

Assessing the scalability of evidence-based healthy eating and physical activity interventions in early childhood education and care: A cross-sectional study of end-user perspectives

Alice Grady,^{1,2,*} Jacklyn Jackson,¹ Luke Wolfenden,^{1,2} Melanie Lum,^{1,5} Andrew Milat,^{3,4} Adrian Bauman,⁴ Rebecca Hodder,^{1,2} Sze Lin Yoong^{2,5}

¹School of Medicine and Public Health, College of Health, Medicine and Wellbeing, University of Newcastle, NSW, Australia

²National Centre of Implementation Science, University of Newcastle, NSW, Australia

³Centre for Epidemiology and Evidence, NSW Health, NSW, Australia

⁴School of Public Health, University of Sydney, Sydney, NSW, Australia

⁵Faculty of Health, School of Health and Social Development, Global Centre for Preventive Health and Nutrition, Institute for Health Transformation, Deakin University, VIC, Australia

Submitted: 25 May 2023; Revision requested: 13 November 2023; Accepted: 30 November 2023

Abstract

Objectives: To describe early childhood education and care (ECEC) services: i) perceptions regarding the scalability of healthy eating and physical activity interventions; and ii) associations between scalability and service characteristics.

Methods: A cross-sectional survey was conducted with a randomly selected sample of ECEC services across Australia. The scalability of 12 healthy eating and physical activity interventions was assessed using items based on the Intervention Scalability Assessment Tool. Higher scores represented higher perceived scalability.

Results: From 453 participants, the highest scoring healthy eating and physical activity interventions were 'providing healthy eating education and activities for children' (M43.05) (out of 50) and 'providing sufficient opportunities for child physical activity' (M41.43). The lowest scoring was 'providing families with lunchbox guidelines' (M38.99) and 'engaging families in activities to increase child physical activity' (M38.36). Services located in rural areas, compared to urban areas, scored the overall scalability of both healthy eating and physical activity interventions significantly lower.

Conclusions: Perceptions regarding the scalability of healthy eating and physical activity interventions in the ECEC setting vary according to service characteristics.

Implications for public health: Findings identify where government investment and implementation efforts may be prioritised to facilitate scale-up. An investigation into the barriers and support required for lower-scoring interventions is warranted.

Key words: scalability, early childhood education and care, healthy eating, physical activity

Introduction

Diet and physical activity are among the primary modifiable risk factors for the development of overweight and obesity in young children.¹ As young children internationally including Australia, do not consume foods consistent with public health recommendations,² nor do they meet physical activity recommendations,² it is unsurprising that 25% of Australian children are living with overweight or obesity.³ To address this disparity,

global initiatives including those from the World Health Organization,⁴ recommend evidence-based healthy eating and physical activity interventions be implemented in community (non-clinical 'settings') organisations.⁵

Early Childhood Education and Care (ECEC) services are a recommended setting to implement healthy eating and physical activity interventions as they provide access to up to 93%⁶ of children aged 4-5 years, for at least 15 hours each week, during an important life stage.⁷ Children attending ECEC services consume up to 67% of

*Correspondence to: Alice Grady, Booth Building, Longworth Avenue, Wallsend NSW 2287, Australia. Tel.: +61 02 4924 6310.

e-mail: alice.grady@newcastle.edu.au.

© 2023 The Authors. Published by Elsevier B.V. on behalf of Public Health Association of Australia. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Aust NZ J Public Health. 2024; Online; <https://doi.org/10.1016/j.anzjph.2023.100122>

their required dietary intake during care,⁸ and ECECs have a professional responsibility to support children to be physically active while in attendance at care.⁹

Despite considerable public health and research investment placed on the development and implementation of effective ECEC-based obesity prevention interventions, such interventions are not routinely scaled up. For example, less than 30% of ECEC services report implementing evidence-based nutrition and physical activity policies and practices.¹⁰ To increase the likelihood of being adopted at a population level, evidence-based interventions need to be amenable to implementation at scale. ‘Scale-up’ is defined as “deliberate efforts to increase the impact of successfully tested health innovations to benefit more people and to foster policy and program development on a lasting basis”.^{11,12} The lack of implementation at scale of evidence-based healthy eating and physical activity interventions may be due to the poor scalability of these interventions. For example, many interventions lack alignment with the context and capacity of the setting in which they are to be implemented.¹³

A variety of frameworks exist to assess whether an intervention is amendable to scale.^{12,14–17} Scalability refers to “the ability of a health intervention shown to be efficacious on a small scale and or under controlled conditions to be expanded under real-world conditions to reach a greater proportion of the eligible population while retaining effectiveness.”¹⁸ In addition to intervention effectiveness, these frameworks suggest consideration of other important factors, including intervention cost/cost-effectiveness, fidelity, adaptation, acceptability, feasibility, reach, sustainability, implementation infrastructure, and organisational readiness for implementation.¹⁹ Despite their existence, the application of scalability assessments prior to the selection of interventions for population-wide delivery appears uncommon. While the inclusion of end-user perceptions and experiences, for example, policymakers, practitioners, and the implementation-setting workforce (i.e. ECEC services), in scalability assessments is recommended,²⁰ engagement and consultation with intervention end-users as part of scalability assessments is rarely undertaken. As ECEC service staff have tacit knowledge of the local context in which interventions are to be implemented and the barriers impacting implementation, their inclusion in assessments of intervention scalability assessments will provide policy and practice decision-makers with crucial perspective to facilitate the selection of interventions for scale-up.

