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Ashley Capestrain

The University of Akron, anc69@zips.uakron.edu

Emily Montague


The University of Akron, enm19@zips.uakron.edu

Meghan Frantz

The University of Akron, mef45@zips.uakron.edu

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Effectiveness of School-based Interventions versus Family-based Interventions in the Prevention
and Treatment of Childhood Obesity

Ashley Capestrain, Meghan Frantz, Emily Montague

The University of Akron

Author Note

Ashley Capestrain, Meghan Frantz, & Emily Montague, College of Nursing, The University of Akron, This paper is in fulfillment for the Honors College, Due May 2017, Professor Christine

Heifner Graor, PhD, MSN, APMHCNS-BC, RN

Abstract

Childhood obesity affects 155 million children worldwide. As prevalence increases, it is important to identify effective interventions in the treatment and prevention of childhood obesity. Obesity may result in short and long term effects linked to some of the leading causes of morbidity and early mortality. The purpose of this systematic review is to identify, review, and critically appraise evidence from studies examining the effect of family and school based interventions. This review answers the following PICO question: In children, how do family based interventions compare to school based interventions, in the prevention and treatment of obesity? Methods included literature searches in university databases and Google Scholar for relevant studies. Studies were critically appraised for their validity, reliability, and limitations. It was found that both school and family interventions are beneficial in decreasing body mass index (BMI), increasing physical activity, improving nutrition and dietary habits, decreasing blood pressure and cholesterol, and improving attitudes and psychosocial outcomes. A definitive conclusion cannot be drawn to determine if school or family based interventions result in a better outcome. Thus, further research is needed that compares school and family based interventions in the prevention and treatment of childhood obesity.

There is an increasing prevalence of childhood obesity throughout the world. It affects 155 million school-aged children and young people globally (Kothandan, 2014). Of the world's 43 million overweight and obese preschoolers, 35 million live in developing countries. By 2020, if this current epidemic continues 9 percent, or nearly 60 million, of all preschoolers will be overweight or obese ("Obesity Trends," 2017). Obesity is defined as a body mass index (BMI) at or above the 95th percentile for children and teens of the same age and gender ("Defining Childhood Obesity," 2015). Obesity is considered to be a major public health issue and is linked to some of the leading causes of morbidity and early mortality (Greening, Harrel, Low, & Fielder, 2011). Some of the health complications resulting from childhood obesity include diabetes, cardiovascular disease, obstructive sleep apnea, nonalcoholic fatty liver disease, and an increased likelihood of ischemic heart disease and breast cancer in adulthood (Anderson, Newby, Kehm, Barland, Hearst, 2015). Early childhood has been identified as a crucial time for obesity prevention based on children's developmental patterns, including stabilization of health behaviors that can lead to obesity, and the large influence of environmental factors on children's regulation of eating (Brotman et al., 2012). Current studies have yet to identify the most effective strategy for childhood obesity management (Elizondo-Montemayor et al., 2013). Since obesity has shown to be a major health crisis globally, there is a need for effective interventions to decrease the prevalence of obesity in children.

Many current research studies look at treating childhood obesity with school or family based interventions. However, most research has yet to compare these two interventions in the prevention and treatment of childhood obesity. School based interventions include actions taken in schools to assist children in the prevention or treatment of obesity independent from family. Family based interventions include actions taken with the child's parents or caregiver in the

home to help prevent or treat obesity. The purpose of this review is to identify, review, and critically appraise the evidence from studies examining the effect of family based intervention and school-based interventions on childhood obesity. This review answers the following PICO question: In children, how do family based interventions compare to school based interventions, in the prevention and treatment of obesity? Based on the critical appraisal of evidence, recommendations for practice and research are made.

Methods

The literature search was conducted within a university database system. Databases used were CINAHL, Medline, Google Scholar, and Health Source: Nursing/Academic Edition. Inclusion criteria were: family and/or school as an intervention for obesity, children, defined as under eighteen years of age, and publications after December 2004. Study designs included are randomized control trials, intervention studies, qualitative studies, quasi-experimental designs, a longitudinal cohort study, pre-post designs, and an observational study. Exclusion criteria were: publications prior to 2004 and systematic reviews. Keywords or phrases used include obesity, pediatric, school based intervention, family based intervention, childhood obesity, school intervention, family intervention, school, and family. Articles were retained as potential sources based on the title of the articles as well as a brief scan of the abstract. Studies that seemed fitting were read thoroughly before being selected as sources. They were assessed based on the criteria set forth prior to being selected for review. Twenty studies were evaluated for quality based on methods for choosing participants, use of family or school as the intervention, use of a control group, and the use of reliable measures. Selection bias was avoided by including studies with conflicting results. For this review, the rating system proposed by Burns, Rohrich, and Chung (2011) was used.

Review of Literature

Childhood obesity has become a major global health problem (Anderson, Newby, Kehm, Barland, & Hearst, 2015; Brotman et al., 2012; Cadzow, Chambers, & Sandell, 2015; Cao, Wang, & Chen, 2015; Chen, Kao, Hsu, Wang, & Hsu, 2015; Davison, Jurkowski, Li, Kranz, & Lawson, 2013; Elizondo-Montemayor, et al., 2013; Fagg, et al., 2014; Greaney, et al., 2014; Greening, Harrell, Low, & Fielder, 2011; Greiner, Lian, & Rosenqvist, 2005; Jiang, Xia, Lee, Ho, Keung, & Kwong, 2014; Leardo, Aneja, & Elbel, 2016; Lederer, King, Sovinski, Seo, & Kim, 2015; Ling, King, Speck, Kim & Wu, 2014; Rodrigues, Alves, Barreto & Freitas, 2015; Sacher et al., 2010; Schwartz, Watson et al., 2015; Steele, Steele, & Cushing, 2012; Teder, et al., 2013). Many researchers have found that childhood obesity can cause numerous short and long term effects associated with early morbidity and mortality (Adab et al., 2015; Anderson et al., 2015; Cadzow et al., 2015; Cao et al., 2015; Elizondo-Montemayor, et al., 2013; Greening et al., 2011; Rodrigues et al., 2015). Current research studies focus on using only school or family based interventions in the treatment of childhood obesity; however, most research has yet to compare these two interventions together in the prevention and treatment of childhood obesity. Due to this gap in knowledge, the increasing prevalence of childhood obesity, and the increased risk for early morbidity and mortality, it is imperative to determine the most effective intervention for treating and preventing obesity in children and young people. Refer to Appendix A for the breakdown of searched articles.

School Based Interventions

Researchers have studied the effect of school-based interventions on the treatment and prevention of childhood obesity (Benjamins, & Whitman, 2010; Cadzow, et al., 2015; Elizondo-Montemayor, et al., 2013; Greaney, et al., 2014; Greening et al., 2011; Lederer et at., 2015; Lee

et al., 2014; Ling et al., 2014; Rodrigues et al., 2015; Schwartz et al., 2016). It has been identified that children spend most of their time in school, therefore school is considered an ideal setting for a healthy lifestyle promotion program (Ling et al., 2014). Of the 10 articles reviewed, numerous effects were found from using school based interventions including, BMI; physical activity; nutrition and dietary habits; blood pressure and cholesterol; and attitude and psychosocial outcomes. Each effect is discussed in depth below.

Body Mass Index. Several articles found positive effects from school based interventions on children's BMI and percentage of body fat. BMI is a measurement of body fat that is based on height and weight ("Calculate your body mass index," 2016). Students receiving school-based intervention decreased their BMI z-score compared to those who did not receive the intervention with statistical significance (Cadzow et al., 2015; Lee et al., 2014; Schwartz et al., 2016). It was also found that children who received school based interventions had a statistically significant decrease in their percentage of body fat (Elizondo-Montemayor, et al., 2013; Greening et al., 2011; Lee et al., 2014; Schwartz et al., 2016). Lee et al. (2014) found that those receiving school based interventions continued to have a significant reduction in BMI z-score and body fat after a four-month maintenance period as well. Schwartz et al. (2016) found that an increase in water consumption while participating in school based interventions showed a decrease in BMI. Some of these studies lacked a control group, which may have biased the findings (Cadzow et al., 2015; Elizondo-Montemayor, et al., 2013; Ling et al., 2014). For example, effects of the school based intervention may be attributed to confounding factors such as the environment, socioeconomic status, and ethnicity. Greening et al. (2011) took this bias into account and provided a randomized controlled trial with intervention and control groups. This study was a level of evidence of one and found no differences in outcomes based on gender, ethnicity, or

race. BMI has been found to be predictive of elevated fat mass and percentage body fat when above the 85th percentile in children.

