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24-hour movement behaviours and health outcomes among forcibly displaced children affected by conflict or natural disasters: a scoping review

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Abstract

Background While there is growing evidence on 24-hour movement behaviours (physical activity, sedentary behaviour, and sleep) in non-displacement settings, understanding these behaviours among displaced children remains limited. This scoping review explored evidence on 24-hour movement behaviours, including active play and health among forcibly displaced children (birth to 12 years) affected by conflict or natural disasters.

Methods We followed JBI guidelines and PRISMA extensions for scoping reviews. Seven databases (PubMed, Medline, Web of Science, Scopus, CINAHL, PsycINFO, and ProQuest) were searched for peer-reviewed studies published in English between January 2000 and July 2024. We used the Population, Concept and Context framework to set eligibility criteria based on our research questions. Two independent reviewers screened the records, and the first author extracted the data, which was then double-checked by a co-author. Data were analysed using narrative synthesis.

Results A total of 28 articles met the inclusion criteria, all of which relied on parent- or self-reports. Forcibly displaced children generally had low levels of physical activity, high sedentary behaviour, including excessive screen time, and disrupted sleep. Girls were less active than boys. An increased risk of obesity and developmental delays were found to be prevalent among forcibly displaced children. Disaster-related stress negatively associated with muscular strength, whereas child-friendly spaces, structured activities, and physical education enhanced the resilience and well-being of displaced children. However, a limited number of child-friendly play spaces were observed in displacement settings.

Conclusions This scoping review highlights the urgent need to promote healthy levels of 24-hour movement behaviours and recognise the right to play among forcibly displaced children, considering limited active play spaces in such settings. Future research should prioritise mixed methods, including device-based measures, particularly in low- and middle-income countries, to gain better insights and inform humanitarian responses.

Keywords Right to play, Active play, Physical activity, Sedentary behaviour, Sleep

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Background

Crises of war, conflict, violence or disasters pose significant health and development challenges [1–3], for over 46 million children globally [4]. A large proportion of forcibly displaced children live in low- and middle-income countries (LMICs) [5]. Growing evidence highlights the importance of maintaining healthy levels of 24-hour movement behaviours —physical activity, active play, sedentary behaviour, and sleep—as interconnected essential behaviours for children's development [6–8]. Physical activity is a broad term that includes all forms of movement involving energy expenditure [9], whereas active play is a specific type of physical activity that is more spontaneous and unstructured. Active play often incorporates fun and creativity [10], making it particularly important for children's physical, social, cognitive, and emotional development [11–12]. Most Humanitarian responses prioritise providing basic needs and protecting human rights [4]. However, one of these rights, a child's right to play, as outlined in Article 31 of the *United Nations Convention on the Rights of the Child* [13], is not always given the attention it deserves. In response to this, the United Nations International Children's Emergency Fund (UNICEF) has made efforts to support early childhood development through integrating nurturing care in emergency settings [14].

Forcibly displaced children often live in highly restricted environments due to safety concerns, overcrowding, and post-traumatic stress, which may lead to a more sedentary lifestyle [15, 16]. Additionally, there is little evidence showing the existence of sleep problems in displacement settings because of post-traumatic stress [3], which might affect children's health and development. Despite growing evidence on 24-hour movement behaviours in non-displacement settings [17], understanding these behaviours among displaced children remains scarce. This context is less studied, possibly due to the challenges [3], in measuring these behaviours and health outcomes in these unique environments. The term 'health outcomes' encompasses various physical and developmental aspects, such as adiposity, motor skills, executive functions, and well-being, which are related to movement behaviours [17]. Ensuring children's protection and rights, including the right to play, is essential for fostering peaceful and inclusive societies [13]. To our knowledge, there are no existing or ongoing scoping reviews on this area. This scoping review aimed to explore available evidence on physical activity, sedentary behaviour, sleep, and health outcomes among forcibly displaced children (birth to 12 years) affected by conflict or natural disasters.

Methods

We opted for a scoping review to broadly explore evidence on 24-hour movement behaviours and health outcomes in displaced settings. This scoping review applied the Joanna Briggs Institute (JBI) methodology for scoping reviews [18]. We reported based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extensions for Scoping Reviews (PRISMA-ScR) [19]. The protocol was registered with the Open Science Framework on 28 July 2024 (https://osf.io/hstb5/).

Eligibility criteria

Based on our research questions, 'Do 24-hour movement behaviours and health outcomes differ among forcibly displaced children, and how can these behaviours be measured in such settings?', we established eligibility criteria for peer-reviewed original studies to be included in the review using the Population, Concept and Context (PCC) framework [20], as our study focused on a broader concept.

