Daily Activity, Time Use, and Childhood Stunting: A Scoping Review of How Movement and Growth Are Studied and Measured

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Abstract

Introduction and Objective. Childhood stunting reflects long-term undernutrition and is traditionally framed as a dietary problem, although how children spend their day through play, work, study, and rest is increasingly examined alongside growth. This scoping review maps how research has examined and measured daily activity, time use, and physical fitness in relation to childhood stunting, including how these constructs are captured in a major longitudinal cohort. **Methodology.** Following the Arksey and O'Malley framework and PRISMA-ScR, Scopus was searched, and records were screened by document type, language, and publication year. A total of 368 documents published between 2010 and 2025 met the inclusion criteria and were charted by year, geography, source, and theme. Young Lives cohort documentation was also examined as a measurement case. **Results.** Nutrition themes appeared in 358 documents, while activity, fitness, or motor themes appeared in 252 (68%), with 252 addressing both domains. The activity strand has closely followed the nutrition strand since approximately 2019. Nutrition and public health journals dominated the literature, whereas dedicated movement and physical education outlets were scarce. The cohort contained 299 unique variables, including harmonised growth and time-use blocks across four countries. **Conclusions.** Research on stunting has expanded beyond a diet-focused perspective toward an integrated view of movement and growth. However, measurement of activity remains uneven and movement science is underrepresented, highlighting an important opportunity for physical education and human movement research.

Keywords

Stunting; physical activity; time use; motor development; child growth; scoping review.

Resumen

Introducción y Objetivo. El retraso del crecimiento infantil refleja una desnutrición prolongada y tradicionalmente se ha relacionado con la dieta. Sin embargo, la distribución del tiempo entre juego, trabajo, estudio y descanso también puede influir en el crecimiento. Esta revisión de alcance analiza cómo la investigación ha examinado y medido la actividad diaria, el uso del tiempo y la condición física en relación con el retraso del crecimiento infantil. **Metodología.** Siguiendo el marco de Arksey y O'Malley y PRISMA-ScR, se realizó una búsqueda en Scopus. Tras aplicar criterios de tipo documental, idioma y año, se incluyeron 368 documentos publicados entre 2010 y 2025. Se analizaron su evolución temporal, distribución geográfica, fuentes y temáticas, complementándose con el examen de la cohorte Young Lives como referencia de medición. **Resultados.** Los temas nutricionales estuvieron presentes en 358 documentos, mientras que 252 (68%) abordaron actividad, condición física o motricidad. La investigación sobre actividad aumentó desde aproximadamente 2019, aunque las revistas de nutrición y salud pública continuaron dominando la literatura. Las publicaciones especializadas en movimiento y educación física fueron limitadas. Young Lives incluyó 299 variables únicas y bloques armonizados de crecimiento y uso del tiempo en cuatro países. **Conclusiones.** La investigación sobre el retraso del crecimiento está avanzando hacia una perspectiva integrada del movimiento y el crecimiento. No obstante, persisten diferencias en la medición de la actividad y una limitada participación de las ciencias del movimiento, lo que señala oportunidades para fortalecer la educación física y las ciencias del movimiento humano en este campo.

Palabras clave

Retraso del crecimiento; actividad física; uso del tiempo; desarrollo motor; crecimiento infantil; revisión de alcance.

Introduction

Stunting is a sign that a child has been undernourished for a long time. It is defined as a height for age more than two standard deviations below the growth reference, and it still affects roughly one in five children under five worldwide, with the heaviest burden in South Asia and sub-Saharan Africa (Roth et al., 2017; Victora et al., 2021). The harm reaches beyond height. Children who are stunted early tend to do worse in school, earn less as adults, and carry a higher risk of chronic disease later in life (Crookston et al., 2011; Sudfeld et al., 2015). Growth faltering also continues past the first thousand days in many settings, so the window for action is wider than once assumed (Benjamin-Chung et al., 2023; Hoddinott et al., 2013; Leroy et al., 2014).

