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EDITORIAL

Epidemiology and Population Health

24-h movement behaviors and the perinatal period

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The 24-h movement guidelines improved upon decades of single-behavior recommendations by providing guidance for all three behaviors (physical activity [PA], sedentary time, and sleep) that occur within the 24-h day [1]. This multi-behavior approach gained attention during the COVID-19 pandemic as daily routines were drastically disrupted [2]. Many were less active, had more sedentary time and light physical activity, and more sleep (though of varying amounts) [2]. The pandemic-mediated shift in movement patterns experienced by a vast segment of the population mirrors the typical change in pregnancy; PA gradually declines, with impacts to sedentary time and sleep.

These changes are recently documented by Dieberger et al. [3]. who conducted a 24-h movement behaviors assessment in pregnancy, moreover in mothers living with obesity. In this secondary data analysis of a multi-country randomized control trial, the group evaluated the relationship between moderate-to-vigorous PA (MVPA) and sedentary time shifts in pregnancy and infant health outcomes. Higher average and less reduction in MVPA across pregnancy were related to lower neonatal adiposity in male infants and an unexpected discovery that higher average sedentary time across pregnancy was related to lower cord blood C-peptide in female infants [3]. These findings extended past literature by examining a sex difference in the impact of changing maternal physical activity and sedentary time [4], as this result was found for male adiposity, but not females.

It is exciting to see the translation of 24-h movement behavior research to obstetrics. Given the potential for inadequate PA, sedentary time, and sleep in pregnancy to have life-long effects on the mother and child, the field should advance investigations in three emerging areas: combining innovative and collaborative measurements of PA, enacting a multi-behavior approach to interventions targeting improvements in maternal and neonatal health, and engaging with pregnant individuals; the end-users.

First, perinatal researchers are encouraged to collaborate with physical activity and sleep experts to further explore novel metrics of movement behaviors across pregnancy and postpartum. A key strength of Dieberger was leveraging an existing cohort with device-based measures across pregnancy, but a limitation was their small sample size for clinical measurements. Like existing databases for children [5], the curation of opportunities to combine device-based 24-h movement with robust clinical measures across the perinatal period and across studies will allow detailed exploration of movement behaviors and health outcomes in maternal-infant dyads. Combined databases and repositories may prompt exploration of emerging findings in general adult literature, such as quantifying the health-derived benefits of shorter bouts of moderate PA or even MVPA or vigorous PA (e.g., vigorous intermittent lifestyle PA) [6], and steps via varying devices [7]. Such investigations would help to inform the optimal pattern and amounts of maternal movement behaviors supportive of optimal pregnancy outcomes such as reduced risk of gestational diabetes, excess gestational weight gain, and postpartum weight retention. These efforts would also help to yield actionable PA, sedentary time, and sleep targets through relatable metrics and eventually, trimester-specific guidelines.

Second, applying a full 24-h movement approach to behavioral interventions in pregnancy may improve upon interventions that focus on only a single behavior and yields minor improvements to PA [7]. Dieberger and colleagues addressed PA and sedentary time in a multi-behavior fashion but did not capture sleep, a critical behavior across pregnancy and within the 24-hour day. Incorporating additional support to reduce sedentary time and enhance sleep may improve maternal health and set the stage for adoption of healthy movement behaviors in the child [8]. Indeed, we caution an interpretation of the current data; that higher sedentary time across pregnancy was beneficial to child health, as others have found opposite results for maternal health [9]. These results in combination with approaches such as compositional data analysis, a method that represents substitution of one behavior for another, in the 24-hour day, may help develop a 24-hour movement program [9]. There is currently no "24-h movement" intervention (i.e., changing all three movement behaviors) per se yet in pregnancy, but the field awaits this approach in any population.

