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Commentary

Move More, Sit Less and Sleep Well: An analysis of WHO movement guidelines for children under 5 years of age

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ABSTRACT

Insufficient physical activity (PA), prolonged sedentary behavior (SB) and inadequate sleep (SLP) are detrimental factors to population health. To address health issues caused by insufficient PA, excessive SB and poor SLP, the World Health Organization (WHO) updated PA and SB guidelines for all populations aged from 5 years to 65 years and older in 2020. For children under 5 years old, the WHO issued the first global guidelines for PA, SB and SLP (collectively refer to movement behaviors) in April 2019. The guidelines applied a holistic approach to promote health behaviors, filling the gap of no comprehensive global movement guidelines for young children. Although the guidelines for young children offer guidance for health promotion, some research and practice implications and other issues should be mentioned. This commentary includes considerations for the importance of the WHO guidelines for younger children, critical analysis of evidence for developing the guidelines, and recommendations for future research and practice. The aim of this paper is to further advance health research in younger populations.

Background

In 2019, the World Health Organization (WHO) released the *Guidelines on Physical Activity, Sedentary Behavior and Sleep for Children Under 5 Years of Age* (usually referred as young children). These recommendations provide innovative health guidelines integrating physical activity (PA), sedentary behavior (SB) and sleep duration (SLP), and provide detailed guidance on young children's health behaviors.[1] The release of these recommendations is a preliminary step for addressing young children's health issues derived from a lack of movement behaviors. These guidelines are also the first global recommendations to provide information on the use of young children's time during a 24-h period. In this paper, we provide our opinions on these new recommendations on the basis of our critical analysis and previous national guidelines for young children's movement and propose suggestions for future research and practice.[2,3]

Overview & significance of the WHO guidelines for young children

Using a transparent and rigorous systematic review process to evaluate present evidence from empirical studies, an expert panel synthesized further recommendations of study for developing the WHO guidelines for young children. Specific recommendations for PA, SB and SLP are presented in Table 1. The guidelines also propose two integrated recommendations for making young children healthier. In sum, '*Move More, Sit Less and Sleep Well*' is the most salient message of the guidelines. Significance in the areas of health promotion, surveillance, global strategies, and the 24-h paradigm are addressed in the following text.

Health promotion

Insufficient PA, excessive SB and inadequate SLP are prevalent across the world and they have been identified as major behavioral factors of young children's health and growth.[4–11] Because of these inadequacies, the need exists to design and implement effective approaches to improve young children's health outcomes. The guidelines for young children provide specific recommendations and thorough details on each movement component, including types, intensity, frequency, and duration. Stakeholders are better informed regarding time young children spend in PA, SB and SLP within 24 hours if they follow the guidelines. Young children are cared for or accompanied by their parents, guardians, or caregivers in various settings, so young children's movement behaviors are likely to be influenced by the parent or guardian. The movement guidelines for young children convey valuable messages to parents, guardians, or caregivers, making them more informed to better monitor and allocate young children's time in PA, SB and SLP during one day. Because young children are incapable of properly developing their movement behaviors on their own, parents, guardians, or caregivers are encouraged to accompany young children in engaging in PA, limiting SB, and developing better SLP habits.

The guidelines for young children have targeted a wide audience for children's health promotion. The audience includes a variety of experts from different professions. For example, policymakers can develop efficient strategies for promoting movement behaviors; researchers can design effective interventions or programs for increasing PA, reducing SB and improving SLP. The guidelines provide the opportunity to increase awareness to improve young children's healthy movement behaviors and increase long-term health benefits.

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Table 1
Specific recommendations on PA, SB and SLP for young children at different age periods.