Physical Activity. Many studies looked at the effects of school based interventions on children's post-intervention physical activity levels. Five studies found that school based interventions led to an overall increase in physical activity among children (Benjamins & Whitman, 2010; Cadzow et al., 2015; Elizondo-Montemayor et al., 2013; Greening et al., 2011; Ling et al., 2014). Ling et al. (2014) found that the effects of the school based intervention on physical activity depended on school, grade, and age of the children. A randomized controlled trial of 450 children, ages 6-10 years old, in Mississippi, found that students who received the school based intervention of participating in monthly physical activity and nutritional events during the nine-month academic year showed statistically significant improvement in physical activity (Greening et al., 2011). Greening et al. (2011) also found that a school based intervention led to a statistically significant increase in performance on physical activity tests including, such as, jump rope, hula hoop, baseball throws, and foot races, compared to those who did not receive the school based intervention.

Nutrition and Dietary Habits. Many researchers examined the effects of school-based interventions on children's nutrition and dietary habits. After receiving school based interventions, many children showed an improvement in dietary habits (Greening et al., 2011; Lee et al., 2014; Ling et al., 2014). Ling et al., (2014) conducted a quasi-experimental study with a level of evidence of two and found that the effects of the intervention on nutrition depended on school, grade, and age of the children. Whereas Greening et al., (2011) did a randomized control trial with a level of evidence of one and found no evidence of differences in outcomes based on gender, ethnicity, or race. A quasi-experimental study of New York, New York public

elementary schools and middle schools and the 1,065,562 students within those schools found that the installation of more water fountains resulted in an overall increased water consumption (Schwartz et al., 2016). Another study found that a school intervention of providing structured meal and physical activity plans for students resulted in a decrease in occurrence of hyperglycemia from 1% to 0% (Elizondo-Montemayor et al., 2013). A limitation to some of these findings includes a lack of control group (Elizondo-Montemayor et al., 2013; Ling et al., 2011; Schwartz et al., 2016). Other studies overcame this limitation by using a control group (Greening et al., 2011; Lee et al., 2014).

Blood Pressure and Cholesterol. An intervention study of 96 children ages six through twelve found that through a structured meal and physical activity plan created by the school, the occurrence of metabolic syndrome fell significantly from 44% to 16%. The study also found that high blood pressure fell from 19% to 0%. High-density lipoprotein-cholesterol also showed a decrease in results with statistics decreasing from 60% to 41% (Elizondo-Montemayor et al., 2013).

Attitudes and Psychosocial Outcomes. Studies examined the effects of school based interventions on attitudes and psychosocial outcomes in children. Lee et al., (2010) found that school based interventions lead to an improvement in attitudes toward exercise. Benjamins & Whitman (2010) found in a school based intervention study that there was an increase in knowledge of the importance of physical activity in the prevention of obesity among the students who participated.

Family Based Interventions

Researchers have studied the effects of family based interventions in the prevention and treatment of childhood obesity (Anderson et al., 2015; Brotman et al., 2012; Chen et al., 2015;

Davison et al., 2013; Fagg, et al., 2014; Jiang et al., 2005; Rodrigues et al., 2015; Sacher et al., 2010; Steele et al., 2012; Teder et al., 2013; Watson et al., 2015). Families play an important role in shaping children's early life experiences (Davison et al., 2013). Many of children's behaviors are learned from their parents, thus parents serve as role models for their children's behaviors. Therefore, educating parents to be healthy role models may be helpful in the prevention and treatment of childhood obesity (Chen et al., 2015). Of the articles studied, numerous effects were found to result from using family based interventions including BMI; physical activity; nutrition and dietary habits; blood pressure and cholesterol; and attitudes and psychosocial outcomes.

Body Mass Index. Several articles found effects on body mass index from the use of family based interventions (Anderson et al., 2015; Brotman et al., 2012; Cao et al., 2015; Chen et al., 2015; Davison et al., 2013; Fagg et al., 2014; Jiang et al., 2005; Sacher et al., 2010; Teder et al., 2013; Watson et al., 2015). Many articles found that the use of family based interventions was associated with statistically significant decreased BMI z-scores (Brotman et al., 2012; Cao et al., 2015; Davison et al., 2013; Jiang et al., 2005; Sacher et al., 2010; Watson et al., 2015). Sacher et al. (2010) found in a randomized control trial with a level of evidence of one, that a family based intervention of educational and physical activity sessions along with a free family swimming pass reduced both waist circumference and BMI z-scores. However, multiple articles also concluded that there was no change in BMI after the implementation of family based interventions (Anderson et al., 2015; Chen et al., 2015; Fagg et al., 2014; Teder et al., 2013). One study relied on self-report for the BMI score, which may have biased the findings (Anderson et al., 2015). A second limitation faced by multiple studies was a restricted sample size (Anderson et al., 2015; Chen et al., 2015; Teder et al., 2013). Some studies also lacked a control group (Anderson et al., 2015; Davison et al., 2013; Watson et al., 2015). Other studies overcame this

limitation by using both an intervention and control group in a randomized controlled study (Brotman et al., 2012; Cao et al., 2015; Fagg et al., 2014; Jiang et al., 2005; Sacher et al., 2010).

Physical Activity. Multiple studies found positive effects of family based interventions on levels of physical activity (Anderson et al., 2015; Brotman et al., 2012; Davison et al., 2013; Rodrigues et al., 2015; Sacher et al., 2010; Teder et al., 2013). Studies found that children who received family based interventions had statistically significant improvements in physical activity levels (Anderson et al., 2015; Brotman et al., 2012; Davison et al., 2013; Sacher et al., 2010; Teder et al., 2013). However, Rodrigues et al. (2015) found that physical activity alone does not lead to weight loss, but needs to be combined with healthy eating habits to be effective. Studies also found that children who received a family based intervention spent less time watching television and engaged in screen time (Anderson et al., 2015; Brotman et al., 2012; Davison et al., 2013; Sacher et al., 2010).

A limitation to some studies includes a setting not in the United States of America (Rodrigues et al., 2015; Sacher et al., 2010; Teder et al., 2013). Some studies' level of evidence indicated a reduced reliability (Anderson et al., 2015; Davison et al., 2013; Rodrigues et al., 2015; Teder et al., 2013) Other studies showed strong reliability through their level of evidence and study methods (Brotman et al., 2012; Sacher et al., 2010).

Nutrition and Dietary Habits. Studies have found that the use of family based interventions is associated with a change in nutrition and dietary habits (Anderson et al., 2015; Brotman et al., 2012; Davison et al., 2013; Teder et al., 2013). Children who received family based interventions had significantly lower total energy intake and macronutrient intake of fat, protein, and carbohydrates compared to pre-family based intervention (Chen et al., 2016; Davidson et al., 2013; Teder et al., 2013). Brotman et al. (2012) found in a randomized

controlled trial of 186 youth with a level of evidence of 1, that there were no significant differences in total calories consumed between those who received a family based intervention aimed at promoting effective parenting and those who were in the control group. However, the study found significant differences in the proportion of calories consumed from carbohydrates, protein, and fat. Those who received the family based intervention consumed fewer of their calories from carbohydrates (Brotman et al., 2012). When family intervention was used, there was also a noted decrease in the incidence of binge eating among children (Teder et al., 2013). Another study found that children significantly increased their fruit and vegetable consumption while decreasing their sugared beverage intake (Anderson et al., 2015). Rodrigues et al. (2015) found that implementation of the Mediterranean diet, which is considered the current healthiest diet, was effective in reducing childhood obesity. One limitation to these findings is that studies relied on self-report (Davidson et al., 2013; Teder et al., 2013). Other studies overcame this limitation by using study designs with higher levels of evidence (Anderson et al., 2015; Brotman et al., 2012; Chen et al., 2015).

Blood Pressure and Cholesterol. A randomized control trial of 68 obese school aged children found that after implementation of a two-year family based behavioral treatment program that total cholesterol decreased by 5.5% and triglycerides by 9.7%. Blood pressure readings were also found to be significantly decreased in those who received the family based intervention (Brotman et al., 2012; Jiang et al., 2005). Both studies have a strong reliability with a level of evidence of one.

