

(Continued from previous page)

Results: Based on the evidence from the Canadian systematic reviews and the updated systematic reviews in Australia, the Consensus Panel agreed to adopt the Canadian recommendations and, apart from some minor changes to the wording of good practice statements, keep the wording of the guidelines, preamble and title of the Canadian Guidelines. The Australian Guidelines provide evidence-informed recommendations for a healthy day (24-h), integrating physical activity, sedentary behaviour (including limits to screen time), and sleep for infants (<1 year), toddlers (1–2 years) and preschoolers (3–5 years).

Conclusions: To our knowledge, this is only the second time the GRADE-ADOLOPMENT approach has been used. Following this approach, the judgments of the Australian Consensus Panel did not differ sufficiently to change the directions and strength of the recommendations and as such, the Canadian recommendations were adopted with very minor alterations. This allowed the Guidelines to be developed much faster and at lower cost. As such, we would recommend the GRADE-ADOLOPMENT approach, especially if a credible set of guidelines, with all supporting materials and developed using a transparent process, is available. Other countries may consider using this approach when developing and/or revising national movement guidelines.

Keywords: Methodolo304(reach,u5e)-k

Methods

Guideline ADOLOPMENT structure

The GRADE-ADOLOPMENT process followed the framework described in detail by Schünemann et al.

SGT, TH, TSO) at appropriate time points in the process. As the Australian guidelines sought to adopt or adapt the Canadian Guidelines using the GRADE-ADOLPMENT process (assuming these would be appropriate as per Step 3 – see below for details), it was agreed that the Principal Investigator from the Canadian Guidelines (MST) and the Principal Investigator from the Australian Guidelines (ADO) would be part of each other's country leadership group to ensure communication and collaboration across countries. This was particularly important as Canada had not yet completed their guideline development process (their second consensus meeting occurred in January 2017) and it was critical that the Australian team were aware of how the Canadian process was progressing, especially in light of any changes that were made. This was necessary as both countries were working towards a co-release of the guidelines.

Step 2: Formation of a Consensus Panel. A guideline development Consensus Panel was also formed which included expert researchers, representatives from key stakeholder groups (including parents and Indigenous communities), and methodology experts (Table 1). The role of this -1308r72(ois1co)122pertierteert-

Table 1 Guideline Consensus Panel

Table 1 Guideline Consensus Panel (Continued)

Panel Member	Affiliation	Role	Conflict of Interest Declaration
Trina Hinkley	Deakin University, Melbourne, Australia	Researcher, expert SB, PA	<p>Has spoken at conferences/provided speeches and lectures on topics such as those in published journal articles</p> <p>Funded by NHMRC ECF: PA/SB in early childhood. Pending ARC DECRA focusing on screen time in early childhood</p> <p>Secretary International Society of Behavioural Nutrition and Physical Activity and Member Early Care and Education SIG (previously co-chair).</p> <p>Has received research grants from Deakin University, Universities Australia: German Academic Exchange Service, National</p>

found in Appendix 4 of the GRADE-ADOLEPMENT paper [11] was used (see Table 3). Based on this information, the Leadership Group made a decision to update the Canadian systematic reviews focusing only on the critical outcomes (see [10] for a list of these for each systematic review) for randomized controlled trials and cohort study designs because the sources of these reviews were older than three months (i.e., they had an end date before November 2016) [11]. We decided not to update the reviews for non-critical outcomes (see [10] for a list of these) or for cross-sectional studies because the consensus was that even if an update was to uncover new studies, they would be graded low quality and as such, would not result in a change to the final guideline. The Australian Leadership Group made the PICOs that guided the four systematic reviews for the 2017 Canadian Guidelines available for comment by the Australian Consensus Panel prior to the Consensus meeting. The Panel was asked to comment on the appropriateness of each of the PICOs for the Australian context. Some of the initial comments sought clarification on the selection of specific search terms for some of the outcomes. These were resolved by indicating that these would be or were captured in the Australian or Canadian searches, respectively,

although this information was not clear in the PICOs. Other queries related to the inclusion of information in the summary tables or in the PROSPERO registration or to definitions of specific terms. Where changes were suggested, these were discussed by the Leadership Group and agreement reached. None of the proposed changes were

s1(n21)24(st)a7(e)13(er)18(i)21(a)13(l)-217(e)1o(st)11(u)gh(an)-364(t26

naturally occurring nap) performed better on selected cognitive tasks compared with those in the no-nap condition (who were visited shortly before they were scheduled to take a nap) [34, 35]. The longitudinal study assessed sleep trajectories annually using parent-report from age 2.5 years to 10 years with follow-up at age 10. Results showed that compared to 11-h sleepers, the odds ratio of having poor receptive vocabulary at age 10 was 2.67 [95% confidence interval (CI): 1.24–5.74, $P = 0.012$] for short persistent sleepers and 1.66 (95% CI: 1.06–2.59, $P = 0.026$) for 10-h sleepers [36]. The assessed quality of overall evidence using GRADE criteria for this outcome (“Moderate” for RCTs and “Very Low” for longitudinal studies) did not change as a result of including these additional studies.