	Infants	Children of 1–2 years old	Children of 3–4 years old
PA	● Engaging in various types of PA ● More is better	● At least 3 h of PA at any intensity per day ● MVPA is encouraged ● More is better	● At least 3 h of PA at any intensity per day ● MVPA is needed for at least 1 h per day ● More is better
SB	● SB should not be more than 1 h at a time ● ST is not recommended (less is better) ● Educational SB is encouraged	● SB should not be more than 1 h at a time ● ST is not recommended (1 year old) (less is better) ● ST is not recommended more than 1 h (2 years old) ● Educational SB is encouraged	● SB should not be more than 1 h at a time ● ST is not recommended more than 1 h ● Educational SB is encouraged
SLP	● 14–17 h with good sleep quality (0–3 months) ● 12–16 h with good sleep quality (4–11 months)	● 11–14 h with good sleep quality	● 10–13 h with good sleep quality
Integration	● Meeting all the recommendations for PA, SB and SLP is associated with greatest health benefits ● Preserving sufficient SLP while replacing SB with more moderate to vigorous PA can provide additional health benefits		

PA: physical activity; SB: sedentary behavior; SLP; sleep; h: hour; MVPA: moderate to vigorous physical activity; ST: sedentary screen time.

Surveillance of movement behaviors

In addition to providing opportunities to improve young children's movement behaviors, the guidelines for young children can be used for surveillance. In behavioral epidemiology, estimating the prevalence of meeting the PA, SB and SLP recommendations is regarded as an approach to assess physical activity levels, sedentary time, and sleep habits. However, previous surveys predominantly reported the prevalence in populations aged over 5 years. Little comparable data for PA, SB and SLP patterns in younger children is available. For this reason, the guidelines for young children establish a benchmark for different professionals to assess global levels of young children's PA, SB and SLP levels. To our knowledge, no global data on PA, SB, and SLP among young children exists, which impedes the understanding of patterns or levels of movement behaviors.[12] The guidelines for young children are an important call for designing new research studies to collect, design, and provide insight into increasing levels of movement behaviors among young children at the population level.

Conducting global surveillance studies for movement behaviors is a complex challenge due to the many limitations and factors affecting accurate measurement, such as measurement variability, variations in cultures and social norms, and the standardization of assessment survey times. At present, measures of movement behaviors in young children are either subjective or device-based, but these measurements have their own limitations. For example, using different cut-points of accelerometer across populations is not a valid strategy to determine young children's prevalence of meeting the moderate-to-vigorous physical activity (MVPA) recommendations. Beets et al. found noticeable variation in estimates of MVPA among different cut-points, which implied measurement of movement behaviors (and/or treatment of the data) affect the surveillance results.[13] Additionally, subjective measures (e.g., self-reported measures) are susceptible to recall errors and participants' cognitive ability. Thus, no 'gold standard' exists when assessing young children's movement behaviors. In this regard, future research is needed to develop standardized protocols to measure movement behaviors in young children.

An indispensable part of global strategy for active lifestyle

Commonly acknowledged is that unhealthy movement behaviors in people aged over 5 years old are highly prevalent around the world.[14,15] As part of the fight against physical inactivity, the WHO launched the *Global Action Plan on Physical Activity 2018–2030* (GAPPA) with an aim to reduce the prevalence of global physical inactivity. However, the GAPPA does not include young children as a target population. The release of the guidelines for young children possibly will enhance the awareness of improving active lifestyles for young children. The new guidelines for young children are the second public health initiative following the first PA guidelines in 2010 targeting people over 5 years of age. The new ones fill the gaps in the previous WHO recommendations on PA for all ages across the span. No global or national surveillance of PA for children younger than the age of 5 years existed. These issues should be resolved immediately.

A plethora of evidence exists demonstrating that policy plays a vital role in addressing public health concerns. Hence, governments need to respond with policy actions aiming to ensure that young children obtain sufficient amounts of PA, limit SB, and obtain adequate SLP. The guidelines for young children are helpful in establishing public health policies for young children's lifestyles at the global, national, regional, and local levels. Therefore, the successful policies for improving young children's PA and SLP while limiting SB must be developed. With the introduction of the guidelines for young children, well-designed policies for improving movement behavior in young children should be developed and implemented as soon as possible.