No studies to date have systematically assessed a comprehensive range of factors that influence the scalability of evidence-based healthy eating and physical activity interventions from the perspective of ECEC services as end-users, nor how these perceptions differ based on service characteristics. The current study aimed to describe Australian ECEC services: i) perceptions regarding the scalability of evidence-based healthy eating and physical activity interventions; and ii) the association between the perceived scalability of evidence-based interventions and service characteristics.

Methods

Design, setting and sample

Cross-sectional online or telephone surveys were undertaken with ECEC services across Australia between August 2021 and March 2022. A sampling frame of 10,578 potentially eligible centre-based ECEC services including long-day cares (for children aged 0-6 years for >8

hours per day) and preschools (for children aged 3- 6 years for 6-8 hours per day),²¹ were identified via the Australian Children’s Education and Care Quality Authority’s (ACECQA) national register.²² A sample of 2,100 ECEC services was randomly selected and stratified by state and service area socioeconomic classification by an independent statistician to ensure representation of geographic and socioeconomic differences in services across Australia.

All centre-based ECEC services registered with ACECQA were eligible to participate. Services identified as out of school hours, vacation care, or family day care; catered solely for children with special needs; or Department of Education and Communities services were ineligible to participate due to operational differences. Ethical approval was obtained from XXXX. All subjects in this research study provided consent to participate in the survey.

Recruitment

Services were recruited using a non-randomised, staggered approach, whereby approximately 250 services received an email invitation to participate each week between August 2021 and November 2021 until the required sample size was achieved. The invitation included a link that directed participants to the information statement and led them to complete the online survey. Services were also mailed a hardcopy of the information statement, informing them that they would receive an email and a phone call inviting them to complete the survey either online or via computer-assisted telephone interview (CATI). Approximately one week from the initial invitation, non-responding services received a reminder email and were prompted via phone by trained interviewers (between 2 and 10 times) to complete the survey via CATI.

Data collection and measures

Service and responder characteristics

ECEC services were asked to report service characteristics including the type of service (i.e. preschool or long-day care), service opening and closing hours, number of full-time educators, number of children attending the service per day, and the number of children from non-English-speaking backgrounds. The staff member completing the survey on behalf of the service was also asked to report their main role at the service. Survey items assessing service and responder characteristics have been used previously by the research team within Australian ECEC service surveys.^{10,23,24} To determine service location and area socioeconomic classification, ECEC service geographical information (postcode and state) was extracted from the ACECQA national register.

Healthy eating and physical activity interventions

To reduce participant burden due to survey length, each consenting service was randomly allocated one of a possible 12 evidence-based interventions related to physical activity or healthy eating in the ECEC setting (see Appendix 1 for detailed descriptions of each intervention). These interventions were identified from published and ongoing reviews of studies conducted in the ECEC setting.^{25–27} The evidence-based interventions were selected by characterising included studies based on their discrete components and examining their impact on core outcomes relating to improvements in child dietary intake and/or physical activity.²⁸ Interventions and their descriptions were reviewed by an expert advisory group (health

promotion practitioners, implementation scientists, and dietitians with experience in the ECEC setting) in addition to ECEC service staff and health promotion staff responsible for supporting ECEC services to implement obesity prevention programs. This was to ensure the language was appropriate, aligned with terminology used in the sector (e.g. the Early Years Learning Framework),²⁹ and reflective of state/territory and national healthy eating and physical activity guidelines and programs being implemented in the sector.

Intervention scalability assessment

Survey items assessing perceived scalability of interventions were developed by the expert advisory group and based on domains within the Intervention Scalability Assessment Tool (ISAT).¹⁵ The ISAT consists of ten domains to consider prior to scaling up interventions: the problem; the intervention; strategic/political context; evidence of effectiveness; intervention costs and benefits; fidelity and adaptation; reach and acceptability; delivery setting and workforce; implementation infrastructure; and sustainability. The ISAT was developed to support policy-makers and practitioners to make systematic assessments of the suitability of health interventions for population scale-up within health and community settings. The ISAT was rigorously developed via literature reviews, expert consultation and pilot testing, and has been identified as a useful tool for assessing the scalability of real-world interventions within an Australian context.^{30,31}

Scalability survey items were pilot-tested and amended on the basis of feedback from health promotion practitioners, trained telephone interviewers, and two ECEC services for item comprehension and face validity. The final measure consisted of 15 items across the 10 ISAT domains and were rated on a 5-point Likert scale (1: strongly disagree to 5: strongly agree) (see Appendix 2 for domain description, number of items, and example item). 'The problem' (i.e. child healthy eating or child physical activity) described in survey items varied depending on whether a service was randomly allocated a healthy eating or physical activity intervention. Services did not need to currently or previously implement any of the interventions to complete the assessment.