Attitudes and Psychosocial Outcomes. Davison et al. (2013) in a pre and post-test design found parents who received family based interventions reported significantly greater self-efficacy to promote healthy eating in children and increased support for their children's physical

activity in the post test. Studies found that children who received a family based intervention had a higher rating of self-esteem compared to the control group (Fagg et al., 2014; Sacher et al., 2010). Watson et al. (2015) found that there were only small improvements in all self-esteem domains from baseline to post-family intervention. The only change to reach significance was in the social acceptance domain. The study also found no significant differences in child outcomes by gender or age (Watson et al., 2015). Steele et al., (2012) found that a child's attitude of readiness to change led to an overall more positive decisional balance related to health choices. As a result, incidence of obesity in children decreased. However, this study also found that if parents did not display the same attitude of readiness to change, then children were less likely to have a positive attitude toward change and therefore did not see an improvement in their weight. One limitation to these findings is that not all studies were conducted in the United States of America (Fagg et al., 2014; Sacher et al., 2012). Another limitation in the study by Steele et al. (2012) was a lack of racial and income level diversity among the studied population. This may lead to difficulties applying the study conclusions to the general population.

Critical Appraisal of the Evidence

Due to the current rate of development of childhood obesity, it is important to review studies on relevant prevention and remediation methods, and apply the most effective approach to correcting this issue. If obesity is reduced and prevented early, it will decrease the likelihood of numerous health issues later in life. Children will have a lesser chance of suffering from problems such as diabetes, heart disease, and cancer if action is taken during childhood to encourage and maintain a healthy lifestyle and BMI (Anderson et al., 2015). By preventing these problems, there will be a decrease in the requirement of medical care for chronic conditions in adulthood. Through investigation, this critical appraisal of evidence has produced several studies

dedicated to both family and school-based interventions and their effectiveness in preventing the development of childhood obesity. Of the twenty studies reviewed in this appraisal, eight focused on school-based intervention and twelve focused on family-based intervention.

Validity and Reliability of Findings and Methods for School Based Interventions

Many studies had a high level of validity and reliability. The validity and reliability of a study can be established through the determination of the level of evidence. The level of evidence is a system for rating evidence based on the effectiveness of a given intervention. For this review, the rating system proposed by Burns, Rohrich, and Chung (2011) was used. Studies are placed into a hierarchal rank based on the likelihood of bias in the study. Randomized controlled trials are considered to be the highest level of evidence because of their intended unbiased design, which leads to a reduced systematic error. Case series are considered to be the lowest level because there is little to no control over interfering factors (Burns, Rohrich, & Chung, 2011). The studies by Greening et al. (2011) and Cao et al. (2015) were a level of evidence of one because they are both classified as randomized control trials. Three studies had less validity and reliability with a level of evidence of two. These studies were considered a level of two because two of the studies were quasi-experimental and one was an interventional study (Ling et al., 2014; Rodrigues et al., 2015; Schwartz et al., 2016). The study by Cadzow et al. (2015) had a level of evidence of three due to its classification as a three-year long longitudinal cohort study that also lacked a control group. Three other studies had a level of evidence of four (Benjamins & Whitman, 2010; Elizondo-Montemayor et al., 2013; Lee et al., 2014). These studies were a level four because they are all intervention studies. The use of a control group helped make two studies researching school based interventions more valid and reliable (Greening et al., 2011; Rodrigues et al., 2015). In addition, a qualitative study was completed

and therefore had a level of evidence of six. This study consisted of research on barriers and facilitators to the effectiveness of school based intervention programs (Greaney et al., 2014). Pre-post interventions can cause many threats to internal validity (Benjamins & Whitman, 2010; Lee et al., 2014). A small sample size also decreases the validity and reliability of two studies (Elizondo-Montemayor et al., 2013; Greaney et al., 2014; Lee et al., 2014) The study conducted by Lee et al. (2014) had a sample size of 106, while the study by Elizondo-Montemayor et al. (2013) had a sample of 96, and Greaney et al. (2014) had 56 participants.

Validity and Reliability of Findings and Methods for Family Based Interventions

Four of the studies were a level of evidence of one evidence because they were randomized controlled trials (Brotman et al., 2012; Fagg et al., 2014; Jiang et al., 2005; Sacher et al., 2010). Two other types of studies used were a quasi-experimental design with a level of evidence of two (Chen et al., 2015; Steele et al., 2012). One study was a level of evidence of three because it was defined as an experimental cohort study (Anderson et al., 2015). Three other studies had a level of evidence of four because the study by Davidson et al. (2013) is a pre-post cohort study, the study by Watson et al. (2015) is a qualitative study with a pre-post design, and the study by Teder et al. (2013) is a case-control observational study. Lack of control makes four studies less valid and reliable (Anderson et al., 2015; Davison et al., 2013; Teder et al., 2013; Watson et al., 2015). Pre-post interventions also decreased internal validity in two studies (Davison et al., 2013; Watson et al., 2015). Self or parent reporting could result in response bias, which occurred in two of the studies (Davison et al., 2013; Watson et al., 2015). A small sample size also poses a threat to validity and reliability of eight studies (Anderson et al., 2015; Brotman et al., 2012; Chen et al., 2015; Davison et al., 2013; Jiang et al., 2005; Sacher et al., 2010; Steele et al., 2012; Teder et al., 2013).

Limitations of School Based Interventions

There were limitations found in the school based interventions studies. Three studies had less reliability since they were not randomized controlled studies (Benjamins & Whitman, 2010; Ling et al., 2014; Schwartz et al., 2016). For example, four studies had an intervention design and one study was quasi-experimental (Benjamins & Whitman, 2010; Elizondo-Montemayor, et al. 2013; Lee et al., 2014; Ling et al., 2014; Rodrigues et al., 2015). Four studies also lacked a control group which decreased their reliability and validity (Benjamins & Whitman, 2010; Cadzow et al., 2015; Elizondo-Montemayor et al. 2013; Ling et al., 2014). Another limitation experienced by two studies was a limited setting and age group (Greening et al., 2011; Lee et al., 2014). For example, Ling et al. (2014) limited their study to just northern and central Kentucky with children in grades kindergarten through fifth grade. Lack of diversity over socioeconomic status and ethnicity was also a limitation found in four studies (Benjamins & Whitman, 2010; Elizondo-Montemayor et al., 2013; Ling et al., 2014; Schwartz et al., 2016). For example, Benjamins & Whitman (2010) based their study on two small Jewish schools in Chicago. Another study looked at only Mexican children when implementing their interventions (Elizondo-Montemayor et al., 2013). Small sample sizes were another limitation encountered in three studies (Elizondo-Montemayor et al., 2013; Greaney et al., 2014; Lee et al., 2014). Another limitation was the use of self or parent report, which may have biased the findings in three studies (Benjamins & Whitman, 2010; Greening et al., 2011; Lee et al., 2014).

Limitations of Family Based Interventions

Limitations were found in the family based intervention studies. For example, six studies were conducted outside of the United States of America (Cao et al., 2015; Chen et al., 2015; Fagg et al., 2014; Jiang et al., 2005; Sacher et al., 2010; Teder et al., 2013). For example, one

study was conducted in two small cities in southeast Sweden (Teder et al., 2013). Another limitation was a relatively short follow up, which limits long-term effects of the intervention in three studies (Anderson et al., 2015; Chen et al., 2015; Sacher et al., 2010). A small sample size was also a limitation in eight studies (Anderson et al., 2015; Brotman et al., 2012; Chen et al., 2015; Davison et al., 2013; Jiang et al., 2005; Sacher et al., 2010; Steele et al., 2012; Teder et al., 2013). A limited setting and age group was a limitation experienced as well in four studies (Davison et al., 2013; Sacher et al., 2010; Steele et al., 2012; Watson et al., 2015). In addition, the lack of a control group influenced the outcome of four studies (Anderson et al., 2015; Davison et al., 2013; Teder et al., 2013; Watson et al., 2015). Another limitation was the absence of a randomized sampling method in two studies (Chen et al., 2015; Davison et al., 2013) For example, Chen et al. (2015) used convenience sampling and chose participating schools and families based on their convenience to the research team. Another limitation was the use of self-report in studies in two studies (Davison et al., 2013; Watson et al., 2015).

Synthesis of Evidence

Based on the findings above, many beneficial outcomes resulted from the use of family and school based interventions. The interventions utilized in the studies can be incorporated into practice and help healthcare professionals better care for children suffering from obesity and provide effective treatment methods. For example, six family and three school based interventions showed a statistically significant decrease in BMI z-scores (Brotman et al., 2012; Cadzow et al., 2015; Cao et al., 2015; Davison et al., 2013; Jiang et al., 2005; Lee et al., 2014; Sacher et al., 2010; Schwartz et al., 2016; Watson et al., 2015). However, four family based intervention studies showed no change in BMI z-scores after family intervention (Anderson et al., 2015; Chen et al., 2015; Fagg et al., 2014; Teder et al., 2013). This could be due to the

decreased validity and reliability of some of the studies (Anderson et al., 2015; Chen et al., 2015; Teder et al., 2013) However, Fagg et al. (2014) was a randomized controlled trial with a level of evidence of one adding good reliability and validity for that finding.