A call for a new paradigm for future research in young children

The importance of movement behaviors in a 24-h day is well-recognized.[1,16,17] The research paradigm of studying codependence of PA, SB and SLP is needed. Several reasonable rationales exist to employ the 24-h movement behavior as a research paradigm. First, within a 24-h day, PA, SB, and SLP impact all individuals' health at all ages. Each movement component is individually linked with health indicators. From the perspective of time-use framework in behavioral epidemiology, studies cannot neglect the effect of each movement component on health.[18] Second, studies have shown an interrelationship among PA, SB, and SLP in young children. Existing studies support that one single healthy movement behavior can be attenuated by other unhealthy movement behaviors. For example, Chaput et al. found that bad SLP habits and/or excessive SB may lessen the health benefits from sufficient PA.[19] The evidence implies that an interaction among PA, SB and SLP is linked with health outcomes. In considering the guidelines for young children that combine all three movement behaviors, future health research is encouraged to collect and/or analyze data on them simultaneously and design an integrated or holistic approach to examine the effects of movement behaviors on health. Third, accumulating multiple healthy movement behaviors will likely generate more desired health benefits when compared with having one single healthy movement behavior.[11] Over the past decade, an increasing number of studies has examined effects of multiple movement behaviors on health indicators. Unfortunately, few have been completed that focus on young children around the world. To better understand the pattern of movement behavior and promote health in young children, studying multiple movement behaviors concurrently is a necessity, especially for studies using interventional

design. In general, with the growing evidence in health research for young children, a primary focus in future studies should examine the effects of integrating PA, SB and SLP on health outcomes.

Evidence for developing the new WHO guidelines for young children

Although the guidelines for young children were developed based on available evidence and a transparent process, a need still exists for future research. First, the quality of evidence of the studies used for developing the guidelines is based on evidence graded as low. For example, when examining the relationship between PA and adiposity, the majority of included studies were cross-sectional design, which produced evidence graded as low. Even when randomized controlled trial studies were included, the derived evidence grade was still low. Future WHO movement guidelines can improve scientific grading when more robust, high-quality research designs are used.

Furthermore, although the guidelines claim that PA is positively related to young children's cardiometabolic health, a recent systematic review only including prospective and longitudinal studies by Pate et al.[20] argued that insufficient evidence was found to support PA's impact on cardiometabolic health. Therefore, the relationship between PA and young children's cardiometabolic health should be re-examined. This discrepancy also suggests that more high-quality evidence is needed to confirm the associations between movement behaviors and health outcomes in young children.

Finally, the guidelines for young children propose two integrated recommendations for young children's greater health benefits. At present, a novel approach, compositional data analysis (CoDA), provides evidence for such proposed recommendations. However, arguments regarding these two proposed recommendations should be noted. No convincing evidence is available to support the relationships between health indicators and the combination of meeting all PA, SB and SLP recommendations. The WEB ANNEX Evidence Profiles does not include any studies examining the relationships between health indicators and meeting all recommendations. In addition, the evidence supporting the integrated recommendations for greater health benefits was largely rated as low. Therefore, reconsideration of these two integrated recommendations is necessary.

Implications of the WHO guidelines for health promotion in young children

Based on the mentioned-above analysis on the WHO guidelines, some implications for future research and practice are concluded as follows.

- Recommendations for future research (these are listed in the guidelines)
  - Examine the 24-Hour movement patterns;
  - Standardize the measurement of movement behavior in young children;
  - Investigate the relationships between 24-h movement patterns with a wider range of health indicators based on improved studies;
  - Evaluate the combined effects of different recommendations on health;
  - Examine the effectiveness of movement behavior interventions.
- Recommendations for policy and practice (these are not listed in the guidelines)
  - Disseminate the WHO movement guidelines effectively;
  - Formulate policy to improve movement behavior in young children;
  - Incorporate promotion of healthy movement behavior of young children into global active lifestyle frameworks;
  - Increase parents', guardians' and caregivers' awareness of promoting movement behavior;
  - Regulate young children's healthy movement behaviors through interactive approaches.

Summary

The launch of these movement guidelines for young children is a milestone in public health and advances the call for practical actions to make young children active and healthy. Even though the guidelines provide supportive and valuable information for improving young children's active and healthy lifestyle, benefiting their healthy development, and disseminating practical implications for governmental sectors, communities, families, parents/caregivers and professionals, the guidelines have limitations that should be addressed by research in the future.

Submission statement

The manuscript has not been published and is not under consideration for publication elsewhere.

Authors' contributions

S.C and Y.L. concepted and designed the study. S.C and J H wrote the manuscript. G.W and Y.L. comented and edited the final document.

Conflict of interest

The authors declare that they have no conflict of interest regarding this study.

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