Analysis

Analyses were performed in SAS (version 9.3).³² Descriptive statistics were employed to describe service and responder characteristics and survey responses. Service postcodes ranked in the bottom 50% of Australia according to the Index of Relative Socioeconomic Disadvantage (IRSD) from Socioeconomic Indices for Areas (SEIFA) were classified as 'lower socioeconomic status' (SES).³³ Service postcodes were also used to describe locality as either 'rural' or 'urban' based upon the Australian Statistical Geography Standard.³⁴ Services were categorised as 'small' if they reported <55 children attending per day (based on the median response of responding services) and 'large' if they reported ≥55 children attending per day. Chi-square analyses were used to compare service area SES classification, locality, and state among consenters and non-consenters.

By summing survey responses to the scalability items, each evidence-based intervention was given an overall 'score'. Where more than 1 survey item was used within an ISAT domain, an average score of the domain items was calculated. The maximum an evidence-based intervention could score was 50, with higher scores representing

higher perceived scalability. All domains were weighted equally. Average scores for each ISAT domain (out of 5) were also calculated, with higher scores representing a more favourable outcome. Radar plots depicting average ISAT domain scores for individual interventions and overall were generated to visually illustrate the study findings.

To explore differences in scalability assessment by service characteristics, simple and multiple linear regression analyses were conducted. This explored the association between average healthy eating and physical activity, individual, intervention scalability scores (dependent variables), and service characteristics (i.e. service type, SES, locality, and size) (independent variables). The significance value was set at .05.

Results

Of the 2,100 randomly selected centre-based ECEC services invited to participate in the study, 116 were deemed ineligible, leaving 1984 eligible participants. Of those, 1,028 services provided consent (51.81% consent rate). The scalability assessment was undertaken with a randomly selected subsample of 453 participants. Compared to non-consenters, consenting services in this subsample had higher odds of being located in rural areas (OR 1.61; 95% CI 1.18, 2.20; $p=0.003$) and lower SES areas (OR 1.37; 95% CI 1.05, 1.78; $p=0.021$). Within the subsample, 195 (43%) completed survey items assessing perceptions of scalability for one randomly allocated physical activity intervention, and 258 (57%) completed survey items assessing perceptions for one randomly allocated healthy eating intervention.

The majority of participating ECEC services were long-day care services (90%), with an average of 58 children attending per day (see Table 1). Survey respondents primarily held the positions of nominated supervisor (55%) or director (28%).

Perceived scalability of evidenced-based healthy eating and physical activity interventions

The mean scalability score for all healthy eating interventions was 40.83 (SD 5.61), and for physical activity interventions, it was 39.33 (SD 4.80), out of a possible 50 (Table 2).

The highest scoring healthy eating intervention was 'providing healthy eating education and activities for children' (M 43.05; SD 3.94), and the lowest was 'providing families with lunchbox guidelines' (M 38.99; SD 3.34). For physical activity, the highest scoring intervention was 'providing sufficient opportunities for child physical activity' (M 41.43; SD 4.58), and the lowest was 'engaging families in activities to increase child physical activity' (M 38.36; SD 7.80). See Appendix 3 for radar plots of the overall and individual scores for each intervention.

For healthy eating interventions, the highest scoring scalability domain was the strategic/political context (M 4.28; SD 0.74) with the lowest scoring being intervention costs and benefits (M 3.65; SD 1.13). For physical activity, the highest scoring scalability domain was evidence of effectiveness (M 4.17; SD 0.72), with the lowest scoring being the problem (M 3.58; SD 1.17).

Service characteristics associated with scalability of evidence-based interventions

Services located in rural areas scored the overall scalability of both healthy eating and physical activity interventions 1.82 points (95% CI

Table 1: Childcare service (N=453) and responder (N=453) characteristics.

| Service Characteristics | n (%) |
|--|---------------|
| Type of service | |
| Preschool | 45 (9.93%) |
| Long-day care | 408 (90.07%) |
| Opening hours per day (mean, SD) | 10.92 (1.26) |
| Number of children attending per day (mean, SD) | 57.95 (29.69) |
| Number of children from non-English speaking backgrounds (mean, SD) ^a | 15.24 (21.77) |
| Number of full-time educators (mean, SD) | 9.13 (8.18) |
| Service area socio-economic status^b | |
| High | 250 (55.31%) |
| Low | 202 (44.69%) |
| Service geographic location | |
| Urban (major cities) | 327 (72.19%) |
| Rural (inner regional, outer regional, remote) | 126 (27.81%) |
| Service state | |
| New South Wales | 183 (40.40%) |
| Victoria | 94 (20.75%) |
| Queensland | 95 (20.97%) |
| Australian Capital Territory | 7 (1.55%) |
| Tasmania | 4 (0.88%) |
| Western Australia | 43 (9.49%) |
| South Australia | 20 (4.42%) |
| Northern Territory | 7 (1.55%) |
| Responder Characteristics | |
| Role at the service | |
| Nominated Supervisor | 250 (55.19%) |
| Director | 129 (28.48%) |
| Other | 74 (16.34%) |

^an=448.^bn=452.

-3.53, 0.11; $p=0.037$) and 1.59 points (95% CI -3.11, 0.07; $p=0.041$) lower than those located in urban areas, respectively (Table 3). For individual interventions, simple and multiple regression analyses revealed borderline statistically significant associations between service characteristics and intervention scalability scores (Appendix 4 and 5). Services located in higher SES areas, compared to lower SES areas, scored the scalability of 'Having a physical activity policy' higher ($p=0.054$); larger services (≥ 55 children attending) scored the scalability of 'training educators to support child healthy eating' higher compared to smaller services (< 55 children attending) ($p=0.053$); and services located in rural areas, compared to urban areas, scored the scalability of 'making healthy menu modifications' lower ($p=0.054$).