For most of two decades, work on preventing stunting has been a story about food. Dietary diversity and diet quality became standard markers, and a large body of research linked them to better growth (Black et al., 2013; Prentice et al., 2013). That premise is sound, but it tells only part of the story. A second strand has grown alongside it. Physical activity, gross and fine motor development, and physical fitness are now studied as part of how children grow and how growth deficits play out (Aubert et al., 2018; Hallal et al., 2012; Kamelia et al., 2025). Skeletal muscle tracks closely with linear growth, and motor delay is one of the more visible functional costs of early stunting. A widely cited study tracked physical fitness, growth, and nutritional status together in Chinese children, treating them as one connected picture rather than separate fields (Dong et al., 2019)

To avoid ambiguity, three terms are used with distinct meanings throughout this review. Physical activity is defined as skeletal-muscle movement that results in energy expenditure, and covers play, chores, and structured exercise alike. Physical fitness is defined as the physiological capacities, cardiorespiratory, muscular, and motor, that enable physical activity to be performed (Galán-Arroyo et al., 2024). Motor development is defined as the progressive acquisition and refinement of gross and fine movement skills across childhood. These terms are applied consistently according to these definitions rather than used interchangeably.

How a child spends the day sits at the centre of this second strand. The way time is divided between play, school, chores, work, caring for siblings, and rest describes a daily life that varies widely, and that daily life may relate to growth through energy, rest, and opportunity for movement (Hofferth & Sandberg, 2001; Larson & Verma, 1999). In many low- and middle-income settings, children carry heavy work and domestic burdens from an early age, which compete with time for play and rest. Yet time use and physical activity are seldom brought together with linear growth in a single frame, and the journals that carry stunting research rarely come from physical education or the movement sciences (Vaivada et al., 2020).

A scoping review is well suited to this situation. It does not test whether one intervention works. Instead it maps how a field is structured, what has been studied, how constructs are measured, and where the gaps lie (Arksey & O'Malley, 2005; Levac et al., 2010; Munn et al., 2018). This is useful when two literatures, nutrition and movement, appear to be converging but have not been charted together, and when the practical question of how activity and growth are actually measured remains open. Mapping measurement matters, because a question about daily activity and growth can only be answered with data that captures both in comparable ways (Peters et al., 2015).

This review maps research on daily activity, time use, and physical fitness in relation to childhood stunting, and then examines how these constructs are measured in practice using the Young Lives multi-country cohort as a case. We set out to answer four questions. How has the literature on activity and stunting developed over time? How are the nutrition and activity strands related within it? Where is the work published and from which countries? And how are daily activity and linear growth measured in a major cohort, including where measurement is strong and where it is thin? By answering these, we aim

to show whether physical education and movement science have a defined place in stunting research, and where that place might grow.

Methods

Protocol framework

The review followed the framework of Arksey and O'Malley (2005), refined by Levac and colleagues (2010), and is reported in line with the PRISMA extension for scoping reviews (Tricco et al., 2018). The choice of a scoping rather than a systematic review reflects the aim, which was to map the extent, range, and measurement of the literature rather than to pool effect estimates (Munn et al., 2018; Peters et al., 2015).

Eligibility Criteria

We included journal articles and reviews published between 2010 and 2025, written in English, that addressed childhood stunting or linear growth together with a determinant related to nutrition or to physical activity, fitness, motor development, or time use. We excluded other document types, non-English records, and work outside the year window. The fifteen-year window was chosen to capture complete years and the period in which the activity strand emerged.

Information sources and search

Scopus was the single source, because it indexes nutrition, public health, and sport science journals together and supplies the structured metadata that charting needs (Pranckutė, 2021). The search combined a stunting block, a child population block, and a determinant block that deliberately held nutrition and physical fitness terms together, so the analysis could see how they sit relative to each other. The search was run on 10 June 2026. Using one database keeps records consistent but omits work indexed only elsewhere, a limitation we return to later.

Selection and charting

Records were screened against the eligibility criteria, with the flow reported following PRISMA 2020 and its scoping extension (Page et al., 2021; Tricco et al., 2018). Included documents were charted by year of publication, contributing countries, source journals, and theme. Each document was flagged for whether its title, abstract, or keywords contained nutrition terms, activity, fitness, or motor terms, or both, and these counts were tracked over time. Consistent with scoping methodology, charting described the breadth of the field rather than extracting effect sizes from individual studies (Levac et al., 2010).