Population

Studies conducted among forcibly displaced (refugees or asylum seekers) children aged from birth to 12 years, irrespective of their health problems or disabilities, were considered for this study. Studies involving non-forcibly displaced groups, such as volunteer migrants or immigrants, host communities (a local population receiving newcomers), as well as studies that included only children aged over 12 years, were excluded.

Concept

Studies were included if they reported descriptive data on physical activity, active play, sedentary or screen time and sleep duration or sleep quality together or individually, as well as health outcomes related to both 24-hour movement behaviours and exposure to conflict or natural disasters.

Context

This scoping review focused on forced displacement settings, specifically targeting refugee camps, internally displaced persons (IDP) camps, or temporary shelters in countries experiencing conflict or natural disasters, regardless of geographical boundaries. Studies from non-displacement settings were excluded.

Study characteristics

This scoping review considered studies that used device-based measures and parent- or self-report methods. Studies could be quantitative, qualitative or mixed. We included peer-reviewed case reports, conference abstracts, observational studies, longitudinal, interventional, and randomised controlled trials published in

English. Theses and dissertations were also included if they underwent rigorous review by examiners or experts. We excluded reviews, expert comments, blogs, newsletter, press release, opinion letters and grey literature along with studies published in languages other than English due to limited resources and translation expertise in the team. Studies released prior to January 2000 were deemed outdated and were excluded from this review.

Information sources and search strategy

This review searched seven electronic databases (PubMed, Medline, Web of Science, Scopus, CINAHL, PsycINFO and ProQuest) from January 2000 to July 2024. The search strategy (Supplementary material 1) was constructed using a combination of keywords and index terms in consultation with a University of Wollongong librarian and guided by the PCC framework [20]. Following the JBI protocol, we employed a three-step search strategy. First, an initial limited search of PubMed and Medline was undertaken, followed by an analysis of the text words contained in the title and abstract, and of the index terms used to describe the article. Second, a comprehensive search using all identified keywords and index terms was conducted across all included databases. Third, the reference lists of all identified reports and articles were searched for additional studies. All searches were downloaded into EndNote (version 21) [21], and then transferred to Covidence [22], for removing duplicates, screening, and data extraction. Two independent reviewers (CA, MTV) screened the titles and abstracts, and then completed full text review for eligibility. A difference between the two reviewers were resolved through discussion with a third reviewer (ADO or DC).

Data charting and extraction

A customized Covidence data extraction template (Supplementary Material 2) was created to identify the variables for extraction. Each reviewer independently charted the data, shared their results with the team, and updated the charting form. The first reviewer (CA) extracted all articles independently, while the second reviewer (MTV) double-checked the extracted articles for consistency, frequently consulting with a third reviewer (ADO or DC). All relevant information on 24-hour movement behaviours and associated outcomes that aligned with our review objectives, was extracted as detailed in Supplementary Material 2. This included the first author's surname, year of publication, country, study setting/context, sample size, study design/type, age of children, exposures and key findings, related to measure movement behaviours and health outcomes.

Data analysis and dissemination

We followed recommended data extraction, analysis and presentation styles for scoping reviews [20]. Data were analysed from multiple studies using narrative synthesis and presented in thematic narratives, tables or figures. We grouped the themes based on our main objectives namely 24-hour movement behaviours and associated outcomes. We used visual representations, such as tables and diagrams, to present our findings clearly. This approach made it easier to identify the key findings and highlighted gaps for future research.

Results

Sources of evidence

Figure 1 presents the PRISMA flowchart for this review [23]. Our database searches resulted in 2,341 articles after 162 duplicates were removed. Of these, 2,294 articles were irrelevant and excluded during the title and abstract screening stage. The remaining 47 articles underwent full-text review, and those that did not meet the inclusion criteria were excluded ($n = 19$).

A total of 28 articles were included in this scoping review, with only ten of them originated from LMICs. All of them used parent- or self-reports [24–51]. Regarding the nature of displacement, 12 studies were conducted among displaced children affected by conflict, five were due to natural disasters, and the remaining 11 studies were mixed. Nine of the studies were conducted among displaced children residing in refugee or IDP camps or temporary shelters, while the remaining were from host communities. Table 1 summarises key findings of this scoping review.