Discussion

This was the first study to apply a policy and practice-based scalability framework to assess the perceived scalability of evidence-based healthy eating and physical activity interventions in the Australian ECEC setting, amongst a national sample of ECEC services. As the ISAT was developed for use by policymakers and researchers to assist in the selection of interventions with the highest likelihood of scale-up success, the use of the ISAT domains to assess perceived scalability among ECEC sector staff represents a novel application. Findings demonstrated varied assessments of the scalability of a range of evidence-based healthy eating and physical activity interventions,

providing some guidance on the interventions perceived as most suitable for implementation at scale.

Overall, the highest scoring healthy eating intervention was 'providing healthy eating education and activities for children', with the lowest scoring being 'providing parents with healthy eating guidelines' (38.99). The highest-scoring physical activity intervention was 'providing sufficient opportunities for child physical activity', with 'engaging families in activities to increase child physical activity' scoring the lowest. Overall, physical activity interventions appeared to score lower for 'the problem' domain compared with healthy eating interventions, suggesting that Australian ECECs may not perceive physical inactivity as a problem that they can address. Despite previous research indicating ECEC staff view it as their role and professional responsibility to support children to be physically active while attending care,³⁵ physical activity is also perceived to not be an issue for young children, potentially due to the misconception that 'children are active and full of energy'.^{36,37} Strategies to underscore the importance of physical activity in children and address any misperceptions that children are currently sufficiently active in care are therefore likely to be an important part of efforts to scale up such interventions.

This study found variability in the contribution of each ISAT domain when determining intervention scalability. Overall, the highest scoring scalability domain was the strategic and political context (whether the intervention is considered to align with the current strategic, political or environmental context), suggesting that other factors may be more important impediments to the successful scale-up of evidence-based interventions in the setting. For example, the cost and benefit domain consistently scored the lowest, suggesting that for most interventions, the perceived benefits would not exceed the expected financial cost of implementing the intervention. While this domain may be difficult to assess without accurate information on actual costs versus quantified benefits, the findings may reflect financial challenges faced by the sector including staff turnover, staff wages and poor working conditions.³⁸ Reviews assessing the reporting of cost and/or the cost effectiveness of healthy eating,^{39,40} physical activity, and obesity-prevention interventions in ECEC^{41,42} have found information relating to cost to be rarely reported. As such, ECEC services may be making decisions regarding the implementation of these interventions without crucial evidence informing budgets and resource allocation. Future research to quantify the benefits of such interventions, particularly for ECECs, and determine whether they outweigh the financial costs involved is required.

Australian ECECs located in rural areas scored the overall scalability of healthy eating and physical activity interventions significantly lower than those located in urban areas. Further, services located in rural areas perceived the scalability of 'making healthy menu modifications' lower than those located in urban areas. This may reflect the increasing prevalence of food insecurity, particularly access to and availability of foods, being experienced in rural and remote communities across Australia.⁴³ Services located in higher SES areas scored 'having a physical activity policy' higher than services located in lower SES areas, and larger services perceived 'training educators to support child healthy eating' to be more scalable than smaller services. Given the health inequities experienced by individuals living in rural and lower SES areas, these findings suggest adaptations to the intervention and/or the resources and process for implementation

Table 2: Mean scalability scores for evidenced-based interventions, as reported by ECEC responders.