Measurement case study

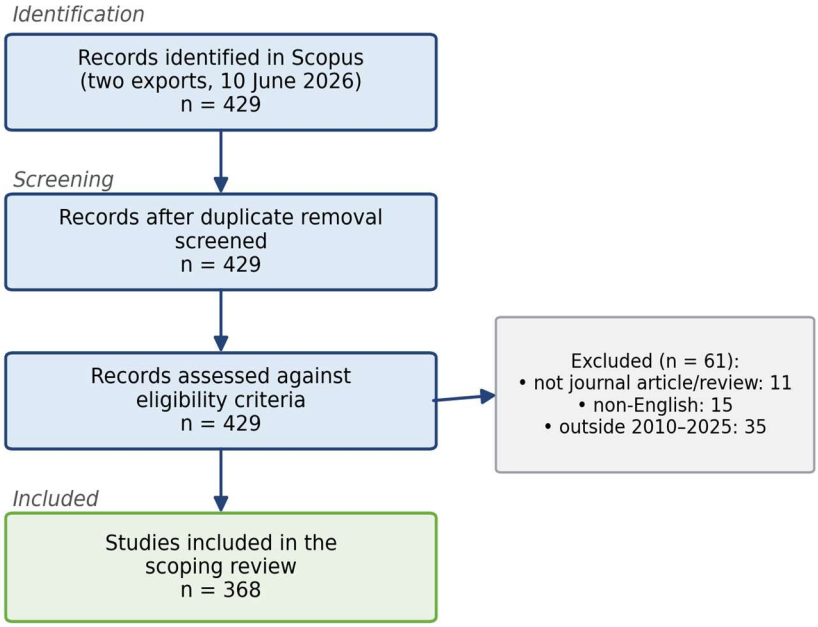
To examine how the charted constructs are measured in practice, we added a measurement case using the public documentation of the Young Lives cohort (UK Data Service study 9543), namely its data inventory and the four constructed-file data dictionaries (Barnett et al., 2013; Favara et al., 2026; Mihaylova et al., 2025). We counted variables by domain and assessed how growth and daily activity are captured and how comparable the measures are across the four countries. This case describes measurement capacity from documentation; it does not report child-level results.

Results

Selection of sources

The search returned 429 records. After removing documents that were not journal articles or reviews (11), non-English records (15), and work outside 2010 to 2025 (35), 368 documents remained for charting. Figure 1 shows the flow.

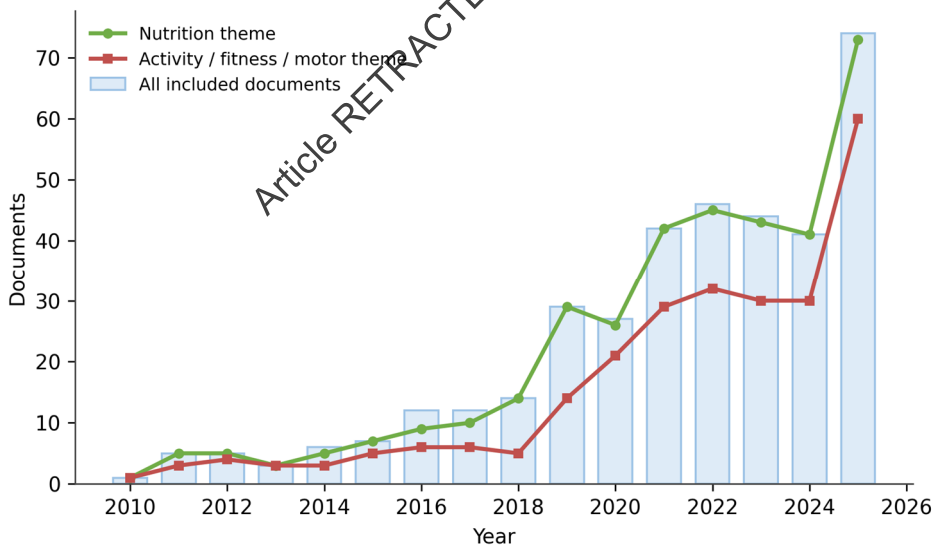
Figure 1. PRISMA-ScR flow of source selection.



How the field has developed

Output rose over the period, thin until about 2015, climbing after 2018, and reaching its highest counts in the most recent years (Figure 2). The rise matches the broader growth of child nutrition and public health research, but the notable feature is the activity strand. Far from trailing, it has tracked the nutrition strand closely since about 2019.

