
This is the accepted manuscript.

This is an Accepted Manuscript of an article published by Taylor & Francis in Early child development and care in 2015, available at:
http://www.tandfonline.com/10.1080/03004430.2014.991723

©2014, Taylor & Francis

Reproduced by Deakin University with the kind permission of the copyright owner.

Available from Deakin Research Online:

http://hdl.handle.net/10536/DRO/DU:30069298
Title: Obesity prevention interventions in early childhood education and care settings with parental involvement: A systematic review

Heather Morris¹
Helen Skouteris¹
Susan Edwards²
Leonie Rutherford³

¹Deakin University, School of Psychology
²Australian Catholic University, Faculty of Education
³Deakin University, School of Communication & Creative Arts

Key Words: Obesity Prevention, Preschool children, Parents, early childhood education and care,

Acknowledgements: None

Corresponding Author:
Professor Helen Skouteris
Deakin University
221 Burwood Highway
Burwood, Victoria, 3124

Conflict of Interest: None to declare
Abstract

**Background**- Childhood obesity prevention interventions have commonly been conducted in two settings: Early Childhood Education and Care (ECEC) and the home. Partnering these settings together may be more effective in combating obesogenic risk factors. The aim of this paper was to evaluate ECEC interventions with a parental component to explore parental engagement and its effect on obesity and healthy lifestyle outcomes.

**Methods**- A search, conducted using Academic search complete, CINAHL, Global Health, ERIC, Health Source, Medline and PsychInfo revealed 17 peer-reviewed papers.

**Results**- Positive changes in body mass index (BMI) were seen in interventions presenting similar content across both ECEC and home. Secondary outcomes of changes in physical activity and healthy eating were reported in most studies; the quality of the studies ranged from fair to good.

**Discussion**- Parental components were often not evaluated separately to the ECEC component however three findings emerged: (1) the educational material must be consistent across settings; (2) parents should encourage their children to drink water; and, (3) parental satisfaction and participation is linked

**Conclusion**- A partnership between parents and ECEC may be a powerful force in the prevention of paediatric obesity, albeit a better understanding of collaborative parental engagement is needed.
Introduction:

Early childhood overweight and obesity is a major health concern that affects almost 23% of preschool children in the United States1 with similar rates in Canada2, Europe3 and Australia4. Little is known about the adverse health outcomes directly attributable to obesity in the preschool years5; in contrast, those in later childhood are well documented. The physical and psychological outcomes of obesity in childhood include heart risk factors6, pre-diabetes and type 2 diabetes7, 8, orthopaedic problems9, obstructive sleep apnoea10, negative body image11-13, stigma14, stereotyping15 and depression12.

Clearly there is an urgent need for effective childhood obesity prevention strategies16, 17. Conceptual models defining the influences of childhood obesity have been developed to inform these strategies. These include the socio-ecological model of predictors of childhood overweight first proposed by Davison and Birch18, that was further revised into the Six C’s model by Harrison and colleagues 19. Relating these models specifically to preschool children reveals that the most important settings where behaviours, policies and habits can be modified are the home and the early childhood education and care (ECEC)1 environment20.

To date preschool childhood obesity interventions have predominantly been conducted in a single setting – either within the home or an ECEC centre. Given that the majority of parents of preschool children enrol their children in ECEC, an obesity prevention strategy designed for implementation within this setting will reach a significant number of children21. Despite this fact, relatively few interventions have been conducted in the ECEC setting22. One recent review identified only 18 interventions conducted within childcare, preschool and head start programs21. The reviewed studies addressed nutrition, physical activity (PA) or sedentary behaviours through specialised curriculum or environmental changes to policy, practices or playgrounds21. Positive changes in dietary, sedentary and/or PA outcomes were frequently achieved in these studies however only five included a weight outcome measure with two reporting a reduced risk for obesity21. Parent only interventions that were systematically reviewed were found to be largely ineffective22-24 or result in no reduction in weight gain or BMI25. Two reviews found that a change in child BMI was only achieved when ECEC interventions included a parental component suggesting that multi-setting interventions may achieve greater success23, 26. As such, the partnering of the two proximal forces (parents and educators) and their settings may strengthen obesity prevention intervention outcomes in preschool children26.

To our knowledge, no systematic review has explored the ways parents have been engaged in ECEC obesity prevention interventions for preschool children. Therefore, the overall aim of this systematic review was to evaluate the success

---

1 Please note that this paper is using the Organization for Economic Co-operation and Development (OECD) definition of Early Childhood Education and Care (ECEC)
of childhood obesity prevention interventions delivered in ECEC services that included a parental component. The specific research questions that informed this review were:

1. How have parents been incorporated into childhood obesity interventions conducted in ECEC settings and to what extent, if any, does their involvement impact the outcomes of the intervention?