Key biases in the literature

Key biases in the literature include the predominance of studies on 24-hour movement behaviours largely focused on non-displaced settings [17], despite the unique environments and challenges in displacement settings [3]. Additionally, existing literature on displaced children mostly originated from high-income countries ($n = 18$), predominantly being qualitative ($n = 14$) and all relying on parent- or self-reports [24–51]. This might skew understanding of 24-hour movement behaviours among forcibly displaced children, as a large proportion of these children live in LMICs.

24-hour movement behaviours in displacement settings

A small number of studies reported that forcibly displaced children tended to have lower levels of physical activity compared to non-displaced children. For instance, a study involving 300 newly arrived displaced children in Canada found that none of the preschool-aged children met the physical activity guidelines, whereas 83% of those aged over five years did [26].

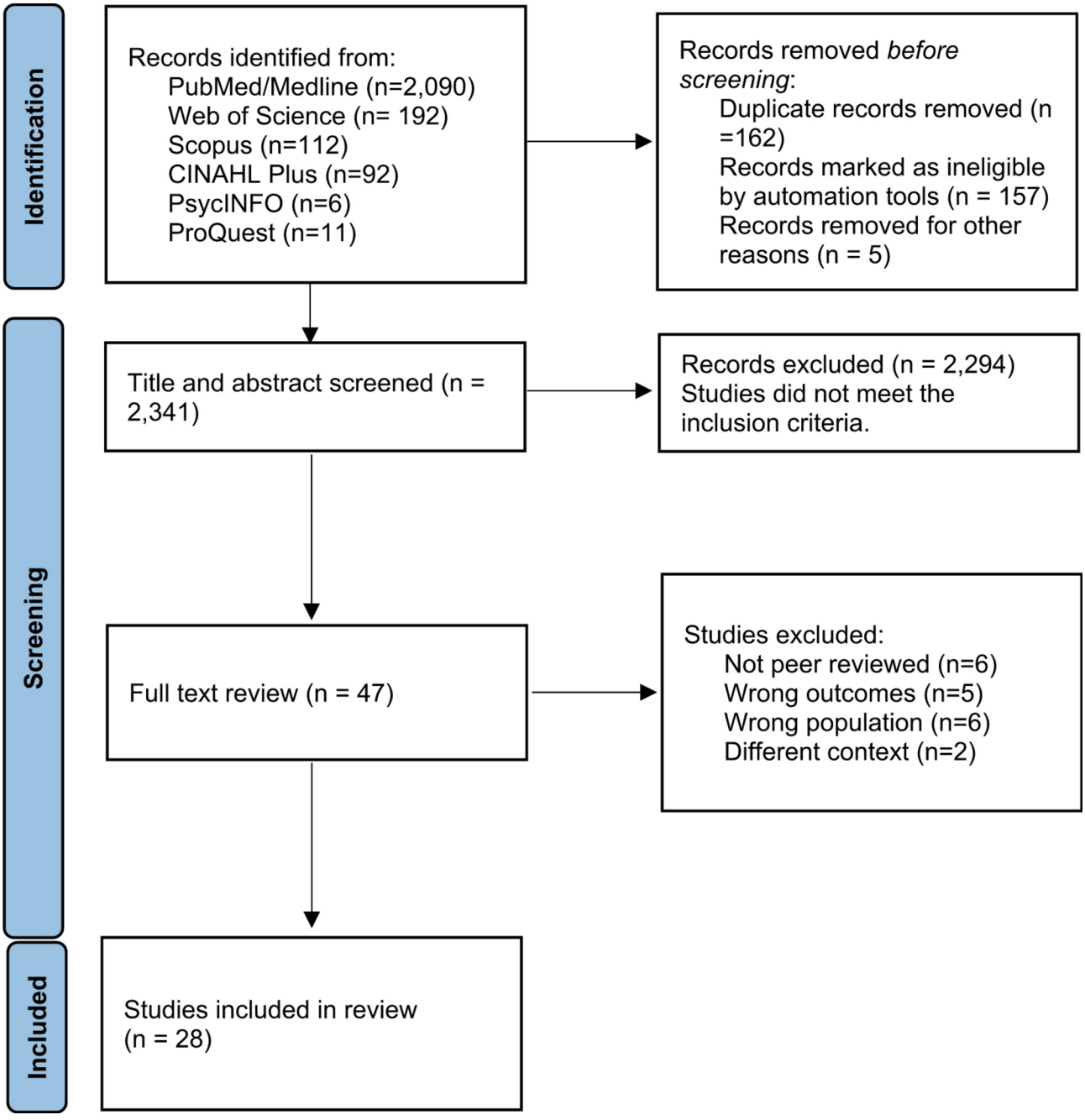

Fig. 1 PRISMA flowchart diagram (adapted)

MacMillan and colleagues (2015) reported an increase in active play after forced displacement compared to before displacement (95% vs. 58%) [28], but no evidence was found during the displacement time. Six studies showed that child-friendly active play spaces were vital for promoting well-being in refugee settings [27, 29–33]. However, access to these spaces was often unequal due to factors such as limited availability, overcrowding, safety concerns, and socio-economic barriers, further restricting opportunities for active play in displacement settings [16, 32–34]. Two studies reported that boys were generally more active compared to girls [24, 25].