The final systematic review update included studies that investigated combinations of physical activity, sedentary behaviour, and sleep and their association with health indicators. The updated searches yielded 518 studies, with five remaining after screening titles and abstracts. No studies met the inclusion criteria and as such, these results were identical to those from the 2017 Canadian review [18].

Agreement in the interpretation of the evidence was reached for each behaviour and for the integration of the three behaviours. Based on the evidence from the Canadian systematic reviews and their GRADE tables and recommendations, in combination with the updated systematic reviews in Australia, the Consensus Panel agreed to adopt the Canadian recommendations. Once it was decided that Australia would adopt the recommendation from the modified EtD framework, the Consensus Panel then decided if they wanted to keep the guideline wording of the Canadian Guidelines. There were a number of minor changes to the wording of the guidelines, preamble and title that were made by the Australian Consensus Panel. Changes were not made to the guideline recommendations per se but rather to the wording of good practice statements [14]. When a change was suggested, the rationale for the change was put forward by the Panel member and discussed. The Panel determined if the proposed change would be consistent with

Table 4 Differences in the Australian Guidelines compared to the Canadian Guidelines

educators, to be already occurring. There was awareness that educators, health workers and parents/carers all play an important role in dissemination and implementation. However, parents felt there needed to be clear messaging to minimise feelings of guilt that may be associated with not meeting the Guidelines. It was also suggested that a glossary of terms be included to provide examples and definitions for some of the terms used in the Guidelines such as sedentary screen time, sleep hygiene, energetic play, and tummy time.

A small number of changes were made to the draft Guidelines as a result of the stakeholder consultation. This included the addition of an age range in the title. Around 80% of respondents to the online survey thought the Guidelines should include a specific age

- Coordinating an effective launch of the guidelines and support for guideline dissemination and integration over a three-year period.
- Identifying the health, education, developmental and economic benefits expected with comprehensive dissemination, implementation and integration of the guidelines into early childhood curricula with appropriate community support.
- Assessing the expected multiplier return-on-investment to the health system of investing in well-disseminated and integrated Guidelines for early childhood, given the expected cost savings from improving the trajectory of integrated movement behaviours and lifestyles from early childhood.
- Ensuring maximum reach and dissemination of the guidelines and making them part of public culture.
- Identifying target audiences and how to reach and engage them.
- The planning and development required to inform social marketing and creative idea development and refinement to actively persuade uptake and reduce perceived costs of improving movement behaviours. This has been identified [28] as key in optimising community ownership of key messages, parent, practitioner and child choices, and long term behaviour change.
- Describing the web-based “digital hub”, stakeholder outreach, and comprehensive communications strategies needed to facilitate sustained implementation and activation of the guidelines following the initial guideline launch, including a social media strategy.

Guid

- Specifying components of the post-launch campaign for parents/carers and educators (primary target audience) and other key influencers.
- Describing the resources required for a comprehensive approach to optimising guideline impacts and their expected cost.
- Evaluating changes in awareness and knowledge of the guidelines and in child movement behaviours.

Research gaps and surveillance recommendations
Research gaps were identified through the updated systematic reviews and during discussion at the Consensus

Panel meeting and are summarised in Table 6. These were determined independent of the research gaps identified in the Canadian Guideline development process. As a result, there may be some overlap between the two countries. As 24-h movement guidelines are new in the early years, there are many gaps in the research and evaluation, providing fertile ground for researchers in the future.

A sub-committee examined the surveillance recommendations made by the Canadian Guideline Development Panel (see [10]) and considered these for adoption in the Australian context. The Australian sub-committee adopted the Canadian recommendations and agreed with the rationale for those guidelines which were not

recommended for surveillance until further research has been completed (see Table 7).

The Australian sub-committee recommended using a representative day (e.g., previous day) for surveillance of each of the behaviours rather than an average day (as recommended by the Canadian Surveillance Sub-committee). The rationale for recommending a representative day was that it would provide a more accurate recall and hence better estimate the prevalence of the guideline in a population representative sample [37, 38]. It would also allow direct comparison with previous national representative data collected using the same approach as part of the Australian Health Survey [39].