2. What are the methodological limitations of ECEC childhood obesity prevention interventions that have included a parental component?

3. What recommendations can be made for future research?

**Method**

**Eligibility criteria**

The year 2000 was chosen to as an appropriate starting point for data collection knowing that paediatric obesity prevention interventions did not begin before 1995. Eligible studies were published in English and required both an ECEC and parental component. Single setting interventions either in the home or ECEC alone were excluded. Interventions starting in elementary school were excluded; however interventions conducted on elementary school grounds where a preschool was present were included. Interventions in primary care clinics, after school care or other care that was not part of a formalised ECEC program were excluded. Protocol, feasibility and pilot studies were also excluded.

**Search Strategy**

In August 2014, a systematic search for suitable articles was conducted using several databases: Academic Source Complete, CINAHL, Global Health, ERIC, Health Source, Medline and PsychInfo. This strategy sought to maximise the possibility of finding all relevant papers published in the past 14 years. To increase the potential of revealing all international literature, the variety of terms used to describe ECEC for a young child who is not in school were searched. This included the words nursery, kindergarten, preschool, childcare, pre-primary school, day care and long day care. These terms were combined with obesity, overweight, obese, adiposity, prevention and intervention when placed in the search engine. Preschool and childcare were searched using both a space and a hyphen. A total of 1064 papers were returned and their titles and abstracts read. To ensure that every relevant paper was found, an examination of reference lists was conducted revealing a further 12 abstracts.

**Selection Process**
After examining the abstracts of returned papers, duplicates and irrelevant abstracts were removed leaving a total of 44 papers that were read in their full text. Of these, 27 were excluded with reasons (see Table S1), leaving 17 papers for inclusion in this review (see Figure 1 for PRISMA flow diagram). There was some difficulty identifying papers that had a parent component as it was often not identified in the title, and at times further reading beyond the abstract was needed to determine eligibility. Papers were identified by one author (HM) and reviewed by two authors (HM and HS); any uncertainty about their inclusion was resolved via discussion. A detailed search strategy for Medline is included in the appendix.

Quality Assessment

The quality assessment was conducted using methodology designed by Downs and Black²⁸ (see Table S2). This quality assessment has been identified as being useful for the evaluation of both randomised controlled trials (RCT) and non RCT’s and is also an effective tool for use in systematic reviews²⁹. Studies are given an overall score for quality after the completion of a 27 item checklist. Each item is given a 1 for Yes, 0 for No and 0 for unable to determine with one question about reporting having the option of scoring two points. A maximum of five points can be earned for the last question about statistical power. However in accordance with a previous study³⁰, question 27 was modified and allocated a score of 1 or 0 to indicate if statistical power was present or not, and the following rubric was used to assess quality: <14 points = poor; 15-19 points = fair; 20-25 points = good; and 26-28 points = excellent.

Results

Study description

Table 1 includes information from each study in relation to: overall aim, a parental aim if present, setting, sample, overall intervention description including parental intervention specifics, theoretical underpinnings, attrition, outcome measures including parental measures if present, and findings. A table was also created to show the main outcome variables in each study (see Table S3). Seventeen studies were included from a number of high and middle income countries around the world including Australia³¹, ³², Switzerland³³, France³⁴, USA³⁵-³⁶,³⁸, Belgium³⁹, Germany⁴⁰, ⁴¹, China⁴², Columbia⁴³ and Scotland⁴⁴. Two studies have multiple papers explaining the study and evaluation; one of these studies has different first authors³², ⁴⁸ and the other has the same first author⁴¹, ⁴⁹. The intervention with multiple papers and different first authors will be referenced using the paper with the evaluation data³². One study was omitted due to its use of the same data from another study that is included⁵⁰. Most studies used some variant of a RCT: cluster, single blinded RCT³³, ⁴⁷, RCT³⁴-³⁶, ⁴⁰, ⁴¹, cluster RCT⁴²-⁴⁴, ⁴⁶ and group RCT³⁷, ³⁹. Three studies included a quasi-experimental design³¹, ³², ³⁸ and one study included a prospective cohort design⁴⁵. Three of the five North American ECEC interventions were conducted either solely or
predominantly in Head Start centres. Nine studies indicated that a theoretical underpinning informed the development of their intervention. As per Table S3, the main targeted outcomes can be condensed into seven main areas: capacity building of agents, screen time, PA, fruit and vegetable intake, reduction of energy dense, nutrient poor (EDNP) foods, increasing water consumption and environmental change. Five studies addressed all seven targeted outcomes in both the home and ECEC setting. Capacity building of centre staff and directors was a high priority in the majority of studies and every parent received some form of education. The reduction of screen time was seen as a way to impact on sedentary lifestyles and was addressed in ten ECEC interventions and seven parental components. Structured PA was included in all but two studies with increases in fruit and vegetable intake and reductions of EDNP foods being targeted in all but three studies. Increasing the consumption of water or reducing soda and juice intake was included in under two thirds of the interventions. A change in environment including the built and/or policy environment was included in eight studies.