Sedentary behaviour, including screen time, and sleep among forcibly displaced children raised considerable concerns. A study indicated that sedentary behaviour was notably high among forcibly displaced children, averaging six hours per day [24]. A significant proportion of displaced children (53–90%) spent three to four hours per day on screen devices [26]. One study reported displaced boys were more sedentary compared to girls [24]. About

Table 1 Summary of scoping review results

Category	Authors	Key findings
Physical Activity	Metzler et al., 2019 Lane et al., 2021 Lau et al., 2018 Sastre and Haldeman, 2020 Dawson-Hahn et al., 2020 Alsubhi et al., 2022	• Many children did not meet recommended physical activity levels. - None of the refugee preschoolers met physical activity guidelines, unlike 83% of older children - Most children engaged in physical activity 2.5 days per week, with boys more active than girls and activity levels slightly decreased post-arrival. - Parents noticed a decline in physical activity due to sedentary habits and safety concerns
Active Play	Chen and Knoll, 2021 Chen and Knoll, 2022a Chen and Knoll, 2022b Lane et al., 2021 Conti, 2020 Woolley, 2021 MacMillan et al., 2015	• Engagement in active play is crucial for children's well-being. - Built environments can promote physical activity in refugee settings but often lack safe areas and shouldn't overlooked in humanitarian response to ensure their right to play. - Children's active play increased significantly (95% vs. 58%), especially among girls (87% vs. 25%), while outdoor play levels remained stable after migration (90.9% vs. 94.4%) - Active play opportunities are often limited in refugee settings. - Unstructured play is preferred by children but often lacks safe spaces.
Sedentary Behaviour	Lai et al., 2014 Lane et al., 2021 Dawson-Hahn et al., 2020	• Increased screen time and sedentary activities are common. - Exposure to disasters has been linked to increased sedentary behaviour, averaging 5.9 h per day, with boys at 7.0 h and girls at 4.9 h - Most refugee children (53–90%) spent over 3 h of screen time per day, no significant gender difference. - Sedentary lifestyles linked to safety concerns and lack of recreational activities.
Sleep	Ceri et al., 2016 Woolley and Kinoshita, 2015	• Sleep disruptions are prevalent among displaced children. - About 71% of refugee children experienced sleep disruptions - Sleep quality is affected by environmental stressors and instability.
Health outcomes	Lane et al., 2018 Ager et al., 2011 Cohen et al., 2014 Veronese and Castiglioni, 2015 Woolley and Kinoshita, 2015 Nopembri et al., 2019 Metzler et al., 2019 Conti, 2020 Dawson-Hahn et al., 2020 Dhillon et al., 2020 Paskevice et al., 2021 Woolley, 2021 Korcz et al., 2024 Sastre and Haldeman, 2020 Ayas et al., 2022 Kozieł et al., 2021 Magnusson et al., 2005 Lane et al., 2021 Alsubhi et al., 2022 Alsubhi et al., 2024	• Health disparities exist between refugee and immigrant children. - Child-friendly spaces, structured activities, active play, creative movement, and physical education or sports enhance refugee children's resilience and well-being, with boys feeling more positive than girls. - Obesity and developmental delays are common among forcibly displaced children. - Children exposed to disaster-related stress during the prenatal and early postnatal periods showed negative effects on handgrip strength. • Access to supportive environments enhances resilience and well-being. - Environmental barriers such as limited space, unsafe environments, rapid lifestyle changes, socio-economic factors, family lifestyles, and social factors hinder children's healthy behaviours.

71% of displaced children showed sleep disruptions [35]. We did not find any reported differences in screen time and sleep between boys and girls.