Discussion

This paper describes the process and outcomes to develop the Australian 24-Hour Movement Guidelines for the Early Years (Birth to 5 years): An Integration of Physical Activity, Sedentary Behaviour, and Sleep. These integrated guidelines represent a shift in thinking away from separate guidelines for each of these behaviours. The feedback to date is that this integrated approach has been well received by key stakeholders. The Australian Consensus Panel was also positive in their response to the task of developing integrated guidelines. This was made considerably easier by having the draft Canadian

Table 7 Surveillance recommendations for the Australian 24-Hour Movement Guidelines for the Early Years (birth to 5 years).
(adapted from the Surveillance recommendations for the Canadian 24-Hour Movement Guidelines for the Early Years)

Physical activity			
Australian Guideline	Specific Surveillance Recommendation	Rationale for specific surveillance recommendation	Recommendation for minimum inclusion in overall guideline surveillance ^a
Infants (aged <1 year)			
Being physically active several times in a variety of ways, particularly through interactive floor-based play; more is better.	None	Currently there are no available benchmarks, further research is required	No
For those not yet mobile, this includes at least 30 min of tummy time spread throughout the day while awake	Total tummy time on the previous day is ≥ 30 min while awake ^b	A representative day provides a more accurate recall and hence better estimate of the prevalence of the guideline in a population representative sample [37,	

Table 7 Surveillance recommendations for the Australian 24-Hour Movement Guidelines for the Early Years (birth to 5 years). (adapted from the Surveillance recommendations for the Canadian 24-Hour Movement Guidelines for the Early Years) (Continued)

Or sitting for extended periods	None	Currently there are no available benchmarks to be more specific for "sitting for extended periods", further research is required.	No
When sedentary, engaging in pursuits such as reading and storytelling with a caregiver is encouraged	None	Currently there are no available benchmarks, further research is required	
Preschoolers (aged 3–5 years)			
Not being restrained for more than 1 h at a time (e.g., in a stroller or car seat).	Time spent restrained is ≤ 1 h at a time ^d	Empirical evidence substantiating this threshold is lacking though this threshold is aligned with earlier guidelines and has met with stakeholder and end-user acceptance	No
Or sitting for extended periods	Bouts of sedentary time	Currently there are no available benchmarks to be more specific for "sitting for extended periods", further research is required.	No
When sedentary, engaging in pursuits such as reading and storytelling with a caregiver is encouraged	None	Currently there are no available benchmarks, further research is required	No
Screen time			
Guideline	Specific Surveillance Recommendation	Rationale for specific surveillance recommendation	Recommendation for minimum inclusion in overall guideline surveillance
Infants (aged <1 year)			
Screen time is not recommended.	Previous day includes no screen time ^c	A representative day provides a more accurate recall and hence better estimate of the prevalence of the guideline in a population representative sample [37, 38]. This threshold is aligned with earlier guidelines and has met with stakeholder and end-user acceptance, and is consistent with evidence in this age group indicating that no screen time is better than some screen time and that less screen time is better than more screen time, for health and development.	Yes
Toddlers (aged 1–2 years)			
For those younger than 2 years, sedentary screen time is not recommended.	Previous day includes no screen time ^c	A representative day provides a more accurate recall and hence better estimate of the prevalence of the guideline in a population representative sample [37, 38].	Yes
For those aged 2 years, sedentary screen time should be no more than 1 h per day; less is better	Sedentary screen time on previous day is ≤ 1 hour ^b	A representative day provides a more accurate recall and hence better estimate of the prevalence of the guideline in a population representative sample [37, 38]. It allows direct comparison with previous national representative data from the Australian Health Survey [39]	Yes
Preschoolers (aged 3–5 years)			
Sedentary screen time should be no more than 1 hour per day; less is better.	Sedentary screen time on previous day is ≤ 1 hour ^b	A representative day provides a more accurate recall and hence better estimate of the prevalence of the guideline in a population representative sample [37, 38]. It allows direct comparison with previous national representative data from the Australian Health Survey [39]	Yes

exactly to 24 h, (e.g., for preschoolers, at least 3 h of physical activity, no more than 1 h of sedentary screen time or less than 1 h of being restrained, and 10–13 h of sleep). For example, if one child sleeps 13 h and another 10 h, the latter has three additional hours of time to be

