

# Global research trends on theory-based interventions targeting 24-hour movement and healthy lifestyle behaviours in school-aged children: a bibliometric analysis

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**Abstract.** This study aimed to examine global research trends on theory-based interventions targeting 24-hour movement and healthy lifestyle behaviours among school-aged children from 2010 to 2025. A bibliometric analysis was conducted using Scopus-indexed journal articles and reviews. After eligibility screening, 218 publications were included. Metadata were cleaned and analysed using Microsoft Excel, while keyword co-occurrence analysis was performed using VOSviewer. Publication output generally increased over time, with the highest number of publications observed in 2023. Social Cognitive Theory was the most frequently employed framework. In contrast, HAPA and COM-B/Behaviour Change Wheel were rarely used. The literature was dominated by lifestyle multi-behaviour, physical activity-only, and nutrition/healthy eating-only interventions, whereas explicitly integrated 24-hour movement behaviour, sleep-only, and sedentary/screen time-only interventions were limited. Keyword mapping showed that the field remains centred on physical activity, nutrition, and obesity. These findings highlight the need for stronger theoretical clarity and explicit theory-based school interventions integrating physical activity, sedentary behaviour, sleep, and healthy balanced diet to support sustainable healthy routines among school-aged children.

## 1 Introduction

Healthy lifestyle behaviours during childhood are critical determinants of growth, development, and long-term health. Regular physical activity, limited sedentary time, adequate sleep, and healthy eating are closely associated with physical fitness, weight status, mental well-being, and academic performance [1, 2]. As habits established in childhood often persist into adulthood, early interventions are essential for promoting sustainable healthy lifestyles [3]. In recent years, the concept of 24-hour movement behaviours has provided a more integrated perspective, recognizing that physical activity, sedentary behaviour, and

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sleep are co-dependent [4]. However, many interventions remain fragmented, targeting single behaviours while overlooking the comprehensive 24-hour framework, with sleep being particularly neglected [5]. Although previous reviews have examined school-based interventions or global research related to 24-hour movement behaviours [5, 6], they have mainly focused on intervention characteristics, outcomes, or guideline-related evidence rather than mapping how behavioural theories are used across different lifestyle domains. This study, therefore, aims to examine global research trends on theory-based interventions targeting 24-hour movement and healthy lifestyle behaviours in school-aged children from 2010 to 2025.

## 2 Methods

This bibliometric study analysed Scopus-indexed journal articles and reviews on theory-based interventions targeting 24-hour movement and healthy lifestyle behaviours among school-aged children from 2010 to 2025. The search combined terms related to school-aged children, interventions, behavioural theories or frameworks, and lifestyle domains, including physical activity, sedentary behaviour, sleep, screen time, diet, nutrition, healthy eating, and 24-hour movement behaviours. Only English-language articles and reviews were included. All retrieved records were screened by the first author using a structured Microsoft Excel screening log and predefined eligibility criteria. Records were included if they focused on school-aged children, examined an intervention, programme, trial, or health promotion approach, explicitly referred to a behavioural theory, model, or framework, and targeted at least one healthy lifestyle behaviour domain. Records were excluded if they involved non-target populations, were not intervention-oriented, lacked an explicit theory or framework, or were non-journal documents. Records with unclear eligibility based on title and abstract were further checked using abstracts, keywords, and available full-text information. The initial Scopus search yielded 291 records, of which 218 publications were included after eligibility screening and publication-year verification (Fig. 1). Metadata were cleaned and standardised in Microsoft Excel, including coding of behavioural theories/frameworks and behaviour domains. Studies were coded as “theory-informed, unspecified” when they referred to a theory-informed or behaviourally informed intervention approach but did not explicitly mention a specific behavioural theory or model. Bibliometric indicators included annual publication trends, theory/framework distribution, and behaviour-domain distribution. Keyword co-occurrence analysis was performed using VOSviewer version 1.6.20 with full counting and a minimum keyword occurrence threshold of three.

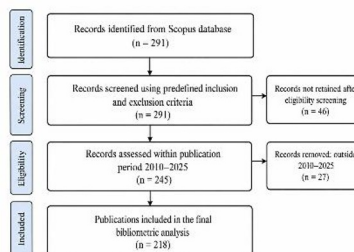


Fig. 1. PRISMA-style flow diagram of study selection.

## 3 Results

The final corpus consisted of 218 publications from 2010 to 2025. Annual output generally increased over time, with the highest number of publications observed in 2023. Social

Cognitive Theory was the most frequently employed framework, followed by unspecified theory-informed approaches, Self-Determination Theory, the Theory of Planned Behavior/Behaviour, and the Social Ecological Model. COM-B/Behaviour Change Wheel and HAPA were rarely represented (Fig. 2). Lifestyle multi-behaviour, physical activity-only, and nutrition/healthy eating-only interventions dominated the literature. In contrast, movement-related multi-domain studies, explicitly integrated 24-hour movement behaviour interventions, sleep-only interventions, and sedentary/screen time-only interventions were much less common (Fig. 3).