| Evidenced-based intervention | Intervention scalability assessment domains: Mean (SD) | | | | | | | | | | Total Score (max 50) |
|---|--|--------------------|------------------------------|---------------------------|--------------------------------|-------------------------|-------------------------|--------------------------------|-------------------------------|--------------------|----------------------|
| | The problem | The intervention | Strategic /political context | Evidence of effectiveness | Intervention cost and benefits | Fidelity and adaptation | Reach and acceptability | Delivery setting and workforce | Implementation infrastructure | Sustainability | |
| Physical Activity (n=195) | | | | | | | | | | | |
| Providing sufficient opportunities for child physical activity (n=24) | 3.71 (1.16) | 3.88 (1.03) | 4.50 (0.53) | 4.38 (0.49) | 3.78 (1.04) | 4.19 (0.59) | 4.36 (0.50) | 4.33 (0.48) | 4.13 (0.71) | 4.21 (0.59) | 41.43 (4.58) |
| Providing educators with annual training opportunities and ongoing support (n=32) | 3.50 (1.22) | 3.97 (0.65) | 4.02 (0.82) | 4.00 (0.72) | 3.53 (0.84) | 3.88 (0.55) | 4.08 (0.51) | 3.97 (0.59) | 3.72 (0.69) | 4.06 (0.62) | 38.72 (4.56) |
| Delivering teacher-led, structured physical activity (n=40) | 3.65 (1.17) | 4.03 (0.53) | 3.99 (0.63) | 4.23 (0.53) | 3.65 (1.00) | 3.91 (0.50) | 4.03 (0.52) | 4.10 (0.50) | 3.65 (0.77) | 4.05 (0.60) | 39.28 (4.14) |
| Engaging families in activities to increase child physical activity (n=24) | 3.71 (1.20) | 3.92 (0.97) | 3.90 (0.99) | 4.13 (0.99) | 3.67 (0.87) | 3.77 (0.97) | 3.99 (0.87) | 4.00 (0.98) | 3.46 (1.07) | 3.83 (1.09) | 38.36 (7.80) |
| Providing sufficient portable play equipment (n=30) | 3.45 (1.09) | 4.00 (0.85) | 4.02 (0.62) | 4.24 (0.64) | 3.52 (1.12) | 3.95 (0.51) | 4.16 (0.43) | 4.03 (0.50) | 3.81 (0.60) | 4.07 (0.53) | 39.25 (4.33) |
| Having a physical activity policy (n=45) | 3.50 (1.23) | 3.89 (0.89) | 4.17 (0.55) | 4.09 (0.86) | 3.50 (1.02) | 3.95 (0.59) | 4.06 (0.38) | 4.05 (0.43) | 3.90 (0.55) | 4.14 (0.41) | 39.24 (3.65) |
| Average Physical Activity intervention score (n=195) | 3.58 (1.17) | 3.95 (0.81) | 4.09 (0.70) | 4.17 (0.72) | 3.59 (0.98) | 3.94 (0.62) | 4.10 (0.54) | 4.07 (0.58) | 3.78 (0.74) | 4.07 (0.64) | 39.33 (4.80) |
| Healthy Eating (n=258) | | | | | | | | | | | |
| Making healthy menu modifications (n=73) | 4.01 (1.05) | 3.83 (0.96) | 4.18 (0.79) | 4.01 (0.85) | 3.69 (1.12) | 3.89 (0.80) | 4.05 (0.73) | 4.13 (0.73) | 4.06 (0.74) | 4.22 (0.77) | 40.05 (6.59) |
| Providing families with lunchbox guidelines (n=14) | 4.21 (0.70) | 3.93 (0.73) | 4.18 (0.54) | 4.00 (0.55) | 2.86 (1.03) | 3.96 (0.57) | 4.17 (0.58) | 4.14 (0.36) | 3.54 (0.69) | 4.00 (0.68) | 38.99 (3.34) |
| Training educators to support child healthy eating (n=49) | 4.06 (0.95) | 4.00 (0.80) | 4.18 (0.62) | 4.10 (0.66) | 3.56 (0.94) | 3.73 (0.53) | 4.19 (0.52) | 4.04 (0.65) | 3.67 (0.68) | 3.88 (0.67) | 39.41 (4.55) |
| Providing healthy eating education and activities for children (n=35) | 4.18 (0.97) | 4.47 (0.56) | 4.46 (0.60) | 4.50 (0.51) | 4.12 (0.95) | 4.07 (0.58) | 4.37 (0.51) | 4.44 (0.50) | 4.12 (0.60) | 4.32 (0.53) | 43.05 (3.94) |
| Role-modelling healthy eating to children (n=39) | 4.08 (0.90) | 4.15 (0.67) | 4.33 (0.57) | 4.36 (0.58) | 3.51 (1.12) | 4.15 (0.63) | 4.26 (0.53) | 4.15 (0.67) | 3.97 (0.70) | 4.28 (0.60) | 41.26 (5.02) |
| Encouraging healthy drink choices (n= 48) | 3.85 (1.33) | 4.02 (1.12) | 4.39 (1.00) | 4.29 (0.90) | 3.67 (1.36) | 4.21 (0.78) | 4.48 (0.51) | 4.35 (0.60) | 4.27 (0.64) | 4.52 (0.55) | 42.03 (6.31) |
| Average Healthy Eating intervention score (n=258) | 4.03 (1.04) | 4.04 (0.89) | 4.28 (0.74) | 4.20 (0.75) | 3.65 (1.13) | 3.99 (0.70) | 4.24 (0.60) | 4.20 (0.65) | 3.99 (0.71) | 4.22 (0.68) | 40.83 (5.61) |

ECEC = early childhood education and care.

Table 3: The association between service demographics and overall intervention scalability scores.