In five school based intervention studies and six family based intervention studies, there was an increase in the level of physical activity among school aged children (Anderson et al., 2015; Benjamins & Whitman, 2010; Brotman et al., 2012; Cadzow et al., 2015; Davison et al., 2013; Elizondo-Montemayor et al., 2013; Greening et al., 2011; Ling et al., 2014; Rodrigues et al., 2015; Sacher et al., 2010; Teder et al., 2013). Four studies including family based intervention showed there was also a decrease in television screening time with an increased activity level (Anderson et al., 2015; Brotman et al., 2015; Davison et al., 2013; Sacher et al., 2010;). However, Rodriguez et al. (2015) found that physical activity alone does not lead to weight loss, but needs to be combined with healthy eating habits as well.

There was an identifiable improvement in dietary habits and nutritional choices among the children participating in the research in five school based studies and six family based studies (Anderson et al., 2015; Brotman et al., 2012; Chen et al., 2016; Davison et al., 2013; Elizondo-Montemayor et al., 2013; Greening et al., 2011; Lee et al., 2014; Ling et al., 2014; Rodrigues et al., 2015; Schwartz et al., 2016; Teder et al., 2013). Three studies of family interventions also found that there was a notable improvement in portion control used for family meals (Chen et al., 2016; Davidson et al., 2013; Teder et al., 2013).

Blood pressure and cholesterol were also measured parameters in both school and family intervention studies. In two family studies and one school intervention study, there was found to be a decrease in blood pressure and cholesterol levels (Brotman et al., 2012; Elizondo-Montemayor et al., 2013; Jiang et al., 2005).

Attitude and psychosocial outcomes were also measured in school and family intervention studies. In two school based intervention studies and five family based intervention studies there was found to be an improvement in attitudes toward exercising and an improvement in self-esteem (Benjamin & Whitman, 2010; Davison et al., 2013; Fagg et al., 2014; Lee et al., 2010; Sacher et al., 2010; Steele et al., 2012; Watson et al., 2015).

Recommendations

Application of Findings

Based on the findings above a definitive conclusion to determine if school or family based interventions result in a more positive outcome cannot be drawn. It was found that both school and family based interventions are beneficial in decreasing BMI, increasing physical activity, improving nutrition and dietary habits, decreasing blood pressure and cholesterol, and improving attitudes and psychosocial outcomes.

Recommendations for Further Research

None of the studies reviewed compared school versus family interventions in the same study. Instead, the studies looked at either school or family based interventions and their outcomes individually. Due to this lack of comparison within studies, further research is needed to be completed. Research studies with a school and family intervention groups need to be carried out in the future to better understand the relationship between the two. By having more research comparing both intervention groups it can be better understood if family or school based interventions are more effective at treating and preventing childhood obesity. Since childhood obesity can lead to many adverse health complications, it is important to implement interventions that can decrease the incidence and prevalence of childhood obesity. By conducting further research, it is possible to advance nursing practice and help guide prevention and treatment of

childhood obesity. At this time, both interventions have proven to be successful to use in practice to help guide childhood obesity treatment and prevention.

Conclusion

In summary, childhood obesity can lead to multiple chronic illnesses including diabetes, cardiovascular disease, obstructive sleep apnea, nonalcoholic fatty liver disease, and an increased likelihood of ischemic heart disease and breast cancer in adulthood (Anderson et al., 2015). Childhood obesity is a prevalent problem affecting 155 million school age children and young people globally (Kothandan, 2014). Early childhood is a crucial time to implement prevention and treatment strategies since both family and school experiences are a large part of their lives. By using the findings from the studies researched, interventions can be implemented to help advance the prevention and treatment of childhood obesity. Although a conclusion cannot yet be drawn as to whether school or family based interventions are more effective, it can be concluded that both intervention methods have proven to have a positive impact on preventing and treating childhood obesity. With further research on childhood obesity, advancement in childhood obesity prevention and treatment can be made.

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<p>APA formatted reference[1]</p> <hr/> <p>[1] Indicate if primary or secondary source and if quantitative, qualitative or mixed methods.</p>	<p>Background of Clinical Problem. Purpose statement. Research question[1].</p> <hr/> <p>[1] Construct purpose statement and research question is not stated in article. Identify independent variables, dependent variables, and population.</p>	<p>Clinical Practice Setting. Population, Sampling methods, sample size.</p>	<p>Design. Level of Evidence.</p>	<p>Evidence-based Findings</p>	<p>Practice & Research Implications</p>	<p>****Limitations [1]</p> <hr/> <p>[1] Identify independent variables, dependent variables, and population.</p> <p>[1] List limitations related to validity and reliability of methods and applicability of findings. Consider strengths and weaknesses of study. [1]</p>
<p>Benjamins, M., & Whitman, S. (2010). A culturally appropriate school</p>	<p>Background- There is a large number of school-based interventions designed to reduce</p>	<p>Setting- Two jewish schools in Chicago</p> <p>Sampling method-</p>	<p>Intervention study</p> <p>Level 4</p>	<p>The findings showed several significant increases in student knowledge, and</p>	<p>The current study was completed in an effort to respond to the increasing need for</p>	<p>All outcomes are based on self-report</p> <p>No diversity in participants-</p>

<p>wellness initiative: results of a 2-year pilot intervention in 2 Jewish schools. <i>Journal Of School Health</i>, 80(8), 378-386 9p. doi:10.1111/j.1746-1561.2010.00517.x</p>	<p>childhood obesity or otherwise promote health, no models or materials were found for Jewish schools.</p> <p>Purpose This study describes the efforts within a Jewish school system to create, implement, and evaluate a school-based intervention tailored to the unique characteristics of Jewish religion, culture, and school structures.</p>	<p>Volunteer</p>		<p>also an increase in the percentage of older students regularly meeting physical activity guidelines. Not many changes in attitudes, other behaviors, or environmental factors were seen. More studies are needed to determine how to bring about behavioral changes, how to increase the sustainability of all of the changes, and how to disseminate the model and products of this intervention to other day schools.</p>	<p>research on how schools can best work to prevent and/or reduce childhood obesity.</p>	<p>Jewish children only</p>
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<p>Fagg, J., Chadwick, P., Cole, T. J., Cummins, S., Goldstein, H., Lewis, H., & ... Law, C. (2014). From trial to population: a study of a family-based community intervention for childhood overweight implemented at scale. <i>International Journal Of Obesity</i>, 38(10), 1343-1349 7p. doi:10.1038/ijo.2014.103</p>	<p>Background- Childhood overweight and obesity is prevalent in many countries and associated with poorer physical and psychosocial health across the life course.</p> <p>Purpose- To assess how outcomes associated with participation in a family-based weight management intervention (MEND 7–13, Mind, Exercise, Nutrition..Do</p>	<p>Setting- Home setting</p> <p>Population- Children between 7 and 13 years old who are overweight or obese</p> <p>Sampling method- Volunteer</p> <p>Sample size- 21,503</p>	<p>Randomised control trial</p> <p>Level- 1</p>	<p>BMI reduced by mean 0.76 kg m² (s.e. = 0.021, P o 0.0001), zBMI reduced by mean 0.18 (s.e. = 0.0038, P o 0.0001), self-esteem score increased by 3.53 U (s.e. = 0.13, P o 0.0001) and psychological distress score decreased by 2.65U (s.e.=0.31, Po0.0001). Generally, outcomes improved less among children from less advantaged backgrounds and in Asian</p>	<p>The MEND intervention, when delivered at scale, is associated with improved BMI and psychosocial outcomes on average, but may work less well for some groups of children, and so has the potential to widen inequalities in these outcomes. Such public health interventions should be implemented to achieve sustained impact</p>	<p>Study completed outside of US</p>

	it!) for childhood overweight or obesity vary by child, family, neighbourhood and MEND programme characteristics.			compared with white children.	for all groups.	
Elizondo-Montemayor, L., Gutierrez, N. G., Moreno, D. M., Martínez, U., Tamargo, D., & Treviño, M. (2013). School-based individualised lifestyle intervention decreases	Background- There is limited evidence about effective strategies to manage childhood obesity and the metabolic syndrome in school settings The study aimed to analyze	Setting- eight public schools in Monterrey, Mexico. Population- overweight/obese children aged 6–12 years, who were Mexican–Hispanic with a low socio-economic status.	Design- Interventional study Level of Evidence- 4	Evidence based findings- The prevalence of metabolic syndrome fell significantly from 44% to 16% , high blood pressure fell from 19% to 0%, hypertriglyceridemia fell from 64% to 35%,	Implications- A school setting lifestyle intervention led to a decreased prevalence of being overweight/obese and to a reduction in the prevalence of the metabolic syndrome in a sample of	Limitations- This is the first lifestyle intervention with an individualized approach that has led to a decrease in overweight/obesity and a striking reduction in the prevalence of