Health and development challenges among forcibly displaced children

The studies found that forcibly displaced children faced numerous challenges. Challenges at the individual level included rapid lifestyle changes and socioeconomic factors. Additionally, parents' or caregivers' lifestyles at the family level, and limited space, unsafe environments, weather conditions, and social factors at the community level may hinder healthy levels of movement behaviours in these children [16, 25–27, 36–41]. Two studies found that obesity and developmental delays were found to be prevalent among forcibly displaced children [38, 39]. A quasi-experimental retrospective study conducted in India involving 867 children and their parents found that exposure to disaster-related stress during the pre-natal and early post-natal periods was found to be negatively associated with muscular strength among 7–9 year-old children [42]. Several studies indicated that child-friendly spaces, structured activities, active play, creative movement, and physical education or sports positively

enhanced the resilience and well-being of displaced children, with boys generally experiencing more benefits than girls [27, 30, 31, 37, 43–50].

Discussion

Summary of evidence

The findings of this scoping review highlight significant concerns regarding the movement behaviours of forcibly displaced children. The evidence from 28 primary studies, predominantly based on parent- or self-reports, indicates that these children generally had low levels of physical activity, high sedentary behaviour (including excessive screen time), and disrupted sleep. These behaviours are particularly concerning given their association with increased risks of obesity, weaker muscular strength, and developmental delays. A limited number of child-friendly play spaces further hinders healthy levels of movement behaviours in displacement settings.

24-hour movement behaviours in displacement settings

This scoping review revealed that children in displaced settings typically exhibit low levels of activity, including active play [26], high sedentary behaviour (including screen time) [24, 26] and disrupted sleep [35]. These might be due to rapid lifestyle changes, socio-economic factors, restricted play spaces, unsafe environments and weather conditions [16, 26]. Stressful conditions and the lack of structured activities in displacement settings can lead to sedentary lifestyles and increased screen time [26, 35]. Displaced children often experience sleep disturbances due to the stress and instability of their situation [35]. The review also highlights movement behaviour disparities between boys and girls, with boys generally being more active than girls [24, 25], but we did not find any sex differences in sedentary behaviour and sleep. Girls in displacement settings may face more outdoor restrictions due to fears of gender-based violence [51], resulting in fewer opportunities for active play. This situation contributes to widening the gap in physical activity levels between boys and girls. Our review demonstrates the need for safe and accessible child-friendly spaces to support the well-being and rights of these children [30, 33] and should not be overlooked in humanitarian responses [31, 33].

Health and development challenges among forcibly displaced children

This scoping review also found that forced displacement was negatively associated with children's health and development, increased adiposity, weaker muscular strength, and developmental delays [38, 39, 42]. A possible explanation could be due to limited outdoor play space, socio-economic factors, cultural influences, and rapid dietary and lifestyle changes [16, 38, 41]. Child-friendly spaces, structured activities, and physical education significantly enhance children's resilience and well-being [30, 43, 46]. However, the scarcity of such spaces in displacement settings remains a major challenge [33, 34].

Recommendations

This scoping review highlights the importance of integrating physically active play into humanitarian responses to uphold the right to play and promote healthier lifestyles among forcibly displaced children. Humanitarian organisations should establish child-friendly active play spaces, especially within refugee camps or displaced communities to mitigate the negative impacts on children's health and well-being. Since boys were found to be more active than girls, it is essential to implement targeted interventions that encourage physical activity among girls to ensure equitable health outcomes. Future research should address the identified gaps using mixed methods, including device-based measures, to better understand the unique challenges faced by forcibly displaced children and to capture levels of movement behaviours using robust measure, especially in LMICs. Longitudinal studies are also needed to explore the long-term impacts of forced displacement on movement behaviours.

Limitations

This scoping review is limited by its exclusion of non-English language studies, potentially leading to an underrepresentation of evidence from certain regions. Additionally, the reliance on parent- or self-reported data across all studies might introduce reporting bias. Most studies on movement behaviours focused on non-displaced settings and originated from high-income countries, which may not accurately reflect the unique challenges in displacement contexts.

Conclusion

This scoping review highlights the urgent need for targeted interventions and further research to understand 24-hour movement behaviours among forcibly displaced children. Creating equitable access to active play spaces and addressing gender disparities are crucial steps in improving the well-being of these vulnerable populations as a part of humanitarian responses.

Abbreviations

IDP	Internally displaced persons
JBI	Joanna briggs institute
LMICs	Low- and middle-income countries
PCC	Population, concept, context framework
PRISMA-ScR	Preferred reporting items for systematic reviews and meta-analyses extensions for scoping reviews
UNICEF	United nations international children's emergency fund

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-025-22996-7.

