



Measuring 24 hour movement of pre-school children: how do we measure sleep?

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About the research

Emerging evidence suggests that ‘healthy sleep’, including sleep duration, quality and timing, plays an important role in the health and development of young children.

Recently, there has been an increased public health interest in healthy sleep. This comes in light of emerging evidence in support of viewing the whole 24 hour period of the day, and the behaviours this encompasses (physical activity, sedentary behaviour and sleep), as one. Previously these behaviours were generally assessed independently of each other. Viewing these behaviours collectively has been related to indicators of health. This evidence aligns with the introduction of the first international 24 hour movement behaviour guidelines for children in their early years.

Measurement underpins the research examining these behaviours. Previously, sleep has generally been examined independently from other movement, with a host of different ways to assess sleep. With increased public health policy interest in this area, it is important to examine which tools can be used to measure all movement.

Here we present findings from a systematic rapid review that examined the validity, reliability, and feasibility of measurement tools used to assess sleep of pre-school children. We provide details for a similar review on tools used to assess physical activity and sedentary behaviour, to identify the full scope of the fields for measuring 24 hour movement behaviour.

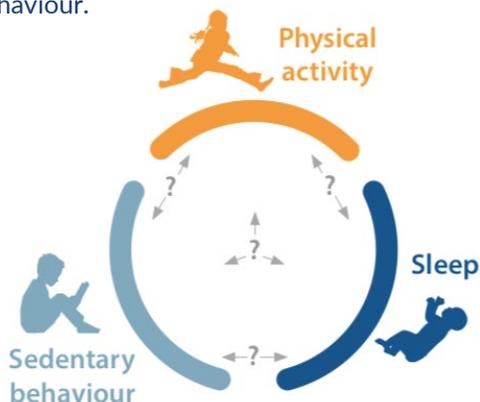


Image: World Health Organization (2019).

Policy implications

- High quality tools must be used to advance research on sleep (as well as the 24 hour movement behaviours), and to help policy makers provide robust public health recommendations.
- There is limited evidence on the quality of tools used to assess sleep in pre-school children. Conclusions drawn from research implementing tools of poor or unknown quality may create bias or invalid conclusions.
- A detailed sleep diary identified through this work may be confidently used in the assessment of sleep of pre-school children.
- Measurement is fundamental to the outcomes of further work – we must evaluate the use of accelerometers for the assessment of sleep. This is important for two main reasons:
 1. Accelerometers are frequently used in studies for sleep assessment, but the accuracy of these devices in the pre-school age group is unknown; and
 2. Accelerometers were used as the comparison tool in all studies assessing the accuracy of questionnaires and diaries. If we do not know how accurate the accelerometer is, it is difficult to distinguish how accurate further tools are.

About the School

The NIHR School for Public Health Research is a partnership between the Universities of Sheffield; Bristol; Cambridge; Imperial; and University College London; The London School for Hygiene and Tropical Medicine (LSHTM); LiLaC – a collaboration between the Universities of Liverpool and Lancaster; and Fuse - The Centre for Translational Research in Public Health a collaboration between Newcastle, Durham, Northumbria, Sunderland and Teesside Universities.

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Key findings

This review highlighted a limited evidence base of studies examining the quality of tools used to assess healthy sleep parameters of pre-school children, with only 16 studies identified.

The majority of studies (3/16) tested the validity of parental reported tools (questionnaires and diaries). There were very few studies (3/16) examining the quality of accelerometers (a small device that measures movement) for the assessment of healthy sleep parameters.

Only one type of sleep diary, from a higher quality study, was shown to be valid for the assessment of sleep duration.

One type of accelerometer, the Fitbit (Ultra) was the only identified tool able to demonstrate some aspects of sleep quality, through detecting night wakings.

Sleep timing was more accurate from diaries than questionnaires, but this was not surprising as diaries often assessed the same period of time as the comparison tool, whereas questionnaires assessed a different time period.

Most studies used a comparison tool (accelerometer) of which the accuracy for the assessment of sleep in this age group was not established within the literature. The studies that did assess accelerometers specifically for pre-school children showed promising results.

Further information

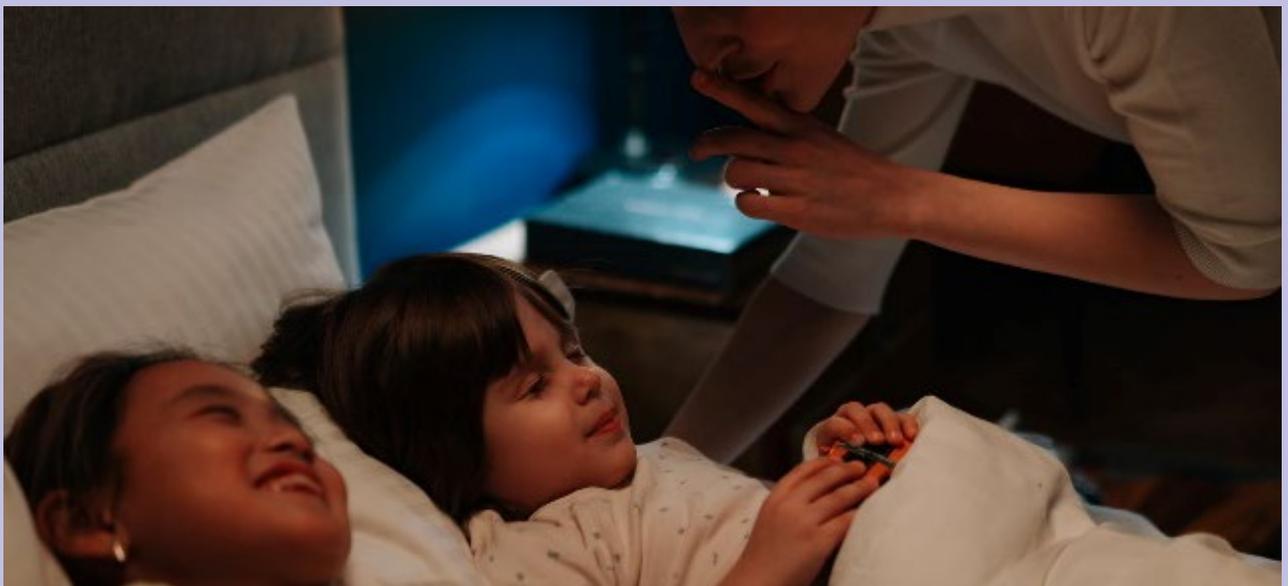
[Phillips SM, Summerbell C, Ball HL, Hesketh KR, Saxena S and Hillier-Brown FC. \(2021\). The Validity, Reliability, and Feasibility of Measurement Tools Used to Assess Sleep of Pre-school Aged Children: A Systematic Rapid Review. *Frontiers in Pediatrics*. 9:770262. doi: 10.3389/fped.2021.770262](#)

[Phillips SM, Summerbell C, Hobbs M, Hesketh KR, Saxena S, Muir C and Hillier-Brown FC. \(2021\). A systematic review of the validity, reliability, and feasibility of measurement tools used to assess the physical activity and sedentary behaviour of pre-school aged children. *International Journal of Behavioral Nutrition and Physical Activity*, 18, 141.](#)

Contact the researchers

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