<p>obesity and the metabolic syndrome in Mexican children. <i>Journal Of Human Nutrition & Dietetics</i>, 2682-89 8p. doi:10.1111/jhn.12070</p>	<p>changes in weight status, anthropometric measurements, fasting glucose, lipids, blood pressure and the prevalence of the metabolic syndrome (MetS) and their connection to a 10-month lifestyle intervention, based on individualised face-to-face sessions and parental support in a school-setting. in overweight and obese Mexican children aged 6–12 years.</p>	<p>Sampling Method- cross-sectional sample Sample Size- 96 children</p>		<p>high-density lipoprotein-cholesterol 40 fell from 60% to 41%, hyperglycaemia fell from 1% to 0%, and waist circumference ! 90th percentile fell from 72% to 57%. There was a 2.84 significant decrease in body mass index percentile and in body-fat percentage. Of the overweight children, 32% achieved normal-weight, whereas 24% of the obese ones converted to overweight and 1% reached normal-weight.</p>	<p>Mexican children.</p>	<p>the metabolic syndrome in 6–12 year-old Mexican children in a school setting. Also voluntary participation in the study and the relatively small sample may have influenced the results, which may not be representative of the general population.</p>
<p>Lee, A., Ho, M., Keung, V. W., & Kwong, A. M. (2014). Childhood</p>	<p>Background: Home and school environments favorable for</p>	<p>Setting: 6 Hong Kong primary schools. Population:overw</p>	<p>Design: Intervention study Level of</p>	<p>Findings: Students in the intervention group reduced their BMI z-score</p>	<p>Implications: school based weight management programs</p>	<p>Limitations: Unable to determine if the environment component was</p>

<p>obesity management shifting from health care system to school system: intervention study of school-based weight management programme. <i>BMC Public Health</i>, 14. doi:10.1186/1471-2458-14-1128</p> <p>Primary</p> <p>Quantitative</p>	<p>unhealthy eating and physical inactivity are precursors to obesity.</p> <p>Purpose Statement: to study the effectiveness of a multi-component school based weight management program for overweight and obese primary school children.</p>	<p>eight and obese children ages 8-12 years old.</p> <p>Sampling Method: Invitation letters were sent to 65 primary schools participating in Health Promoting School (HPS). Sixteen schools replied and based on the prevalence of obesity, children in the school, school district, readiness of the school, and similarity in socio-demographic background among participating schools, 6 schools were selected to participate. The schools were responsible to recruit eligible</p>	<p>Evidence: 4</p>	<p>and body fat compared to the control group with statistical significant. The intervention group also had a significant reduction in BMI z-score and body fat after a 4 month maintenance period.</p> <p>An Improvement in dietary habits and positive attitudes towards exercise were observed among the intervention group</p>	<p>integrated into a health promoting school approach appears to be a promising practice for sustaining weight control.</p>	<p>essential to success.</p> <p>Small sample size</p> <p>Self administered questionnaire.</p>
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		students for the program. Sample Size: 106 with 57 in the intervention group				
Greaney, M. L., Hardwick, C. K., Spadano-Gasbarro, J. L., Mezgebu, S., Horan, C. M., Schlotterbeck, S., & ... Peterson, K. E. (2014). Implementing a Multicomponent School-Based Obesity Prevention Intervention: A Qualitative Study. <i>Journal Of Nutrition Education &</i>	Background- Schools are a strategic organizational setting for obesity prevention, but school-based interventions addressing lifestyle behaviors to prevent obesity have had mixed success,3,4 which has led to calls for comprehensive approaches to obesity prevention that address multiple	Setting- 10 Healthy Choices-II program participating schools. Population- middle school administrators or employees involved in implementation of Healthy Choices-II program Sampling method- Individual schools were contacted based	Design- Qualitative Study Level VI	Findings- State-mandated testing, budget limitations, and time constraints were viewed as implementation barriers, whereas staff buy-in, external support, and technical assistance were seen as facilitating implementation.	Implications- Results confirm the importance of gaining faculty and staff support. Schools implementing large-scale interventions should consider developing sustainable partnerships with organizations that can provide resources and ongoing training.	Limitations- It was designed as an in-depth exploration of the process of implementing Health Choices; thus, results are not generalizable. Interviews were conducted at 1 time point, during the third year of the intervention, rather than at several points throughout the intervention period. In addition, the

<p><i>Behavior</i>, 46(6), 576-582 7p. doi:10.1016/j.jneb.2014.04.293</p>	<p>levels in schools or in afterschool settings.</p> <p>Purpose statement- The purpose of this case study was to use qualitative research methods to explore barriers and facilitators to implementing and maintaining a multicomponent school- based intervention.</p>	<p>on their use of the Healthy Choices-II program and the number of students involved with the program at the school. Once schools agreed to voluntary participation in the study, administrators identified proper employees for interviews.</p> <p>Sample Size- 56 interview participants</p>				<p>researchers used purposive sampling; individuals identified by school coordinators as potential participants may have been more invested in the intervention than those who were not approached. The authors were also unable to conduct all planned interviews.</p>
<p>Ling, J., King, K. M., Speck, B. J., Kim, S., & Wu, D. (2014). Preliminary assessment of a school-based healthy lifestyle</p>	<p>Background: Childhood obesity has become a national public health crisis in America. School based healthy lifestyle interventions</p>	<p>Setting: Four K-5 rural Elementary schools in north and central Kentucky.</p> <p>Population: children in grades K-5 in northern and central</p>	<p>Design: quasi-experimental design</p> <p>Level of Evidence: Level 2</p>	<p>Findings: The intervention had significant effects on increasing the percentages of children meeting physical activity and nutrition recommendations . The effects of</p>	<p>Implications: Findings suggest that school authorities and classroom teachers should consider incorporating nutrition,</p>	<p>Limitations: quasi - experimental design is not as reliable as a randomized controlled trial.</p> <p>Lack of control group.</p>

<p>intervention among rural elementary school children. <i>Journal Of School Health</i>, 84(4), 247-255. Retrieved from http://web.a.ebscohost.com.ezproxy.uakron.edu:2048/ehost/pdfviewer/pdfviewer?sid=e4cce3a6-2fbf-4e21-981f-10580c2d819b%40sessionmgr4008&vid=4&hid=4214</p>	<p>play a promising role in preventing and treating childhood obesity.</p> <p>Purpose. To assess the effects of a comprehensive school-based intervention on healthy behavior among elementary school children in rural Kentucky counties.</p>	<p>Kentucky.</p> <p>Sampling methods: All children in these four elementary schools were included.</p> <p>Sample Size: 1508 children, 814 boys and 679 girls.</p>		<p>the intervention on physical activity and nutrition depended on school, grade, and age of the children. There was an increasing linear trend of physical activity and an increasing quadratic trend of nutrition over time among children</p>	<p>physical activity, and health messages into school curricula and aligning school wellness policies with the Healthier US School Challenge in early grades.</p>	<p>Lack of control over other factors such as socioeconomic status and ethnicity.</p> <p>BMI, waist circumference, or skin folds were not measured to evaluate the effects of this intervention on controlling childhood obesity.</p>
<p>Chen, C., Kao, C., Hsu, H., Wang, R., & Hsu, S. (2015). The Efficacy of a Family-Based Intervention Program on Childhood</p>	<p>Background- Childhood obesity is an international health problem. School nurses in Taiwan are in need of effective interventions to decrease the</p>	<p>Setting- Eight primary schools in Kaohsiung City, Taiwan</p> <p>Population- Overweight or obese children according to BMI between 9 and 11</p>	<p>Design- Quasi experimental design</p> <p>Level 2</p>	<p>Findings - The experimental group and the control group did not differ significantly in the outcome variables. In terms of the time main effect</p>	<p>Implications of findings - Compare d with the control group, the experimental group reported a significantly greater reduction in</p>	<p>Limitations- Small sample size</p> <p>Study completed outside U.S.</p> <p>Did not measure</p>