Supplementary Material 1

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Author contributions
CA conceptualised the study, reviewed the literature, screened, extracted, analysed the data, interpreted the findings and wrote the manuscript. DC conceptualised the study and interpreted the findings. MTV screened the literature, extracted data, and interpreted the findings. ADO conceptualised the study, screened the literature, and interpreted the findings. All authors read and approved the final manuscript.

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Data availability
All data generated or analysed during this study are included in this published article (and its supplementary information files).

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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References

1. Salami B, Iwuagwu S, Amodu O, et al. The health of internally displaced children in sub-Saharan Africa: a scoping review. BMJ Glob Health. 2020;5(8):e002584. https://doi.org/10.1136/bmjgh-2020-002584
2. Cantor D, Swartz J, Roberts B, et al. Understanding the health needs of internally displaced persons: A scoping review. J Migr Health. 2021;4:100071. https://doi.org/10.1016/j.jmh.2021.100071
3. Bernhardt K, Le Beherec S, Uppendahl JR, et al. Young children's development after forced displacement: a systematic review. Child Adolesc Psychiatry Ment Health. 2024;18:20. https://doi.org/10.1186/s13034-024-00711-5
4. United Nations High Commissioner for Refugees: Global trends forced displacement in 2023. 2023. https://www.unhcr.org/global-trends-report-2023. Accessed 20 June 2024.
5. World Bank Group. Forced displacement. 2023. https://www.worldbank.org/en/topic/forced-displacement. Accessed 6 May 2024.
6. Chaput JP, Carson V, Gray CE, Tremblay MS. Importance of all movement behaviors in a 24 hour period for overall health. Int J Environ Res Public Health. 2014;11(12):12575–81. https://doi.org/10.3390/ijerph111212575
7. Kuzik N, Poitras VJ, Tremblay MS, Lee EY, Hunter S, Carson V. Systematic review of the relationships between combinations of movement behaviours and health indicators in the early years (0–4 years). BMC Public Health. 2017;17(Suppl 5):849. https://doi.org/10.1186/s12889-017-4851-1
8. Tremblay MS. Introducing 24-Hour movement guidelines for the early years: A new paradigm gaining momentum. J Phys Act Health. 2020;17(1):92–5. https://doi.org/10.1123/jpah.2019-0401
9. World Health Organization. Physical Activity Fact sheets. Geneva: World Health Organization. 2024. https://www.who.int/news-room/fact-sheets/detail/physical-activity. Accessed April 19, 2025.
10. Truelove S, Vanderloo LM, Tucker P. Defining and measuring active play among young children: A systematic review. J Phys Act Health. 2017;14(2):155–66. https://doi.org/10.1123/jpah.2016-0195
11. Milteer RM, Ginsburg KR, Council On Communications And Media; Committee On Psychosocial Aspects Of Child And Family Health. The importance of play in promoting healthy child development and maintaining strong parent-child bond: focus on children in poverty. Pediatrics. 2012;129(1):e204–13. https://doi.org/10.1542/peds.2011-2953
12. Yogman M, Garner A, Hutchinson J, Hirsh-Pasek K, Golinkoff RM, Committee on Psychosocial Aspects of Child and Family Health; Council on Communications And Media. The power of play: A pediatric role in enhancing development in young children. Pediatrics. 2018;142(3):e20182058. https://doi.org/10.1542/peds.2018-2058