| Service demographic | Category | Overall intervention scalability score | Simple regression | | Multiple regression | |
|--|-----------------------------|--|--------------------------|---------|-----------------------------------|---------|
| | | | Mean difference (95% CI) | p-value | Adjusted mean difference (95% CI) | p-value |
| Healthy eating interventions | | | | | | |
| Service locality | Rural (n=74) | 40.07 (5.24) | -1.08 (-2.60, 0.44) | 0.16 | -1.82 (-3.53, 0.11) | 0.037 |
| | Urban (n=181) | 41.14 (5.73) | | | | |
| Service SES | Least disadvantaged (n=145) | 40.56 (5.93) | -0.63 (-2.03, 0.77) | 0.37 | -1.39 (-2.97, 0.18) | 0.08 |
| | Most Disadvantaged (n=110) | 41.19 (5.15) | | | | |
| Service type | Long-day care (n=228) | 40.74 (5.69) | -0.85 (-3.10, 1.40) | 0.46 | -1.10 (-3.43, 1.23) | 0.35 |
| | Preschool (n=27) | 41.59 (4.91) | | | | |
| Size (number of children attending) | Large ≥ 55 (n=127) | 40.86 (5.26) | 0.07 (-1.32, 1.45) | 0.93 | 0.53 (-0.93, 1.98) | 0.48 |
| | Small < 55 (n=128) | 40.80 (5.95) | | | | |
| Physical activity interventions | | | | | | |
| Service locality | Rural (n=52) | 38.17 (5.08) | -1.59 (-3.11, 0.07) | 0.041 | -1.62 (-3.27, 0.02) | 0.053 |
| | Urban (n=141) | 39.76 (4.65) | | | | |
| Service SES | Least disadvantaged (n=101) | 39.43 (4.77) | 0.16 (-1.21, 1.53) | 0.82 | -0.18 (-1.65, 1.29) | 0.81 |
| | Most disadvantaged (n=91) | 39.27 (4.85) | | | | |
| Service type | Long-day Care (n=175) | 39.38 (4.83) | 0.58 (-1.77, 2.93) | 0.63 | 0.46 (-1.94, 2.86) | 0.71 |
| | Preschool (n=18) | 38.81 (4.65) | | | | |
| Size (number of children attending) | Large ≥ 55 (n=111) | 39.01 (4.76) | -0.75 (-2.13, 0.63) | 0.29 | -0.63 (-2.06, 0.80) | 0.38 |
| | Small < 55 (n=82) | 39.76 (4.86) | | | | |

SES = socioeconomic status.

may be required prior to attempts to scale these interventions in these populations. A range of strategies, for example, close consultation and co-design of interventions among individuals living in rural and lower SES areas, tailored and targeted support, increased resourcing, and socially and culturally appropriate strategies to address specific barriers to implementation, may help to mitigate any risks exacerbating or contributing to the maintenance of health disparities in these populations.

Implications

To further contextualise study findings, future research should examine scalability domains for each intervention using qualitative methods among intended end-users, particularly ECEC services. This will provide insights into the perceived barriers to scale up, and indication as to whether these barriers are modifiable or not. Such in-depth assessments will also provide guidance around which domains of scalability may be most pertinent to the ECEC setting. As all ISAT domain scores were weighted equally, it should be noted that higher average scores may not necessarily mean that an intervention is more likely to result in a successful scale-up. For example, a low score on a single domain (e.g. cost and benefits) may preclude the large-scale implementation of an intervention, even in circumstances where other domains are rated highly.

The delivery of healthy eating and physical activity programs in ECEC is part of national prevention strategies globally. As the ISAT was designed to support decision-making and prompt reflection among those involved in selecting interventions and helping to make decisions regarding where implementation efforts are to be placed to support scale-up, future assessments of intervention scalability should also be conducted from additional end-users, for example, policymakers and practitioners. Combined with the findings of the current study, scalability assessments from a broader range of

stakeholders would provide a more complete picture of the scalability of evidence-based healthy eating and physical activity interventions in the Australian ECEC setting.

Findings from the current study should be compared against current rates of implementation of the evidence-based interventions. This would provide important information for policymakers and practitioners to include in their assessments of intervention scalability and may also help to guide future policy and practice efforts, which could be prioritised towards those interventions with high scores across all domains but low prevalence of implementation in order to yield the greatest impact. While study findings provide useful information to facilitate this at a population level, local variation is likely and needs to be considered prior to any efforts to scale up.

Limitations

While survey items were informed by previous measures and developed in consultation with practitioners and end-users, the study employed a non-validated self-reported measure to assess Australian ECEC perceptions regarding the scalability of evidence-based interventions, which may be subject to social desirability bias. While generic language for each evidence-based intervention was employed to standardise interventions across states and territories, the study did not control for service familiarity or the current or previous implementation of an intervention, which may have influenced responses. In an attempt to reduce participant survey burden, services were asked scalability items about only one intervention (out of 12), which reduced the sample size per intervention. IRSD data from SEIFA to determine service area SES was dichotomised into high or low SES. Although the present study was limited by the sample size, the use of more categories to describe SES (e.g. quintiles) may provide more nuanced findings in relation to characteristics associated with perceived scalability. Approximately

40% of the surveyed ECECs were located in NSW, Australia, which, compared to the proportion of Australian children using approved childcare by state and territory, is slightly higher than national data.⁴⁴ Finally, comparisons between consenting and non-consenting services indicated significant differences in service locality and SES area, and as such, the findings may not be representative of the wider population.

Conclusions

This study has identified a variety of healthy eating and physical activity interventions that are both evidence-based and perceived as scalable to Australian ECEC services, particularly 'providing healthy eating education and activities for children', and 'providing sufficient opportunities for child physical activity'. Investigation into lower scoring interventions and implementation support requirements, particularly among smaller ECECs and those located in rural and lower SES areas, is warranted prior to efforts to scale up obesity-prevention interventions in the ECEC setting.

Conflicts of interest

The authors have no competing interests to declare.

Funding

This project was funded by a NHMRC Centre for Research Excellence grant (APP1153479) the National Centre of Implementation Science. Infrastructure support was provided by Hunter New England Population Health and University of Newcastle. AG is supported by a Heart Foundation Postdoctoral Fellowship (102518). SLY is supported by a Heart Foundation Future Leader Fellowship (106654). LW is supported by an NHMRC Investigator Grant (G1901360).