Methodological quality

The Downs and Black checklist was used to assess included studies for methodological quality. Seven papers were fair and ten were good with no studies classified as excellent or poor. The scores ranged between 16 and 24 with the average score being 19.47; see Table S2.

Parental intervention: The parental component of each study had a focus on education often about healthy eating and PA. Education was delivered through newsletters, brochures, pamphlets, letters, posters, cards and take home bags. Three studies supported the parental intervention with an internet site. Family functions, information nights, workshops, dinners and school festivals were also provided however attendance was noted as moderate to low. One study reported a 20% attendance and another demonstrated a drop in attendance from the first event at 48.7% to 7.9% at the last event. A monetary reward for returning allocated homework was provided to parents in two interventions. Only one study provided tailored advice to parents based on the questionnaire data they returned and another provided a workshop on positive parenting with a focus on fussy eaters.

Ten interventions did not state an aim for the parent component even though it clearly varied from the ECEC intervention. Seven studies had separate parental aims with only two measuring outcomes to determine if the aims were met. The aim of two studies was to influence parents either through their children or take home activities.
A further two studies sought to alter the home environment with one study specifying parent report of food intake of the child as the outcome of the home intervention. Two studies reported changes in nutrition knowledge and parental attitudes that were evaluated through questionnaires. Four studies had no measurement of the parental component. Parental involvement was used several times as a process evaluation measure to evaluate if the intervention had been conducted as intended. This included the distribution and reading of Tipp cards as well as the attendance at family events and information sessions. Parents were used to collect data about their child's eating and PA habits. Four studies reported that parent involvement and acceptance of material was high and that the time spent on the intervention was acceptable. A recent study examined the association between parent participation in the intervention and their child's BMI. They found a significant correlation between parents doing the intervention and a reduction in the child's BMI. In six studies, a critical evaluation of the parent component was conducted. It was concluded that adaptation, additional strategies or work was needed. A behavioural emphasis may have made a difference in one study and an increase in intensity may have altered non-significant outcomes.

Compared to fostering healthy eating and PA, reducing screen time and encouraging water for drinking were less likely to be included in the parental interventions. Of the seven interventions that suggested parents recommend drinking more water (with or without a recommended reduction of soda and juice consumption), four were successful in achieving statistically significant reductions in child BMI. Conversely, all interventions requesting parents decrease their children's screen time were unsuccessful in reducing child BMI. Furthermore, only half of these studies achieved part of their primary aims including nutrition changes, aerobic fitness and a reduction in TV viewing. Healthy eating and PA was targeted across all interventions with a small number omitting one or more components: PA, reduction of EDNP foods and increasing fruit and vegetable intake.

The measurement of attitudes and habits was undertaken in two studies with the aim of modifying obesogenic behaviours. A focus on changing parental eating habits and attitudes to food preparation and planning was made in an intervention conducted in China. The knowledge and attitudes of parents significantly changed as did the prevalence of unhealthy diet related behaviours of children. Overall however, no significant difference was made in any weight measures. A Columbian study also aimed to modify the knowledge, attitudes and habits of healthy eating and living an active lifestyle. This effect was sought in all study participants including preschool children, their parents and teachers. The primary outcome was achieved, specifically a significant change in knowledge, attitudes and habits over time for both parents and children although not for teachers. No significant connection between the child's baseline BMI and their knowledge, habits and behaviours was found, moreover no significant difference between groups for BMI was found. Further research is needed to establish how changing parental attitudes and knowledge can result in changes in BMI.
**ECEC Interventions:** A number of the ECEC interventions were informed by experts: exercise physiologists\(^33, 36, 37, 43\), paediatricians\(^33, 36, 43\), dieticians or nutrition specialists\(^33, 36, 37, 43\) and psychologists\(^33\). The input of key stakeholders including parents and migrant families\(^32, 33, 39\), community members\(^31, 39, 42\), elders\(^39\), teachers, principals and education specialists\(^32, 33, 36, 39, 43\), health promotion specialists\(^32, 37\), community health advocates\(^36\) and experts in minority health\(^36\) were also utilized. As a result, many interventions were specialised and targeted to the needs of the individual ECEC service. Two distinct methods of intervention delivery were used: provision of a prepared manual or specialized material for the teacher to deliver\(^23-35, 39, 41-43, 45\) and allowing trained educators choose how they implement the activities within the protocol requirements\(^37, 38, 44, 46, 47\). Neither method was more or less effective in producing BMI changes.