Figure 2. Annual documents and theme coverage over time.



How nutrition and activity relate

The central mapping finding concerns how the two strands relate. Nutrition or dietary themes appeared in 358 of the 368 documents, as expected. Activity, fitness, or motor themes appeared in 252, which is 68 percent of the corpus, far from a marginal presence. Most striking, 252 documents addressed both at once. The two strands are not separate bodies of work that share a keyword. They overlap across most of the literature, which suggests the field has moved toward treating movement and growth as parts of the same problem (Dong et al., 2019); Table 1).

Table 1. Thematic coverage across the included documents.

Theme	Documents	Share of corpus
Nutrition / dietary	358	97%
Activity / fitness / motor	252	68%
Both at once	252	68%

Where the work comes from

Contributions came from across high- and low-income settings. The United States led, followed by China, Ethiopia, the United Kingdom, Iran, and Bangladesh (Table 2). The presence of Ethiopia, Bangladesh, and other high-burden countries reflects where stunting is heaviest, while the United States and United Kingdom hold their place through large research infrastructure. Source distribution was concentrated in nutrition and public health journals, led by Nutrients, PLoS ONE, Maternal and Child Nutrition, the Journal of Nutrition, and the American Journal of Clinical Nutrition. The limited presence of dedicated sport and physical education outlets is striking given how often activity appears in the content, and it is part of why this corpus matters for movement science.

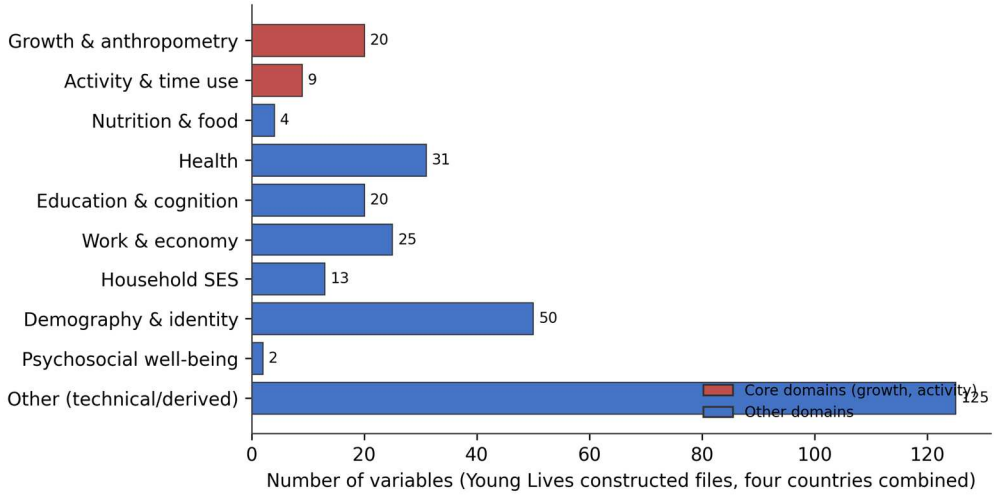
Table 2. Leading contributing countries and source journals.

Country	Documents	Leading journal	Documents
United States	128	Nutrients	22
China	45	PLoS ONE	19
Ethiopia	37	Maternal and Child Nutrition	16
United Kingdom	36	Journal of Nutrition	15
Iran	34	American Journal of Clinical Nutrition	11

How activity and growth are measured: the Young Lives case

Charting showed that activity is studied widely but measured in many different ways, from questionnaires to time-use diaries to device-based methods. To ground this, we examined one major cohort. The Young Lives constructed files hold 299 unique variables across four countries, of which 219 appear in all four (Figure 3). Linear growth is captured by a harmonised block of ten anthropometric variables, including height-for-age z-scores and a derived stunting indicator, all following WHO standards (WHO Multicentre Growth Reference Study Group, 2006). Daily activity is captured by a harmonised eight-variable time-use block covering hours of leisure and play, school, study, chores, family-farm tasks, paid work, care, and sleep.

Figure 3. Measurement coverage by domain in the Young Lives cohort (case study).