<p>Obesity. <i>Biological Research For Nursing</i>, 17(5), 510-520 11p. doi:10.1177/1099800414565815</p>	<p>prevalence of obesity in children. purpose - The purpose of this study was to assess the efficacy of a family-based (FB) weight-loss and behavior-modification intervention among overweight/obese children (age 9–11 years) and their parents in Taiwan.</p>	<p>and had parents or primary caregivers who could participate in the study Sampling method- Convenience sampling Sampling size- 52 in the experimental and 55 in control group (107)</p>		<p>(Model 1), children’s BMI z-scores, parents’ BMI, parents’ HC food-intake behaviors, and the availability of HC foods at home differed significantly between T0 and T1 and T0 and T2.</p>	<p>parents’ HC food- intake behaviors and availability of HC foods at home and increased parental restrictions on children’s consumption of HC foods from T0 to T1 and T0 to T2. The results indicate that an FB program can influence the behaviors of parents during and soon after intervention.</p>	<p>behavioral changes Short follow up time Not randomized sampling method</p>
<p>Cadzow, R. B., Chambers, M. K., & Sandell, A. D. (2015).</p>	<p>Background- School-based interventions to improve health</p>	<p>Setting- Lockport City School District, Lockport NY</p>	<p>Design- 3 year longitudinal cohort study</p>	<p>Findings- The mean BMI percentile of students</p>	<p>Conclusion- Conclusions are limited due to the lack of a</p>	<p>Limitations- Lack of a control population. It is</p>

<p>School-Based Obesity Intervention Associated with Three Year Decrease in Student Weight Status in a Low-Income School District. <i>Journal Of Community Health, 40(4), 709-713.</i> doi:10.1007/s10900-015-9989-0</p>	<p>have been shown to decrease intake of non-nutritional foods, increase student physical activity and educate students about healthy food choices but relatively few have shown long-term decrease in weight status</p> <p>Purpose Statement- The purpose of this study was to evaluate the effects of the changes related to the obtainment of the U.S. Department of Education Carol M. White Physical Education Program Grant</p>	<p>Population- Children in grades 3-12</p> <p>Sampling Method- All students present at school on days of data collection</p> <p>Sample Size- cohort of 2,259 students who had both baseline (2007) and endpoint (2010) data measurements. 39 % elementary students (grades 3-5), 38 % middle school students (grades 6-8), and 23 % high school students (grades 9-12) in 2007. The study sample is 51 % female and 89 % non-Hispanic white which is</p>	<p>Level III</p>	<p>decreased significantly from 70.4 to 65.7 %.. This exceeds the change in BMI percentile seen at the national level. There was a significant decrease in the proportion of students categorized as overweight or obese.</p>	<p>control population however they indicate that a three year multilevel school-based intervention involving physical activity and nutritional changes was correlated with improved weight status among participating school children.</p>	<p>not known whether other students in this same region also experienced decreases in BMI percentile over this same time period. Also, a multifaceted approach, while considered advantageous for making the most impact, makes it difficult to determine which aspect of the intervention contributed most to its success. Time and funding did not allow for phasing in of intervention components to measure them individually.</p>
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	(PEP) funds. Changes included physical education equipment and curriculum and offered access to equipment and activities outside of school hours. There were also changes to school food and health education curriculum.	representative of the overall student population.				
Greening L., Harrell K.T., Low A.K., Fielder C.E. (2011). Efficacy of a school-based childhood obesity intervention program in a rural southern community: TEAM Mississippi Project.	Background: Obesity is linked to some of the leading causes of morbidity and early mortality. Purpose: to apply the social learning theory to a school based childhood obesity intervention program in a state where the	Setting: Mississippi Population: school aged children ranging from 6-10 years of age. Sampling Method: Schools were randomly assigned to the intervention and control conditions.	Design: randomized control trial Level of evidence: 1	Findings: students who participated in monthly physical activity and nutritional events during the 9-month academic year (intervention group) showed statistically significant improvement in percentage body fat, physical activity,	Implications: School-based interventions designed to instill healthy lifestyle behaviors by engaging at-risk children and their parents in nutritional and physical activities might be a solution for preventing childhood	Limitations: Use of self-and/or parent-report measures for physical activity and dietary fat intake. Some adiposity measures are under scrutiny such as BMI.

<p><i>Obesity</i>, 19(6):1213-1219. Retrieved from http://web.a.ebscohost.com.ezproxy.uakron.edu:2048/ehost/pdfviewer/pdfviewer?sid=e4cce3a6-2fbf-4e21-981f-10580c2d819b%40sessionmgr4008&vid=8&hid=4214</p>	<p>rate of obesity is the highest in the nation-Mississippi.</p>	<p>Sample Size: 450 children (204 attended the intervention school and 246 attended the control school.</p>		<p>performance on fitness tests, and dietary habits compared to the control school. There was no evidence of differences in outcomes based on gender or ethnicity/race.</p>	<p>obesity since children in this study showed a statistically significant reduction in their percentage body fat compared to students in the school system's standard health curriculum.</p>	
<p>Sacher P.M., Kolotourou M., Chadwick P.M., Cole T.J., Lawsonet M.S., ... Singhal, A. (2010) Randomized controlled trial of the MEND program: a family-based community intervention for</p>	<p>Background: the recent rise in the prevalence of childhood obesity is a major public health issue. The short and long term effects including a potential reduction in life expectancy for future generations, have made the</p>	<p>Setting: London, UK. Population: Children were eligible if they were obese (BMI \geq 98th percentile) had no apparent clinical problems, comorbidities,</p>	<p>Design: Randomized control trial Level of evidence: 1</p>	<p>Parents and children in the intervention group (who attended eighteen 2-h group educational and physical activity sessions held twice weekly in sports centers and schools, followed by a 12-week free family swimming pass) had a reduced</p>	<p>Implications: participation in the MEND Program was effective in reducing adiposity in children and effects were sustained 9 months after the intensive part of the intervention. Importantly, the program is one of the few</p>	<p>Limitations: Lack of blinding for measurement of outcomes. Selective dropout may have influenced the results. Relatively short follow up (12 months) Not conducted</p>

<p>childhood obesity. <i>Obesity</i>, 18 (1), S62- S68. Retrieved from http://web.a.ebscohost.com.ezproxy.uakron.edu:2048/ehost/pdfviewer/pdfviewer?vid=11&sid=e4cce3a6-2fbf-4e21-981f-10580c2d819b%40sessionmgr4008&hid=4214</p>	<p>prevention and treatment of childhood obesity a priority.</p> <p>Purpose: to assess the effectiveness of a 6-month intervention consisting of the 9-week Mind, Exercise, Nutrition, Do it (MEND) Program followed by a 12-week free-family swim pass.</p>	<p>physical disabilities, or learning difficulties, which would interfere with their ability to take part in the program. Participants were aged between 8 and 12 years and had at least one parent/carer who was able to attend each of the program sessions.</p> <p>Sampling Method: Potential subjects were recruited from five UK sites by referrals from local health professionals (dietitians, school nurses, and general practitioners), or were self-referred</p>		<p>waist circumference z-score and BMI z-score at 6 months when compared to the controls. Significant between-group differences were also observed in cardiovascular fitness, physical activity, sedentary behaviors, and self-esteem. At 12 months, children in the intervention group had reduced their waist and BMI z-scores by 0.47 and 0.23 respectively, and benefits in cardiovascular fitness, physical activity levels, and self-esteem were sustained. High-attendance rates suggest that</p>	<p>pediatric obesity interventions which conforms to expert recommendations and is deliverable in a primary care setting. These results suggest that the MEND Program is a promising intervention to help address the rising obesity problem in children.</p>	<p>in the USA</p>
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		Sample Size: 116 children: 60 to the intervention group and 54 to the control group.		families found this intensive community-based intervention acceptable.		
<p>Brotman L.M., Dawson-McClure S., Huang K.Y., Theise, R., Kamboukos, D. Wang, J. (2012). Early childhood family intervention and long-term obesity prevention among high-risk minority youth. <i>Pediatrics</i>, 129(3):E621-E628. Retrieved from http://pediatrics.aappublications.org/content/129/3/e621</p>	<p>Background: The rates of overweight have doubled among 2-5 year olds over the past three decades. Overweight preschool children are five times more likely to be obese at age 12 than non-overweight children. Childhood obesity is a costly public health problem which is associated with an increased incidence of hypertension</p>	<p>Setting: ten USA elementary schools</p> <p>Population: minority youth at risk for behavior problems</p> <p>Sampling Method: Random</p> <p>Sample Size: 186</p>	<p>Design: Randomized control trial</p> <p>Level of Evidence: 1</p>	<p>Results: Youth randomized to the family intervention aimed to promote effective parenting and prevent behavior problems group had significantly lower BMI at follow-up relative to controls. Clinical impact is evidenced by lower rates of obesity among intervention girls and boys relative to controls There were significant intervention-control group</p>	<p>Implications: Early intervention that promotes effective parenting in children at high risk is a promising approach to obesity prevention.</p>	<p>Limitations: Randomized control trials were not designed for the purpose of evaluating physical health outcomes. Small sample size.</p>