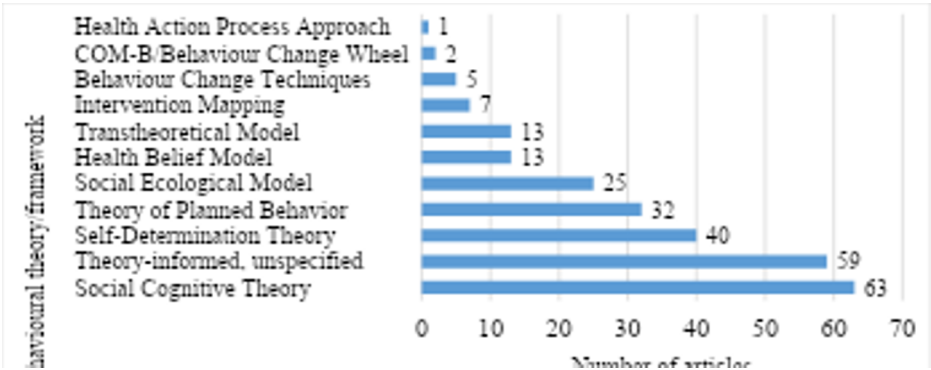


Fig. 2. Distribution of behavioural theories/frameworks.

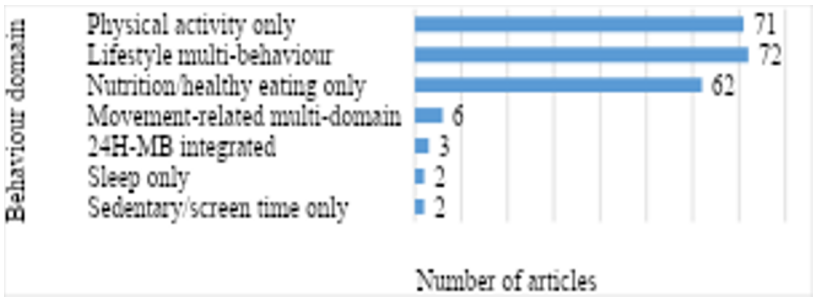
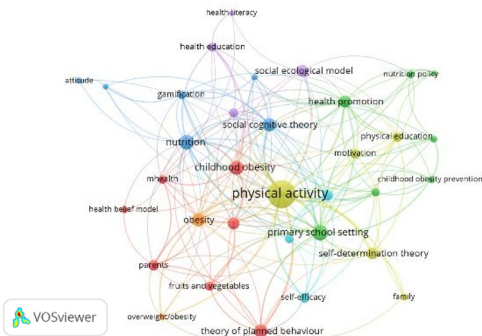


Fig. 3. Distribution of healthy lifestyle behaviour domains.

The keyword co-occurrence network showed that physical activity was the most central theme, closely connected with school setting, physical education, health promotion, and motivational constructs. Nutrition, obesity, parents, family, and fruits and vegetables also appeared as prominent themes, whereas 24-hour movement behaviour, sleep, and sedentary behaviour were less visible in the network (Fig. 4).



**Fig. 4.** Keyword co-occurrence network. Node size indicates keyword frequency, link thickness represents co-occurrence strength, and clusters indicate thematic groupings generated by VOSviewer.

## 4 Discussion

The present bibliometric analysis shows that theory-based interventions for school-aged children remain concentrated on physical activity, nutrition, and obesity prevention, whereas explicitly integrated 24-hour movement behaviour interventions are still limited. This finding extends previous reviews by showing that the gap lies not only in intervention content or outcomes, but also in how behavioural theories are applied across lifestyle domains [5–7]. Since children’s health is shaped by combined patterns of physical activity, sedentary behaviour, sleep, and diet, school age is a critical period for establishing long-term healthy habits [1–3]. SCT was the dominant framework in the present analysis, possibly because its core constructs, such as self-efficacy, observational learning, outcome expectations, reinforcement, and environmental support, are readily translatable into school-based strategies, including classroom education, peer modelling, teacher-led activities, parental support, and goal setting [8]. However, the large number of theory-informed but unspecified studies suggests limited theoretical clarity, which may hinder identification of mechanisms underlying intervention design, implementation, evaluation, and replication [9, 10]. The rare use of HAPA and COM-B/Behaviour Change Wheel suggests limited attention to self-regulatory and implementation-oriented processes, although these frameworks may help children translate healthy intentions into daily routines through planning, coping strategies, self-monitoring, and adult support [9, 11].

The limited representation of integrated 24-hour movement behaviour studies may reflect implementation challenges. Physical activity and nutrition are more directly addressed during school hours through physical education, school meals, classroom activities, and nutrition education, whereas sleep, sedentary behaviour, and screen time are strongly shaped by home routines and parental monitoring. Therefore, integrated programmes should combine movement behaviours with healthy eating and strengthen family-school collaboration, especially for behaviours occurring outside school [5, 7]. This study maps global trends in theory-based interventions targeting 24-hour movement and healthy lifestyle behaviours among school-aged children and identifies key gaps: limited integrated lifestyle interventions, unclear theory specification, and rare use of frameworks supporting the transition from intention to sustained action, such as HAPA. These findings support explicit theory-based school interventions integrating physical activity, sedentary behaviour, sleep, and healthy balanced diet, particularly in elementary school as a critical period for habit formation [3]. Although this study was limited to Scopus-indexed English-language articles and reviews, and the classification depended on reported information, it highlights the need for stronger theoretical clarity and behavioural integration in school-based lifestyle interventions.

## 5 Conclusion

This bibliometric analysis shows that theory-based interventions for school-aged children remain dominated by physical activity, nutrition, obesity prevention, and broad lifestyle approaches, while integrated 24-hour movement behaviour interventions are still limited. SCT was the most frequently used framework, whereas HAPA and COM-B/Behaviour Change Wheel were rarely represented, and many studies were theory-informed but unspecified. These findings highlight the need for stronger theoretical clarity and explicit theory-based school interventions that integrate physical activity, sedentary behaviour, sleep,

and healthy balanced diet. Approaches such as HAPA may help support the transition from healthy intentions to sustained daily routines, particularly among elementary school students as a critical period for long-term habit formation.

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