The case also shows where measurement is thin, which mirrors the wider literature. The leisure-and-play variable bundles active play with other restful activity, so it is not a clean measure of physical activity or fitness as defined by movement guidelines (Bull et al., 2020; Tremblay et al., 2016). The cohort holds no standardised motor-development battery. These gaps are not unique to one dataset; they reflect a field in which growth is measured to a common standard while activity is not (Hallal et al., 2012).

Table 3. How core constructs are measured in the cohort case.

Construct	Young Lives block	Countries
Linear growth	10 anthropometric variables (zhfa, stunting_child, ...)	4/4
Daily activity	8 time-use variables (hplay, hwork, hschool, hsleep, ...)	4/4
Motor development	none in constructed files	—
Dietary diversity	raw round files only, not constructed panel	—

Discussion

This review set out to map how daily activity and growth are studied and measured in childhood stunting research, and the picture is clear. What began as a literature about diet now carries a strong and growing thread of work on physical activity, motor development, and physical fitness, and the two threads run through most of the same documents. Activity, fitness, or motor themes appeared in 68 percent of the corpus, and most documents that addressed activity also addressed nutrition. The field has moved toward treating movement and growth as parts of the same problem rather than separate concerns (Adair et al., 2013; Dong et al., 2019).

The convergence has a timing. The activity strand has tracked the nutrition strand closely since about 2019, which fits the wider recognition that growth faltering and recovery continue well beyond the first thousand days (Benjamin-Chung et al., 2023; Leroy et al., 2014). As the window of attention widens, factors beyond the plate, including how active or burdened a child's day is, become more relevant (Hofferth & Sandberg, 2001; Larson & Verma, 1999).

Yet the map also shows an imbalance. Nutrition and public health journals carry almost all of this work, while dedicated sport and physical education outlets are scarce, even though physical activity is one of the most common substantive keywords in the corpus. The people who study movement for a living are largely absent from a literature that overlaps heavily with their core concerns (Aubert et al., 2018; Vaivada et al., 2020). This is the clearest practical message of the review: stunting prevention is not a nutrition problem with a movement footnote, and there is room for physical education and human movement research to contribute.

The measurement case sharpens the point. Using the Young Lives cohort, we found that linear growth is measured to a common international standard and harmonised across four countries, while activity is captured through a time-use block that, although harmonised, bundles active play with other leisure and omits any standardised motor measure (WHO Multicentre Growth Reference Study Group, 2006; Bull et al., 2020). This asymmetry, growth measured precisely and activity measured loosely, runs through the wider field and helps explain why the activity strand, though large, is still uneven. Better, more consistent measurement of children's movement is a concrete contribution that movement science is well placed to make.

For research and practice, three directions follow. First, studies linking activity and growth should state plainly what their activity measure does and does not capture, rather than treating leisure or time use as a proxy for fitness (Tremblay et al., 2016). Second, existing cohorts such as Young Lives offer harmonised growth and time-use data that can support honest secondary analyses, provided their limits are respected (Barnett et al., 2013). Third, the movement-science community has an opening to bring

validated activity and motor measures into stunting research, which would strengthen a field that has so far relied on growth standards far more developed than its activity measures.

This review has limits. It drew on a single database, Scopus, so work indexed only elsewhere was not captured (Pranckutė, 2021). Charting described the breadth of the field at the level of themes, geography, and sources rather than extracting findings from each study, which is consistent with scoping methodology but means the review maps the literature rather than weighing its evidence (Levac et al., 2010; Munn et al., 2018). Theme classification relied on titles, abstracts, and keywords, which can miss nuance. The measurement case rested on documentation, so it describes what a cohort can measure, not the quality of its field data. These limits are typical of scoping work and do not change the main pattern.

Conclusions

Research on childhood stunting has widened. What began as a literature about diet now carries a strong and growing thread of work on physical activity, motor development, and physical fitness, and the two threads run through most of the same documents. Activity is one of the most common substantive themes in the field, and the literature increasingly treats movement and growth as parts of one problem rather than two. The measurement of activity, however, lags behind the measurement of growth, and the journals that carry this work rarely come from physical education or the movement sciences. The practical message is that stunting prevention is a growth problem in which diet and physical activity act together, and that physical education and human movement research have a clear and largely unfilled role. Bringing movement science more fully into stunting research, with better activity measures and honest secondary analyses of existing cohorts, is a reasonable next step, both for the children involved and for the breadth of the evidence base.

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