13. United Nations General Assembly: Convention on the Rights of the Child. Treaty Series, 1577, 3. 1989. https://www.ohchr.org/en/instruments-mechanisms/instruments/convention-rights-child. Accessed 12 May 2024.
14. United Nations International Children's Emergency Fund (UNICEF): Early Childhood Development in Emergencies Integrated Programme Guide. 2014. https://www.unicef.org/media/73736/file/Programme-Guide-ECDiE-2014.pdf.pdf. Accessed 17 June 2024.
15. Hermosilla S, Metzler J, Savage K, Musa M, Ager A. Child friendly spaces impact across five humanitarian settings: a meta-analysis. BMC Public Health. 2019;19(1):576. https://doi.org/10.1186/s12889-019-6939-2
16. Alsubhi M, Epton T, Goldthorpe J, Peters S. A qualitative investigation of the health behaviours of young children from refugee families using photo elicitation interviews. Health Psychol Behav Med. 2022;10(1):1086–109. https://doi.org/10.1080/21642850.2022.2141245
17. Rollo S, Antsygina O, Tremblay MS. The whole day matters: Understanding 24-hour movement guideline adherence and relationships with health indicators across the lifespan. J Sport Health Sci. 2020;9(6):493–510. https://doi.org/10.1016/j.jshs.2020.07.004
18. Peters MDJ, Marnie C, Tricco AC, Pollock D, Munn Z, Alexander L, McInerney P, Godfrey CM, Khalil H. Updated methodological guidance for the conduct of scoping reviews. JBI Evid Implement. 2021;19(1):3–10. https://doi.org/10.1097/XEB.0000000000000277
19. Tricco AC, Lillie E, Zarin W, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. Ann Intern Med. 2018;169(7):467–73. https://doi.org/10.7326/M18-0850
20. Pollock D, Peters MDJ, Khalil H, McInerney P, Alexander L, Tricco AC, Evans C, de Moraes ÉB, Godfrey CM, Pieper D, Saran A, Stern C, Munn Z. Recommendations for the extraction, analysis, and presentation of results in scoping reviews. JBI Evid Synth. 2023;21(3):520–32. https://doi.org/10.11124/JBIES-22-00123
21. EndNote Team. EndNote version () for Window software. 2024. Philadelphia, United States.
22. Veritas Health Innovation. Available at www.covidence.org. Covidence systematic review software. Australia: Melbourne. 2024. Accessed 10 August 2024.
23. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. https://doi.org/10.1136/bmj.n71
24. Lai BS, La Greca AM, Llabre MM. Children's sedentary activity after hurricane exposure. Psychol Trauma: Theory Res Pract Policy. 2014;6(3):280–9. https://doi.org/10.1037/a0033331
25. Lau W, Silove D, Edwards B, et al. Adjustment of refugee children and adolescents in Australia: outcomes from wave three of the Building a new life in Australia study. BMC Med. 2018;16(1):157. https://doi.org/10.1186/s12916-018-1124-5
26. Lane G, Nisbet C, Johnson S, Candow D, Chilibeck PD, Vatanparast H. Barriers and facilitators to meeting recommended physical activity levels among new immigrant and refugee children in Saskatchewan, Canada. Appl Physiol Nutr Metab. 2021;46(7):797–807. https://doi.org/10.1139/apnm-2020-0666
27. Korcz A, Cieśla E, Urbański P. The role of school functioning, physical activity, BMI, sex and age in Building resilience among Ukrainian refugee children in Poland. Sci Rep. 2024;14:5308. https://doi.org/10.1038/s41598-024-55933-6
28. MacMillan KK, Ohan J, Cherian S, Mutch RC. Refugee children's play: before and after migration to Australia. J Paediatr Child Health. 2015;51(8):771–7. https://doi.org/10.1111/jpc.12849