Ethics

Ethical approval was obtained from the University of Newcastle (H-2008-0348) and Hunter New England (06/07/26/4.04 2019/ETH12353) Human Research Ethics Committees.

Author contributions

SY, LW, AM, AB, RH conceived the study; AG, SY ML, JJ designed the survey items; ML contributed to data collection. CL conducted data analysis. AG drafted the manuscript. All authors critically reviewed and approved the manuscript.

Acknowledgements

We would like to thank participating ECEC services and data collectors.

Author ORCIDs

Alice Grady  <https://orcid.org/0000-0003-3379-5340>
 Melanie Lum  <https://orcid.org/0000-0003-2371-6549>
 Andrew Milat  <https://orcid.org/0000-0003-3126-3463>
 Adrian Bauman  <https://orcid.org/0000-0002-0369-4621>
 Rebecca Hodder  <https://orcid.org/0000-0003-3730-0907>

References

- Lanigan J. Prevention of overweight and obesity in early life. *Proc Nutr Soc* 2018; 77(3):247–56.
- Australian Institute of Health Welfare. *Nutrition across the life stages*. Canberra: AIHW; 2018.
- Australian Institute of Health Welfare. *Overweight and obesity*. Canberra: AIHW; 2020.
- World Health Organization. *Global action plan for the prevention and control of noncommunicable disease, 2013–2020*. Switzerland: Geneva; 2013.
- National Preventative Health Taskforce. Australia. *The healthiest country by 2020. National preventative health strategy- the road map to action*. Canberra: Commonwealth of Australia; 2009.
- Baxter J. *Child care and early childhood education in Australia (Fact Sheets 2015) Melbourne*. Australian Institute of Family Studies; 2015 [cited 2020 29 June], <https://aifs.gov.au/publications/child-care-and-early-childhood-education-australia>.
- Australian Bureau of Statistics. *Preschool Education, Australia. Statistics about preschool education, including enrolment, attendance, fees and service providers*. 2021. 2022 [cited 2022 June 7], <https://www.abs.gov.au/statistics/people/education/preschool-education-australia/latest-release>.
- Radcliffe B, Cameron C, Bade P. Nutrient intakes of young children: implications for long-day child-care nutrition recommendations. *Nutr Diet* 2002;59(3):187.
- Connelly J-A, Champagne M, Manningham S. Early childhood educators' perception of their role in children's physical activity: do we need to clarify expectations? *J Res Child Educ* 2018;32(3):283–94.
- Yoong SL, Finch M, Nathan N, Wiggers J, Lecathelinais C, Jones J, et al. A longitudinal study assessing childcare services' adoption of obesity prevention policies and practices. *J Paediatr Child Health* 2016;52(7):765–70.
- World Health Organization. *Beginning with the end in mind: planning pilot projects and other programmatic research for successful scaling up*. 2011.
- World Health Organization. *Practical guidance for scaling up health service innovations*. World Health Organization; 2009. Report No.: 9241598522.
- Milat AJ, Bauman A, Redman S. Narrative review of models and success factors for scaling up public health interventions. *Implement Sci* 2015;10(1):1–11.
- Charif AB, Hassani K, Wong ST, Zomahoun HTV, Fortin M, Freitas A, et al. Assessment of scalability of evidence-based innovations in community-based primary health care: a cross-sectional study. *CMAJ (Can Med Assoc J)* 2018; 6(4):E520–7.
- Milat A, Lee K, Grunseit A, Conte K, Wolfenden L, Bauman A. *The intervention scalability assessment tool: a guide for assessing the scalability of health interventions*. 2019.
- Cooley L, Kohl R. *Scaling up—from vision to large-scale change: a management framework for practitioners*. Washington, DC: Management Systems International; 2006.
- Zamboni K, Schellenberg J, Hanson C, Betran AP, Dumont A. Assessing scalability of an intervention: why, how and who? *Health Pol Plann* 2019;34(7):544–52.
- Milat AJ, King L, Bauman AE, Redman S. The concept of scalability: increasing the scale and potential adoption of health promotion interventions into policy and practice. *Health Promot Int* 2013;28(3):285–98.
- Weiner BJ. *A theory of organizational readiness for change. Handbook on implementation science*. Edward Elgar Publishing; 2020.
- Ben Charif A, Zomahoun HTV, Gogovor A, Abdoulaye Samri M, Massougbdji J, Wolfenden L, et al. Tools for assessing the scalability of innovations in health: a systematic review. *Health Res Pol Syst* 2022;20(1):34.
- Australian Institute of Family Studies. *Child care and early childhood education in Australia*. 2015 [cited 2020 29 June]. Available from: www.aifs.gov.au/publications/child-care-and-early-childhood-education-australia.
- Australian Children's Education and Care Quality Authority. National Register 2021 [cited 2021 June]. Available from: www.acecqa.gov.au/resources/national-registers.
- Grady A, Wolfenden L, Wiggers J, Rissel C, Finch M, Flood V, et al. Effectiveness of a web-based menu-planning intervention to improve childcare service compliance with dietary guidelines: randomized controlled trial. *J Med Internet Res* 2020;22(2):e13401.
- Finch M, Seward K, Wedesweiler T, Stacey F, Grady A, Jones J, et al. Challenges of increasing childcare center compliance with nutrition guidelines: a randomized controlled trial of an intervention providing training, written menu feedback, and printed resources. *Am J Health Promot* 2019;33(3):399–411.
- Grady A, Yoong S, Jackson J, Lamont H, Giles L, Lorch R, et al. *The effectiveness of early childhood education and care (ECEC) based interventions for increasing child physical activity: protocol for an updated systematic review and meta-analysis*. 2022. <https://doi.org/10.17605/OSF.IO/VY3NB>.
- Lum M, Wolfenden L, Jones J, Grady A, Christian H, Reilly K, et al. Interventions to improve child physical activity in the early childhood education and care setting: an umbrella review. *Int J Environ Res Publ Health* 2022;19(4).
- Yoong SL, Lum M, Wolfenden L, Jackson J, Barnes C, Hall AE, et al. Healthy eating interventions delivered in early childhood education and care settings for improving the diet of children aged six months to six years. *Cochrane Database Syst Rev* 2023;(6).
- Brown V, Moodie M, Sultana M, Hunter KE, Byrne R, Seidler AL, et al. Core outcome set for early intervention trials to prevent obesity in childhood (COS-EPOCH): agreement on "what" to measure. *Int J Obes* 2022;46(10):1867–74.