	<p>and diabetes. Children with behavior problems, such as impulsivity, or a family history of behavior problems are at increased risk for poor health, including obesity</p> <p>Purpose: to test the hypothesis that family intervention to promote effective parenting in early childhood affects obesity in preadolescence.</p>			<p>differences on physical and sedentary activity, blood pressure, and diet.</p> <p>Two long-term follow-up studies of randomized trials show that relative to controls, youth at risk for behavior problems who received family intervention at age 4 had lower BMI and improved health behaviors as they approached adolescence.</p>		
<p>Davison, K. K., Jurkowski, J. M., Li, K., Kranz, S., & Lawson, H. A. (2013). A childhood obesity</p>	<p>Background: Ineffective family interventions to help prevent childhood obesity have in part been attributed to the</p>	<p>Setting: five Head Start centers in upstate New York.</p> <p>Population: Parents and their children 2-5 year</p>	<p>Design: Pre-Post cohort</p> <p>Level of Evidence: 4</p>	<p>Findings: Children at post intervention (parents implemented revisions to letters sent home to families</p>	<p>Implications: Empowering parents to play an equal role in intervention design and implementation</p>	<p>Limitations: The level of evidence is not as reliable as it could be.</p> <p>Small sample</p>

<p>intervention developed by families for families: results from a pilot study. <i>International Journal Of Behavioral Nutrition & Physical Activity</i>, 10(11) 11p. doi:10.1186/1479-5868-10-3</p>	<p>challenges of reaching and engaging parents. Purpose: to evaluate the effectiveness of a parent-centered community based participatory research approach for obesity prevention in vulnerable families.</p>	<p>olds in Head Start centers. Sampling Methods: Parents of Head Start children, who comprised the majority of the community advisory board, were recruited through the Head Start Policy Council and word of mouth by organizational staff, the Policy Council parents, and the project coordinator Sample Size: 423 children and their families were exposed to the intervention and 154 families participated in its evaluation</p>		<p>reporting child body mass index; (2) a communication campaign to raise parents' awareness of their child's weight status; (3) the integration of nutrition counseling into Head Start family engagement activities; and (4) a 6-week parent-led program to strengthen parents' communication skills, conflict resolution, resource-related empowerment for healthy lifestyles, social networks, and media literacy) exhibited significant improvements in their rate of obesity, light</p>	<p>is a promising approach to family-centered obesity prevention</p>	<p>size restricted to one area. Lack of control group. Pre-post interventions can reflect a number of threats to internal validity. Parent reporting could result in response bias.</p>
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				physical activity, daily TV viewing, and dietary intake (energy and macronutrient intake). Trends were observed for BMI z-score, sedentary activity and moderate activity. Parents at post intervention reported significantly greater self-efficacy to promote healthy eating in children and increased support for children's physical activity.		
Watson, P. M., Dugdill, L., Pickering, K., Owen, S., Hargreaves, J., Staniford, L. J., & ... Cable, N. T. (2015).	Background: Children who are obese face psychological and physical health complications in the short term	Setting: Community venues in a socioeconomically deprived, urban location in the north west of England	Design: Single-group repeated measures with qualitative questionnaires. Pre-post design Level of	Results: Child BMI z-score reduced by 0.07 from baseline to post-intervention and was maintained at 12 months.	Implications: This study shows the GOALS childhood obesity treatment intervention	Limitations: lack of control group The pre-post design provides no information about how

<p>Service evaluation of the GOALS family-based childhood obesity treatment intervention during the first 3 years of implementation <i>.BMJ Open</i>, 5(2), e006519. doi:10.1136/bmjopen-2014-006519</p>	<p>and are more likely to become obese adults. Since adult obesity is a risk factor for lifestyle-related morbidity and mortality, it is important to develop effective interventions for treating obesity in childhood. Parents play a key role in children's physical activity and dietary behaviors. Therefore in order for children who are overweight to make healthy changes to their physical activity and diet, changes may also be required in their parents weight-related</p>	<p>Population: overweight or obese children and their parents/caregivers who completed GOALS between September 2006 and March 2009.</p> <p>Sampling Method: All families attending GOALS between September 2006 and March 2009 were invited to take part in the study.</p> <p>Sample Size: 143 families</p>	<p>Evidence: Level 4</p>	<p>There was no change in parent/carer BMI or child self-perceptions, other than an increase in perceived social acceptance from baseline to post-intervention. Parents/carers reported positive changes to family physical activity and dietary behaviors after completing GOALS.</p>	<p>supported families to change their physical activity and dietary behaviors, resulting in small improvements to children's BMI z-scores.</p>	<p>children's BMI z-scores might have changed without intervention High attrition rate</p> <p>Not as reliable as a randomized controlled trial.</p>
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	<p>cognitions and behaviours.</p> <p>Purpose: to evaluate a community-based childhood obesity treatment intervention Getting Our Active Lifestyles Started (GOALS) that drew on social cognitive theory to encourage healthy lifestyle changes for the whole family.</p>					
<p>Cao, Z., Wang, S., & Chen, Y. (2015). A randomized trial of multiple interventions for childhood obesity in China. <i>American Journal Of</i></p>	<p>Background- Family and school-based interventions for childhood obesity have been widely applied; however, the prevalence of childhood</p>	<p>Fourteen primary schools were selected from 26 primary schools in a district of Shanghai, China, and then randomly divided into intervention and control groups with</p>	<p>Design- randomized control trial level-1</p>	<p>The overall prevalence of overweight/obesity declined from 28.92% in 2011 to 24.77% in 2014, with a difference of 4.15% in the intervention group compared</p>	<p>The family-individual-school-based comprehensive intervention model is effective for controlling childhood obesity and overweight.</p>	<p>Study conducted outside of US</p>

<p><i>Preventive Medicine</i>, 48(5), 552-560 9p. doi:10.1016/j.amepre.2014.12.014</p>	<p>obesity remains high.</p> <p>Purpose- To evaluate the effectiveness of a family-individual-school-based comprehensive intervention model.</p>	<p>seven schools in each. The trial started with first-grade students.</p> <p>Sample- 1,287 students in the intervention group and 1,159 in the control group</p>		<p>with a 0.03% decline (from 30.71% to 30.68%) in the control group. The intervention group had significantly lower odds of developing obesity or overweight and had decreased average BMI z-scores compared with the control group, especially for obese or overweight students.</p>		
<p>Jiang, J., Xia, X., Greiner, T., Lian, G., & Rosenqvist, U. (2005). A two year family based behaviour treatment for obese children. <i>Archives Of Disease In</i></p>	<p>Background- Childhood obesity has become a nutritional problem in China since the 1990s.</p> <p>Purpose- A family based behavioural</p>	<p>Setting- single school and Beijing</p> <p>Population- obese school children grades 7-9</p> <p>Sampling method- random assignment</p>	<p>Design- random controlled trial</p> <p>Level - 1</p>	<p>Body mass index (BMI, kg/m²) was significantly reduced in the treatment group (from 26.6 (1.7) to 24.0 (0.9), 95% CI 2.06 to 3.18) but not in the control group (from 26.1 (1.5) to 26.0 (1.6)).</p>	<p>A family based behavioural intervention was feasible to use in treating obesity in schoolchildren in Beijing, China. After two years of implementation, it successfully</p>	<p>Study completed outside of US</p>

<p><i>Childhood, 90(12), 1235-1238 4p.</i></p>	<p>treatment plan was developed and tested to see if its use was feasible in China and to evaluate its impact on obese schoolchildren.</p>	<p>Sample size- 33 in treatment group, 35 in control group</p>		<p>Total cholesterol decreased 5.5% and triglycerides 9.7% in the treatment group. There was a significant correlation between change in BMI and change in triglycerides. There were no significant changes in plasma lipids in the controls. Blood pressure values also decreased significantly in the treatment, but not the control group.</p>	<p>decreased the degree of obesity, reduced levels of blood pressure, and decreased serum lipids in treatment; there were no significant changes among control children.</p>	
<p>Steele, M. M., Steele, R. G., & Cushing, C. C. (2012). Weighing the Pros and Cons in Family-</p>	<p>Background: Despite the potential for understanding readiness to change in the context of</p>	<p>Population: families enrolled in a 10-week, family-based weight loss program. Families with</p>	<p>Design: quasiexperimental Level of Evidence.: Level II</p>	<p>Evidence-based Findings: Children evidenced a more positive decisional balance profile</p>	<p>Research Implications: The results of this study emphasize the important role a child's readiness</p>	<p>Limitations: The restricted ethnic and racial diversity, and relatively high income level, within the</p>