A reduction in overall or subgroup BMI changes was seen in a number of interventions\(^31, 32, 34, 36, 38, 41, 42\). Secondary outcomes were achieved in studies that could not produce a change in BMI including a reduction in the incidence of overweight\(^39\), better movement skills\(^47\), improvement in fruit and vegetable intakes\(^43, 44\), and a significant decrease in television viewing\(^45\). A large Swiss intervention achieved successful outcomes on aerobic fitness, motor agility, percentage body fat, waist circumference and benefits in other outcome measures including media use and healthy eating\(^33\). Only one intervention was unable to achieve their primary or secondary outcome measures of BMI changes and modifications in diet and PA, concluding that the Latino community is difficult to reach\(^37\). This study was methodologically similar to the one conducted a year prior that did produce a statistically significant change in BMI\(^36\).

**Discussion**

How have parents been incorporated into childhood obesity interventions conducted in ECEC settings and to what extent, if any, does their involvement impact the outcomes of the intervention.

The obesity prevention interventions reviewed here focused predominantly on the ECEC component and rarely fully engaged parents within their intervention. Moreover, a lack of consistent information across settings further widens the gap and prevents collaboration between the ECEC and the home. Two of the 17 studies, engaged parents with the ECEC curriculum\(^36, 37\) and four studies provided parents with some description of the information presented to the children\(^33, 38, 41, 42\). Providing parents with the same information that their children receive allows for more opportunities for discussion and integration of concepts within existing settings. This is supported by Vygotsky’s theories which suggest that child development occurs within the social context and the environment\(^51\). When the same material is given to a parent and is applied in both the home and ECEC environments, the child’s development and understanding has the potential to be richer and more complex. As a result, three of these studies reported either a significant change in BMI z score increase, a significant slowing in BMI increase, or a significant difference in the BMI of children whose parents carried out the
intervention. Newsletters and homework done with the child were the methods used to reinforce the curriculum. The long duration of the studies also allowed for consistency and frequent contact which may have assisted in achieving these outcomes. This is consistent with Bronfenbrenner and Morris’s (1998) theory of human development where proximal processes (reciprocal experiences that occur regularly, over a period of time) effect child development.

An Australian and a German study effectively engaged parents in the ECEC program, albeit using different methods. The Australian study involved parents in the development of policy and project management within the ECEC service. Parents were also given education and support. Policy changes were an important addition to the intervention and reflected the use of social ecological theory. However the authors nominated the building of parent’s capacity as a contributor to the study’s outcomes, as it may have led to environmental changes within the home or centre. Both Vygotsky and Bronfenbrenner identify the environment as a major contributor to child development, and its effect on childhood obesity development has been emphasised in the work by Harrison. Therefore it is likely that improving parenting skills would alter the outcome of new experiences. Parents in a German study were given training to design and implement a PA focused program. It was then collaboratively delivered concurrently with a state sponsored, expert run PA program within an ECEC service. A participatory approach was specifically chosen to encourage replication of the program post intervention. In fact, 44% of the PA programs were repeated the next school year, reflecting the success of the participatory approach.

Even though no significant changes in BMI were seen, other outcomes were achieved including a significant decrease in sedentary minutes per week and an increase in accelerometry counts. Positive unintended outcomes also occurred including parent networking, tailored programming to suit local needs and a pro PA culture. While not objectively measured, intervention parents described their children as being in better general health and having an improved quality of life. The collaboration was not without its apprehensions by ECEC staff fearing extra work or difficulties with extra parent involvement. These concerns were better dealt with in centres with effective communication strategies and procedures.