29. Australian Government Department of Education [AGDE]. *Belonging, being and becoming: the early years learning framework for Australia (V2.0)*. Australian Government Department of Education for the Ministerial Council; 2022.
30. Milat A, Lee K, Conte K, Grunseit A, Wolfenden L, Van Nassau F, et al. Intervention Scalability Assessment Tool: a decision support tool for health policy makers and implementers. *Health Res Pol Syst* 2020;**18**(1):1–17.
31. Lee K, Milat A, Grunseit A, Conte K, Wolfenden L, Bauman A. The intervention scalability assessment tool: a pilot study assessing five interventions for scalability. *Public Health Res Pract* 2020;**30**(2):e3022011.
32. SAS Institute Inc. SAS software. 9.4 ed. [Cary, NC, USA].
33. Australian Bureau of Statistics. *Census of population and housing: socio-economic indexes for areas (SEIFA), Australia*. 2016 [cited 2020 29 June]. Available from: www.abs.gov.au/AUSSTATS/abs@nswf/Lookup/2033.0.55.001Main+Features12016?OpenDocument.
34. Department of Health. *Australian statistical Geography standard- remoteness area*. Commonwealth of Australia Department of Health; 2021 [cited 2022 May 20]. Available from: <https://www.health.gov.au/health-topics/rural-health-workforce/classifications/asgs-ra>.
35. Pagnini D, Wilkenfeld R, King L, Booth M, Booth S. Early childhood sector staff perceptions of child overweight and obesity: the Weight of Opinion Study. *Health Promot J Aust* 2007;**18**(2):149–54.
36. Hollman H, Updegraff JA, Lipkus IM, Rhodes RE. Perceptions of physical activity and sedentary behaviour guidelines among end-users and stakeholders: a systematic review. *Int J Behav Nutr Phys Activ* 2022;**19**(1):21.
37. Sisson SB, Smith CL, Cheney M. Big impact on small children: child-care providers' perceptions of their role in early childhood healthy lifestyle behaviours. *Child Care Pract* 2017;**23**:162–80.
38. Thorpe K, Panthi N, Houn S, Horwood M, Staton S. Support to stay and thrive: mapping challenges faced by Australia's early years educators to the national workforce strategy 2022–2031. *Aust Educ Res* 2023;**6**:1–25.
39. Yoong SL, Lum M, Wolfenden L, Jackson J, Barnes C, Hall AE, et al. Healthy eating interventions delivered in early childhood education and care settings for improving the diet of children aged six months to six years. *Cochrane Database Syst Rev* 2023;**8**:CD013862. <https://doi.org/10.1002/14651858.CD013862.pub3>.
40. Grady A, Jackson J, Wolfenden L, Lum M, Yoong S. Assessing the scalability of healthy eating interventions within the early childhood education and care setting: secondary analysis of a Cochrane systematic review. Public health Nutr, Unpublished results.
41. Wolfenden L, Barnes C, Jones J, Finch M, Wyse RJ, Kingsland M, et al. Strategies to improve the implementation of healthy eating, physical activity and obesity prevention policies, practices or programmes within childcare services. *Cochrane Database Syst Rev* 2020;(2).
42. Sanchez-Flack JC, Herman A, Buscemi J, Kong A, Bains A, Fitzgibbon ML. A systematic review of the implementation of obesity prevention interventions in early childcare and education settings using the RE-AIM framework. *Transl Behav Med* 2020;**10**(5):1168–76.
43. National Rural Health Alliance. *Food security and health in rural and remote Australia*. Australian Government: Rural Industries Research and Development Corporation; 2016.
44. Australian Government: Department of Education. *Child Care in Australia report March quarter 2020* [cited 2022 May 20]. Available from: www.education.gov.au/child-care-package/early-childhood-data-and-reports/quarterly-reports/child-care-australia-report-march-quarter-2020.

Appendix A Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.anzjph.2023.100122>.