Finally, harnessing opportunities such as the updated Dietary Reference Intakes for Energy (DRI) [10] and related reports are prime moments to engage with end-users to convey a relatable message about being active throughout pregnancy and enacting change. The revised DRIs are adjusted for the level of PA (range from inactive to very active) and promise to inform energy intake (relative to activity level) prescriptions for appropriate weight gain in each body mass index for individuals who are pregnant [10]. A shortcoming of the DRI is lack of guidance for estimating PA level in pregnant individuals. Obstetrics lacks a compendium of PA, which makes the link between PA, energy expenditure, and health (e.g., weight regulation) difficult to quantify. Creation of such compendium is a clear future direction for researchers. Moreover, the release of these public health recommendations is an important moment to involve interested parties (e.g., individuals who are pregnant, medical personnel, and public health practitioners) in a conversation on PA during pregnancy. These conversations may begin with uncovering effective implementation strategies to adopt and maintain use of the DRIs in practice, and progress to discussing multi-level supports for all pregnant individuals to be active and sleep well.

Through collaborative and modern PA assessment, a 24-h approach, and translational efforts, we may begin to move towards real-world recommendations for 24-h movement behaviors. Dieberger et al. [3]. provides a call to action, and it is up to pregnancy, physical activity, and sleep researchers to come together for maternal and child health.

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REFERENCES

1. Tremblay MS, Carson V, Chaput JP, Connor Gorber S, Dinh T, Duggan M, et al. Canadian 24-hour movement guidelines for children and youth: an integration of physical activity, sedentary behaviour, and sleep. Appl Physiol Nutr Metab. 2016;41:S311–327.
2. Paterson DC, Ramage K, Moore SA, Riazi N, Tremblay MS, Faulkner G. Exploring the impact of COVID-19 on the movement behaviors of children and youth: a scoping review of evidence after the first year. J Sport Health Sci. 2021;10:675–89.
3. Dieberger AM, Obermayer-Pietsch B, Harrieter J, Desoye G, van Poppel M, Group DCI. Physical activity and sedentary time across pregnancy and associatiosn with neonatal weight, adiposity, and cord blood parameters: a secondary analysis of the DALI study. Int J Obes. 2023.
4. Jones MA, Whitaker K, Taverno Ross SE, Davis K, Libertus K, Gibbs BB. Maternal sedentary behavior and physical activity across pregnancy and early childhood growth. Child Obes. 2022;18:399–408.
5. Atkin AJ, Biddle SJH, Broyles ST, Chinapaw M, Ekelund U, Esliger DW, et al. Harmonising data on the correlates of physical activity and sedentary behaviour in young people: Methods and lessons learnt from the international Children's Accelerometry database (ICAD). Int J Behav Nutr Phys Act. 2017;14:174.
6. Stamatakis E, Huang BH, Maher C, Thogersen-Ntoumani C, Stathi A, Dempsey PC, et al. Untapping the health enhancing potential of Vigorous Intermittent Lifestyle Physical Activity (VILPA): rationale, scoping review, and a 4-pillar research framework. Sports Med. 2021;51:1–10.
7. Sharp KJ, Sherar LB, Kettle VE, Sanders JP, Daley AJ. Effectiveness of interventions to increase device-measured physical activity in pregnant women: systematic review and meta-analysis of randomised controlled trials. Int J Behav Nutr Phys Act. 2022;19:142.
8. Kracht CL, Redman LM, Bellando J, Krukowski RA, Andres A. Association between maternal and infant screen time with child growth and development: a longitudinal study. Pediatr Obes. 2023;18:e13033. https://doi.org/10.1111/ijpo.13033.
9. Sandborg J, Migueles JH, Soderstrom E, Blomberg M, Henriksson P, Lof M. Physical activity, body composition, and cardiometabolic health during pregnancy: a compositional data approach. Med Sci Sports Exerc. 2022;54:2054–63. https://doi.org/10.1249/MSS.0000000000002996.
10. National Academies of Sciences E, Medicine. Dietary Reference Intakes for Energy. https://doi.org/10.17226/26818. (Washington, DC: The National Academies Press; 2023).

AUTHOR CONTRIBUTIONS

CLK conceived the work that led to submission, and all authors played an important role in interpreting the results. All authors drafted or revised the paper, approved of the final version, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

COMPETING INTERESTS

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ADDITIONAL INFORMATION

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