This review has revealed that parent engagement within an ECEC intervention is limited, however there are many opportunities for improvement. Three conclusions can be drawn from the findings present. Firstly, interventions that communicated with parents on classroom activities and content, often achieved their primary outcome measures. Newsletters were regularly used as the communication vehicle with effective studies providing them frequently. Secondly, some successful studies that lowered or slowed BMI increases included major changes to ECEC water policies. These were supported through parent activities including not packing sweet drinks in lunchboxes or responding to an individualised report. Unfortunately most studies did not describe the specific activities parents did to increase water consumption or restrict sweet drinks. Future studies need to outline the ways parents increase water intake and decrease soft and sweet drink intake. Thirdly, parental interest leading to participation leads to significant changes in child BMI, as
found in one study\textsuperscript{41}. Furthermore, the children of parents who were satisfied with the intervention consumed significantly less fruit and soft drinks and ate less French fries, salty foods and macaroni and cheese\textsuperscript{41}. When parents actively participated, their children saw greater changes in healthy eating and physical activity than others, further demonstrating the necessity of parental partnership with ECEC for obesity prevention. Apart from this most recent study, only a further two studies measured parent satisfaction\textsuperscript{33, 38}. However the link between parent satisfaction and its effect on outcomes were not measured. The possibility exists that parent satisfaction is linked with parent self-efficacy or one’s confidence in their parenting abilities. Parental self-efficacy has been associated with positive changes in child behaviours and obesity outcomes and may explain this result\textsuperscript{54-56}.

Possible mechanisms explaining the lack of significant changes in BMI that are apparent in studies requesting parents to reduce screen time are unclear. Of the seven studies that asked parents to reduce screen time, four did not achieve any statistically significant changes in BMI measures\textsuperscript{33, 35, 37, 39} and three achieved BMI changes in either whole\textsuperscript{31} or subgroups \textsuperscript{41, 42}. Only one of these studies failed to measure screen time as an outcome measure\textsuperscript{39} with the remaining measuring hours per day. While the reduction of screen time was only a small portion of the overall intervention, these results may indicate that screen time reduction needs a different approach. Alternatively screen time as an obesity risk factor alone may not be a strong enough contributor to obesity development and its influence is only seen when combined with other risk factors. This is demonstrated in the results of two studies that significantly reduced screen time without a concurrent change in BMI\textsuperscript{35, 33}. Only one study achieved a significant change in both BMI and screen time reduction and its community wide approach to obesity prevention is the distinguishing factor when compared to the other studies\textsuperscript{31}.

Six studies acknowledged that superior parental engagement may have led to the successful achievement of their primary outcome measures\textsuperscript{33, 35, 37, 39, 42, 47}. This admission of poor engagement and collaboration is not congruent with the messages of partnership that are discussed in early childhood recommendations across the world\textsuperscript{57, 58 59}. If collaborative efforts are to be made with the goal of obesity prevention then greater parental engagement within ECEC services needs to occur. The most ideal ways to do this have not fully been clarified and future research is needed.

**What are the methodological limitations of ECEC childhood obesity prevention interventions that have included a parental component?**

The reviewed studies cited a number of limitations explaining a lack of significant effect. Attrition was a major factor for a number of studies. While eleven studies described their attrition as low (around 10\%)\textsuperscript{31-33, 36-40, 43, 44, 47}, the remaining six were either medium (around 20\%)\textsuperscript{45}, or high (around 30\%)\textsuperscript{34, 35, 41, 42, 46}. Four studies that achieved successful changes in BMI had low attrition rates\textsuperscript{31, 32, 36, 38}. The changeable nature of the preschool population was cited when attrition was high.
Starting school, moving away, new siblings and parent leaving work to stay home are all reasons for withdrawing from ECEC contributing to a high attrition rate. Weak parental components were identified by some studies as contributing to the poor outcomes, and as previously stated were inadequately planned, and evaluated. Reporting bias, sample bias, social desirability bias were also cited as possible study contaminants. Logistical issues that are faced in remote areas including weather and phone reception were also identified in one study.

**What recommendations can be made for future research?**

In recent years, a number of protocols for obesity prevention interventions in preschool aged children have been published demonstrating the importance of early childhood obesity prevention. However the care and consideration that has gone into the development of the parent component or the collaboration across settings is difficult to determine. Future interventions must adequately plan, implement and evaluate any parental intervention that is conducted in conjunction with an ECEC service. Furthermore, factors that can affect participation within the preschool population must be accounted for during planning, prior to implementation to keep attrition low.

This review has identified a number of fair to good quality published studies that have evaluated interventions conducted in the ECEC with a parental component. To our knowledge, no systematic review has only evaluated interventions in ECEC with a parental component. Filling this gap has provided a significant contribution to this area of research. This review has also revealed that well planned parental components improve the overall intervention’s success.

**Conclusion**

Overweight and obesity in the preschool years is a problem affecting over 20% of children in many western countries. Ecological models of childhood obesity development point to parents and ECEC educators as having significant influence on a child’s healthy weight development and maintenance. Engaging parents and ECEC educators to work in partnership may lead to effective outcomes and assist the preschool population with achieving a healthy weight. The best ways to engage this partnership and divide the areas of responsibility are still to be determined.


