit/hyperactivity disorder symptoms in children and adolescents: An umbrella review. EClinicalMedicine. 2023;58:101881. doi:10.1016/j.eclinm.2023.101881.
6. Berger NAA, Müller A, Brähler E, *et al*. Association of symptoms of attention-deficit/hyperactivity disorder with excessive exercising in the general population. BMC Psychiatry. 2014;14:246. doi:10.1186/s12888-014-0246-0.
7. Ratey JJ. Spark: The Revolutionary New Science of Exercise and the Brain. New York: Little, Brown and Company; 2008.
8. Damasio A. Descartes' Error: Emotion, Reason, and the Human Brain. New York: G.P. Putnam's Sons; 1994.
9. Segev I, Gidon A, London M. Principles governing the operation of synaptic inhibition in dendrites. Neuron. 2012;75(2):330–341. doi:10.1016/j.neuron.2012.05.033.
10. Gao Z, Chen S, Stodden DF. Motor skill competence, physical activity, and cognitive function in children: A developmental perspective. Developmental Review. 2023;68:101071. doi:10.1016/j.dr.2023.101071.
11. Crispiani P, Capparucci ML, Giaconi C. Working with ADHD. London: Whurr Publishers; 2006.
12. Morin E. The Well-Made Head: Rethinking Reform, Reforming Thought. Paris: Éditions du Seuil; 1999.
13. Illich I. Deschooling Society. New York: Harper & Row; 1971.
14. Rogers CR. Freedom to Learn. Columbus (OH): Charles E. Merrill Publishing Company; 1969.
15. Foucault M. Discipline and Punish: The Birth of the Prison. New York: Pantheon Books; 1977.
16. Kropotkin P. Mutual Aid: A Factor of Evolution. Montreal: Black Rose Books; 1989.
17. Lindvall MA, Wienecke J, Bilenberg N. START—Physical exercise and person-centred cognitive skills training as treatment for adults with attention-deficit/hyperactivity disorder: A study protocol. BMC Psychiatry. 2023;23:356. doi:10.1186/s12888-023-04892-6.
18. Réol LA. Is physical activity good medicine for children and youth with attention-deficit/hyperactivity disorder? International Journal of Disability, Development and Education. 2024;71(2):163–176. doi:10.1080/1034912X.2023.2262469.
19. Abramovitch A, Dar R, Schweiger A, *et al*. Correlates of physical activity with impulsivity in adults with attention-deficit/hyperactivity disorder. Journal of Nervous and Mental Disease. 2013;201(10):859–864. doi:10.1097/NMD.0b013e3182a5c52f.

How to Cite This Article
Bozzato A. Exercise, Excess and Self-Regulation: Neurobiological and Pedagogical Perspectives on ADHD. International Journal of Multi Research. 2025; 2(1): 08-13.