<p>Based Pediatric Obesity Intervention: Parent and Child Decisional Balance as a Predictor of Child Outcomes. <i>Children's Health Care</i>, 41(1), 43-55 13p. doi:10.1080/02739615.2012.645726</p>	<p>weight management, few studies have examined decisional balance of lifestyle changes within the family as an indicator of readiness to change in this context.</p> <p>Purpose Statement: This study was designed to advance the following three discrete aims related to the understanding of the decisional balance in the context of a pediatric weight management intervention: describe the relation between parent and child decisional</p>	<p>children between the ages of 7 and 18 years, who had at least one parent willing to participate in the program, and a child with a BMI above the 85th percentile for their age and gender were included in the study.</p> <p>Sampling methods: Volunteer</p> <p>Sample size. 37 participant</p>		<p>than their parents at pre-intervention. Child pre-intervention weight status was associated with child decisional balance, but not parent decisional balance. Finally, child total decisional balance was the single best predictor of child outcomes</p>	<p>to change can play in the treatment of pediatric obesity.</p>	<p>sample can be seen as a potential issue that could limit the generalizability of these findings.</p> <p>Simply weighing the advantages and disadvantages of engaging in specific weight loss behaviors is not the responsible mechanism for actual weight loss.</p>
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	<p>balance profiles and pre-intervention weight status, examine the relation between parent and child decisional balance profiles, and examine the impact of parent and child decisional balance profiles on child weight posttreatment.</p>					
<p>Anderson, J. D., Newby, R., Kehm, R., Barland, P., & Hearst, M. O. (2015). Taking Steps Together: A Family- and Community-Based Obesity Intervention for Urban, Multiethnic Children. <i>Health</i></p>	<p>Background: Primary care providers play a pivotal role in identifying and managing childhood obesity, yet they face challenges that restrict their ability to help patients make key obesity-related behavioral changes in a</p>	<p>Setting: Two Minneapolis Park and Recreation Community Centers in low-income, multiethnic communities in Minneapolis, Minnesota.</p> <p>Population: Families with at least</p>	<p>Design: Experimental Cohort study</p> <p>Level of Evidence: Level III</p>	<p>Evidence based findings: Adults and children were largely Hispanic/Latino and low-income. Adults and children significantly increased their fruit and vegetable consumption and weekly physical activity, and adults</p>	<p>Conclusion: This family-focused childhood obesity intervention integrated evidence-based principles with a non prescriptive approach and produced significant improvements in key healthy behaviors for</p>	<p>Limitation: The small sample size affects our ability to detect significant changes in health-related behaviors and also reduces the generalizability of the results. Only a third of the participants completed the intervention,</p>

<p><i>Education & Behavior</i>, 42(2), 194-201 8p. doi:10.1177/1090198114547813</p>	<p>clinic setting. Purpose statement: Taking Steps Together's approach emphasized building self-efficacy, targeting both children and parents for healthy change, and fostering intrinsic motivation for healthier living. The hypothesis of the study is that a childhood obesity intervention utilizing these strategies will be efficacious in helping families achieve the evidence-based healthy behaviors.</p>	<p>one child between the ages 7 and 17 with a BMI% \geq85% and fluency in English or Spanish. Sample Method: the program allowed rolling enrollment with families completing the entire curriculum but graduating at different times. In response to participant feedback, enrollment was subsequently changed to a cohort model with six cohorts of families starting and completing the 16-week program together at two program sites</p>		<p>significantly decreased sugared beverage consumption and screen time. No change in body mass index was observed for adults or children.</p>	<p>both adults and children.</p>	<p>with those who left citing barriers such as scheduling conflicts and transportation difficulties Without a randomized control group, we are limited in our ability to assert that the healthy changes made by participants were a direct result of the intervention and not, in part, due to a greater degree of motivation for health improvements.</p>
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		Sample Size: Sample Size varies based on the number of participants that fit criteria for each variable measured.				
Teder, M., Mörelius, E., Nordwall, M., Bolme, P., Ekberg, J., Wilhelm, E., & Timpka, T. (2013). Family-Based Behavioural Intervention Program for Obese Children: An Observational Study of Child and Parent Lifestyle Interpretations. <i>Plos ONE</i> , 8(8), 1-8. doi:10.1371/journal.pone.007	Background: Family-based behavioural intervention programs (FBIPs) against childhood obesity have shown promising results, but the mediating mechanisms have not been identified. Purpose statement: The aim of this study was to examine changes in obese children's	Setting: Two municipalities in southeast Sweden Population: Children ages 8-12 years and their parents Sample method: Sample size: Twenty-six children, 14 boys and 12 girls, and their parents were included.	Design; Case-Controlled Observational study Level: IV	Evidence Based Findings: According to both children's and parents' reports, the level of physical activity among the children had increased after the intervention as well as the agreement between the informants' reports. According to the children, eating habits had improved, while the parents' reports showed an improvement	Conclusion: Child and parent reports of physical activity were found to converge and display an improvement in a 2-year FBIP, while the reports on eating habits showed a more refractory pattern. Changes in concordance and agreement between children and parents reports did not correlate with weight reduction. Further methods	Limitations: The single-group design, having as consequence that it is not possible to distinguish between FBIP effects and normal cognitive and behavioural maturation and development in childhood. The items used for lifestyle assessments during the treatment process were derived from the

1482	lifestyle habits during a 2-year FBIP according to their own and parents' reports, the concordance between these reports and the correlations to change in post-intervention BMI.			only with regard to binge eating. The concordance between children and parents regarding eating habits was slight to fair also after the intervention. No statistically significant associations between changes in lifestyle reports and changes in BMI were observed.	development and studies of the processes during family-based interventions against childhood obesity are warranted.	manual for tutor-supervised group sessions used for the FBIP, and the data were used in the intervention process.
Schwartz, A. E., Leardo, M., Aneja, S., & Elbel, B. (2016). Effect of a School-Based Water Intervention on Child Body Mass Index and Obesity. <i>JAMA Pediatrics</i> , 170(3), 220-226 7p.	Background: Decreasing the amount of caloric beverages consumed and simultaneously increasing water consumption is important to promoting child health and decreasing the prevalence of childhood	Setting: 227 New York, New York, public elementary schools and middle schools Population: Elementary and middle school students Sample method: Sample size:	Design: Quasi-experimental Level of Evidence: Level II	Evidence based findings: There was a significant effect of water jets on standardized BMI, such that the adoption of water jets was associated with a 0.025 reduction of standardized BMI for boys and a 0.022 reduction of standardized	Results: Results from this study show an association between a relatively low-cost water availability intervention and decreased student weight. Additional research is needed to examine	Limitations: Limited socio economic diversity due to schools studied all being selected from the same geographic area. Not randomized control study.

doi:10.1001/ja mapediatrics.2 015.3778	obesity. Purpose statement: To estimate the impact of water jets (electrically cooled, large clear jugs with a push lever for fast dispensing) on standardized body mass index, overweight, and obesity in elementary school and middle school students.	1 065 562 students within studied schools.		BMI for girls. There was also a significant effect on being overweight. Water jets were associated with a 0.9 percentage point reduction in the likelihood of being overweight for boys and a 0.6 percentage reduction in the likelihood of being overweight for girls. We also found a 12.3 decrease in the number of all types of milk half-pints purchased per student per year.	potential mechanisms for decreased student weight, including reduced milk taking, as well as assessing impacts on longer-term outcomes.	
Marques Rodrigues, A., Azevedo Alves, O. M., & Elsa Cristina Barreto Lima Freitas, A.	Background- The etiology of childhood obesity is multifactorial but thought to be primarily an	Setting- School Population- students turning six years old who were	Design- Intervention study Level- 2	The prevalence of overweight was high throughout the schools years. However, overweight	The prevalence of obesity was high in children of the different age groups who were subjected to the childhood	Study completed in one single community setting outside of US

<p>(2015). Impact of the Childhood Obesity Intervention Project on primary school children from a cluster of schools. <i>Revista De Enfermagem Referência</i>, (5), 57-64 8p. doi:10.12707/RIV14062</p>	<p>inappropriate and unbalanced diet and sedentarism.</p> <p>Purpose- To assess the impact of the project on the prevalence of childhood obesity, eating habits and physical activity in children turning six by the end of each year.</p>	<p>enrolled in primary schools of the Cluster of Schools of Ponte da Barca</p> <p>Size- 381 children</p>		<p>children who were subjected to an individual/family intervention became normal-weight. The levels of physical activity were low and the optimal Mediterranean Diet was predominant. As regards the focus groups, perceptions related to project development emerged.</p>	<p>obesity intervention project during a 4-year period. It was concluded that the problem of overweight and obesity remains.</p>	
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