References

1. Department of Health, Australian Government. Move and play every day: National Physical Activity Recommendations for children 0–5 years. 2010. <http://www.health.gov.au/internet/main/publishing.nsf/content/health-pubhlth-strateg-phys-act-guidelines#npa05>.
2. Department of Health PA, Health Improvement and Protection. Start active, stay active - a report on physical activity for health from the four home countries' chief medical officers. UK: Department of Health PA, Health Improvement and Protection; 2011.
3. Tremblay MS, LeBlanc AG, Carson V, Choquette L, Connor Gorber S, Dillman C, Duggan M, Gordon MJ, Hicks A, Janssen I. Canadian sedentary behaviour guidelines for the early years (aged 0–4 years). *Appl Physiol Nutr Metab*. 2012;37(2):370–80.
4. Tremblay MS, LeBlanc AG, Carson V, Choquette L, Connor Gorber S, Dillman C, Duggan M, Gordon MJ, Hicks A, Janssen I, et al. Canadian physical activity guidelines for the early years (aged 0–4 years). *Appl Physiol Nutr Metab*. 2012;37(2):345–56.
5. Tremblay MS, Carson V, Chaput J-P, Connor Gorber S, Dinh T, Duggan M, Faulkner G, Gray CE, Gruber R, Janson K, 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(6):S311–27.
6. Carson V, Chaput J-P, Janssen I, Tremblay MS. Health associations with meeting new 24-hour movement guidelines for Canadian children and youth. *Prev Med*. 2017;95:7–13.
7. Janssen I, Roberts KC, Thompson W. Is adherence to the Canadian 24-hour movement behaviour guidelines for children and youth associated with improved indicators of physical, mental, and social health? *Appl Physiol Nutr Metab*. 2017;42(7):725–31.
8. Roman-Viñas B, Chaput J-P, Katzmarzyk PT, Fogelholm M, Lambert EV, Maher C, Maia J, Olds T, Onywera V, Sarmiento OL. Proportion of children meeting recommendations for 24-hour movement guidelines and associations with adiposity in a 12-country study. *Int J Behav Nutr Phys Act*. 2016;13(1):123.
9. Alonso-Coello P, Schünemann HJ, Moberg J, Brignardello-Petersen R, Akl EA, Davoli M, Treweek S, Mustafa RA, Rada G, Rosenbaum S. GRADE evidence to decision (EtD) frameworks: a systematic and transparent approach to making well informed healthcare choices. 1: introduction. *BMJ*. 2016;353: i2016.
10. Tremblay MS, Chaput JP, Adamo KB, Aubert S, Barnes JD, Choquette L, et al. Canadian 24-Hour Movement Guidelines for the Early Years (0-4 years): An Integration of Physical Activity, Sedentary Behaviour, and Sleep. *BMC Public Health*. 2017;17(5) [in press].
11. Schünemann HJ, Wiercioch W, Brozek J, Etzeandia-Ikobaltzeta I, Mustafa RA, Manja V, Brignardello-Petersen R, Neumann I, Falavigna M, Alhazzani W. GRADE evidence to decision (EtD) frameworks for adoption, adaptation, and de novo development of trustworthy recommendations: GRADE-ADOLOPMENT. *J Clin Epidemiol*. 2017;81:101–10.
12. Brouwers MC, Kho ME, Browman GP, Burgers JS, Cluzeau F, Feder G, Fervers B, Graham ID, Grimshaw J, Hanna SE. AGREE II: advancing guideline development, reporting and evaluation in health care. *Can Med Assoc J*. 2010;182(18):E839–42.
13. Balshem H, Helfand M, Schunemann HJ, Oxman AD, Kunz R, Brozek J. GRADE guidelines: 3. Rating the quality of evidence. *J Clin Epidemiol*. 2011;64(4):401–6.
14. Guyatt G, Oxman AD, Akl EA, Kunz R, Vist G, Brozek J. GRADE guidelines: 1. Introduction-GRADE evidence profiles and summary of findings tables. *J Clin Epidemiol*. 2011;64(4):383–94.
15. Carson V, Lee E-Y, Hewitt L, Jennings C, Hunter S, Kuzik N, Stearns JA, Powley Unrau S, Poitras VJ, Gray CE, et al. Systematic review of the relationships between physical activity and health indicators in the early years (0–4 years). *BMC Public Health*. 2017;17(5). [in press].
16. Poitras VJ, Gray CE, Janssen X, Aubert S, Carson V, Faulkner G. Systematic review of the relationships between sedentary behaviour and health indicators in the early years (0–4 years). *BMC Public Health*. 2017;17(5). [in press].

39. Australian Bureau of Statistics. In: Australian Bureau of Statistics, editor. 4364.0. 55.004 - Australian health survey: physical activity, 2011–12. Canberra; 2013.
40. Eckermann S, Dawber J, Yateman H, Quinsey K, Morris D. Evaluating return on investment in a school based health promotion and prevention program: the investment multiplier for the Stephanie Alexander kitchen garden National Program. *Soc Sci Med.* 2014;114:103–12.
41. Quinsey K, Condon-Paoloni D, Dawber J, Eckermann S, Fildes D, Grootemaat P, Morris D, Nielsen W, Yeatman H. Combining realism with rigour: evaluation of a national kitchen garden program in Australian primary schools. *Eval J Australasia.* 2014;14(2):17–24.