29. Kinoshita I, Woolley H. Children's play environment after a disaster: the great East Japan earthquake. Child (Basel). 2015;2(1):39–62. https://doi.org/10.3390/children2010039
30. Metzler J, Diaconu K, Hermosilla S, Kaijuka R, Ebulu G, Savage K, Ager A. Short- and longer-term impacts of child friendly space interventions in Rwamwanja refugee settlement, Uganda. J Child Psychol Psychiatry. 2019;60(11):1152–63. https://doi.org/10.1111/jcpp.13069
31. Conti RL. Safe play spaces for children in emergency contexts. Landsc Archit Front. 2020;8(2):144–9. https://doi.org/10.15302/J-LAF-1-050016
32. Chen S, Carver A, Sugiyama T, Knöll M. Built-environment attributes associated with refugee children's physical activity: a narrative review and research agenda. Confl Health. 2021;15(1):55. https://doi.org/10.1186/s13031-021-00393-2
33. Chen S, Knöll M. Perceived environmental barriers and facilitators of refugee children's physical activity in/around refugee accommodation: a qualitative case study in Berlin. Arch Public Health. 2022a;80(1):242. https://doi.org/10.1186/s13690-022-00993-1
34. Chen S, Knöll M. Understanding Spatial characteristics of refugee accommodations associated with refugee children's physical activity in micro-environments: six case studies in Berlin. Int J Environ Res Public Health. 2022b;19(13):7756. https://doi.org/10.3390/ijerph19137756
35. Ceri V, Özlü-Erkilic Z, Özer Ü, Yalcin M, Popow C, Akkaya-Kalayci T. Psychiatric symptoms and disorders among Yazidi children and adolescents immediately after forced migration following ISIS attacks. Neuropsychiatr. 2016;30(3):145–50. https://doi.org/10.1007/s40211-016-0195-9
36. Magnusson MB, Hulthén L, Kjellgren KI. Obesity, dietary pattern and physical activity among children in a suburb with a high proportion of immigrants. J Hum Nutr Diet. 2005;18(3):187–94. https://doi.org/10.1111/j.1365-277X.2005.00604.x
37. Veronese G, Castiglioni M. When the doors of hell close': dimensions of well-being and positive adjustment in a group of Palestinian children living amidst military and political violence. Childhood. 2015;22(1):6–22. https://doi.org/10.1177/0907568213512692
38. Sastre LR, Haldeman L, Diet. Physical activity and Weight-Related behaviors, changes and risks with Newly-Arrived (< 1 Year) immigrant and refugee adolescents (Ages 12–17). J Immigr Minor Health. 2020;22(2):282–90. https://doi.org/10.1007/s10903-020-00970-2
39. Ayas MT, Özmert EN, Başer DA, Karabulut E, Cankurtaran M. Development of preschool refugee children living under temporary protection status. Turk J Pediatr. 2022;64(4):683–93. https://doi.org/10.24953/turkjped.2021.1309
40. Alsubhi M. Aug. Health behaviours and childhood obesity among refugee families with young children. Division of Psychology & Mental Health. 1 2024. Student thesis:Phd. https://research.manchester.ac.uk/en/studentTheses/health-behaviours-and-childhood-obesity-among-refugee-families-wi. Accessed 16 July 2024.
41. Keita AD, Whittaker S, Wynter J, Kidanu TW, Chhay C, Cardel M, Gans KM. Applying concept mapping methodology to identify the perceptions of risk and protective factors for childhood obesity among Southeast Asian refugees. J Health Care Poor Underserved. 2016;27(4):1909–33. https://doi.org/10.1353/hpu.2016.0171
42. Kozieł S, Chakraborty R, Bose K, Ignasiak Z, Gomula A, Nowak-Szczepanska N. The effect of a natural disaster on handgrip strength in prepubertal Indian children exposed to a severe cyclone during the prenatal and early postnatal growth. Sci Rep. 2021;11(1):7473. https://doi.org/10.1038/s41598-021-86845-4
43. Ager A, Akesson B, Stark L, Flouri E, Okot B, McCollister F, Boothby N. The impact of the school-based psychosocial structured activities (PSSA) program on conflict-affected children in Northern Uganda. J Child Psychol Psychiatry. 2011;52(11):1124–33. https://doi.org/10.1111/j.1469-7610.2011.02407.x
44. Cohen E, Pat-Horenczyk R, Haar-Shamir D. Making room for play: an innovative intervention for toddlers and families under rocket fire. Clin Soc Work J. 2014;42:336–45. https://doi.org/10.1007/s10615-013-0439-0
45. Woolley H, Kinoshita I, Space. People, interventions and time (SPIT): A model for Understanding children's outdoor play in Post-Disaster contexts based on a case study from the triple disaster area of Tohoku in North-East Japan. Child Soc. 2015;29:434–50. https://doi.org/10.1111/chso.12072
46. Nopembri S, Sugiyama Y, Saryono, Rithaudin A. Improving stress coping and problem-solving skills of children in disaster-prone area through cooperative physical education and sports lesson. J Hum Sport Exerc. 2019;14(1):185–94. https://doi.org/10.14198/jhse.2019.141.15
47. Dawson-Hahn E, Koceja L, Stein E, et al. Perspectives of caregivers on the effects of migration on the nutrition, health and physical activity of their young children: A qualitative study with immigrant and refugee families. J Immigr Minor Health. 2020;22(2):274–81. https://doi.org/10.1007/s10903-019-00905-6
48. Dhillon KK, Centeio EE, Dillon S. Drumming and dancing: creative movement for convention refugee youth in a physical activity space. Sport Educ Soc. 2019;25(3):318–31. https://doi.org/10.1080/13573322.2019.1589444
49. Paskevice A, Pozeriene J, Dyka O, Asauliuk I, Olefir D. Refugees children and youth social skills education in football activities. Indep J Manage Prod. 2021;12(6):s584–609. https://doi.org/10.14807/ijmp.v12i6.1780
50. Woolley H. Beyond the fence: constructed and found spaces for children's outdoor play in natural and human-induced disaster contexts– Lessons from north-east Japan, and Za'atari refugee camp in Jordan. Int J Disaster Risk Reduct. 2021;56:102155. https://doi.org/10.1016/j.ijdrr.2021.102155
51. Stark L, Seff I, Reis C. Gender-based violence against adolescent girls in humanitarian settings: a review of the evidence. Lancet Child Adolesc Health. 2021;5(3):210–22. https://doi.org/10.1016/S2352-4642(20)30245-5

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