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Peer Review

Review of: "Have Children Lost a Natural Training Ground for Attention? Manual Activities, Embodied Cognition, and the Expression of ADHD Symptoms"

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Review

This is a very interesting and stimulating commentary. My comments mainly aim to strengthen the author's argument by providing more precision and clarification in several sections of the manuscript.

Introduction (p.1)

The author could provide a more precise estimate of the increase in ADHD diagnoses, ideally with reference to a specific country or region. It would also strengthen the argument to better articulate the parallel increase in screen use among children in terms of historical timeframe: during which period did screen exposure substantially increase, and does this correspond to the same period during which ADHD diagnoses rose? In addition, are there estimates of the proportion of the increase in ADHD diagnoses that cannot be accounted for by improved recognition, changes in diagnostic criteria, or increased awareness?

Motor coordination impairments in ADHD (p.3)

Regarding impairments in motor coordination in ADHD, it would be useful to provide an estimate (or range) of the proportion of children with ADHD who present such impairments, as this would help readers appreciate the clinical significance of this aspect of the disorder.

Discussion of Ouyang et al. meta-analysis (p.4)

Regarding the findings of Ouyang et al., it would strengthen the manuscript to briefly comment on the methodological quality of the studies included in the meta-analysis, the magnitude of the observed

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effects, and the typical duration of the intervention programmes. These elements would help contextualize the robustness and practical significance of the findings.

Concept of “attentional intelligence” (p.4)

The author introduces the concept of “attentional intelligence,” which, as currently presented, appears to suggest a novel dimension of intelligence. However, I wonder whether this concept may overlap with the idea that embodied activities provide an important developmental context for attention. To me, these seem to be two distinct propositions.

Although this may not be the central focus of the paper, it would be helpful if the author could further justify the need for a new construct beyond existing concepts of attention (e.g., sustained attention, executive attention). Why is a new concept necessary rather than referring to “attention in embodied contexts” or “embodied attention”? Clarifying the theoretical added value of this construct would considerably strengthen the conceptual section.

Ecological modulation and causality (p.5)

The manuscript argues for a modulatory rather than causal role of reduced embodied activities in ADHD. However, contemporary causal models of neurodevelopmental disorders are generally multifactorial and assume interactions between genetic and environmental influences, rather than single direct causes. From this perspective, if reduced embodied activities contribute to increasing the proportion of children who reach clinically significant symptom levels, this could arguably still be considered a causal factor within a multifactorial developmental framework. I think this point deserves further discussion and clarification.

Clinical and educational implications (p.6)

I found the section on clinical and educational implications somewhat premature given the current state of evidence acknowledged later in the manuscript. Since the paper explicitly states that direct evidence is lacking and that substantial research remains to be conducted, I would suggest shortening this section considerably.

These implications could instead be mentioned more cautiously near the end of the manuscript, after the limitations and future research sections, or briefly integrated into the conclusion. In its current form, the section may give the impression that the proposed hypothesis is already sufficiently empirically established to justify practical recommendations.

Distinction between embodied activities and sport (p.7)

I wondered whether the author distinguishes between the embodied activities emphasized in the manuscript and more general physical or sports activities. The activities discussed here seem to involve finer motor coordination and sustained object manipulation, whereas sports may involve different forms of motor engagement.

This point connects directly to the discussion of motor-based interventions and physical activity studies, particularly in relation to the mixed or null findings mentioned later in the manuscript. Are these interventions truly targeting the same mechanisms as those hypothesized in the present paper? Regarding references 13 and 20 specifically, it would be helpful to provide a more concrete description of what is meant by “motor-based interventions” and “physical activities” in those studies.

Relation to broader discussions on free play and nature exposure

The manuscript discusses the recent decline in embodied activities, but I see an interesting parallel with broader developmental discussions suggesting that ADHD may also be linked to the historical reduction of free play, outdoor play, and unstructured interaction with natural environments.

Some authors have argued that this process began with increasingly structured schooling after the Industrial Revolution and intensified during the late twentieth century through changes in parenting practices and educational systems that reduced opportunities for autonomous outdoor play. This line of thinking also connects to Jaak Panksepp’s work on the developmental role of free play in animals.

Although this is not identical to the argument developed in the present manuscript, it appears conceptually related and may deserve at least brief mention in the discussion section, as a broader contextual framework concerning the ecological conditions of attentional development.

Embodied activities and video games

A further conceptual clarification may be useful regarding the distinction between embodied manual activities and certain contemporary digital activities such as video games. Some video games involve sustained visuomotor coordination, rapid attentional shifts, sensorimotor integration, procedural learning, and fine motor control. In this sense, they could also be considered “embodied” activities to some degree.

This raises an important theoretical question: what exactly differentiates the kinds of embodied activities emphasized in the present manuscript from interactive digital activities? Is the critical distinction truly embodiment per se, or rather the nature of attentional engagement involved?

For instance, many traditional manual activities (drawing, handwriting, crafting, building, playing a musical instrument) require relatively self-sustained attention, internally regulated pacing, and prolonged engagement without continuous external stimulation or reward salience. By contrast, many digital activities rely heavily on exogenous attentional capture, rapid reward cycles, and externally driven stimulation.

Clarifying whether the proposed mechanism concerns embodiment itself, self-regulated sustained attention, reduced external stimulation, slower temporal dynamics, or some combination of these factors would substantially strengthen the theoretical precision of the manuscript.

Overall, I found the manuscript original, stimulating, and thought-provoking. I believe these clarifications and conceptual refinements would further strengthen its theoretical coherence and scientific contribution.

Declarations

Potential competing interests: No potential competing interests to declare.