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Effectiveness of a Multi-Component Intervention Program for Treating Childhood Obesity

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EFFECTIVENESS OF A MULTI-COMPONENT INTERVENTION PROGRAM FOR TREATING CHILDHOOD OBESITY

by

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DEDICATION

This project is dedicated to my late father, Charles S. Njoroge. R.I.P (1954-2010).

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ABSTRACT

Childhood obesity is one of the most chronic childhood illness worldwide (Centers for Disease Control and Prevention [CDC], 2019; World Health Organization [WHO], 2019). The prevalence of childhood obesity has been described as one of the most common chronic childhood conditions (CDC). The purpose of this evidence-based practice (EBP) project was to reduce the BMI scores of obese children using a multi-component intervention program that incorporates healthy eating, physical activity, and family involvement. The Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) model was used to facilitate the implementation of this EBP project. The synthesis of the appraised literature established that utilizing motivational interviewing (MI) to deliver multicomponent lifestyle interventions and family involvement is considered best practice for childhood obesity treatment. For six weeks, seven participants and their parents received a weekly, 30-minute, face-to-face, individualized: MI session integrating the 5-2-1-0 healthy habits messages**.** The mnemonic, 5-2-1-0 represents healthy eating and physical activity habits each day: five or more fruits and vegetables per day, two hours or less screen time per day, one hour or more of physical activity per day, and zero sugar drinks coupled with plenty of water, and low-fat milk consumption (Tucker et al., 2013). The BMI measurements of the same participants were collected prior to the initiation of the 5-2-1-0 obesity program and after the program completion at six weeks. A paired *t*-test was used to compare the pre-implementation BMI data to the post-implementation BMI data. Statistically significant differences in BMI were found ($p = 0.012$; $N=7$) over the six-week intervention period. Future projects with similar objectives to this EBP project may benefit from using the 5-2-1-0 program to combat childhood obesity.

Keywords: childhood obesity, children, BMI, healthy habits, 5-2-1-0

CHAPTER 1

INTRODUCTION

Background

Childhood obesity is one of the most chronic childhood illness worldwide (CDC, 2019; WHO, 2019). The prevalence of childhood obesity has increased rapidly globally and nationally over the past several decades (CDC). The CDC utilizes body mass index (BMI) measurements to classify childhood obesity. According to the CDC, childhood obesity is defined as a BMI equal to or greater than the 95th percentile for children ages 2-19 years of the same sex and age (CDC).

The most common cause of childhood obesity is caloric imbalance secondary to greater intake than energy expenditure. Data from three systematic reviews established that 95-99% of all childhood obesity prevalence are related to caloric imbalance (Mead et al., 2017; Resnicow et al., 2018; Stoner et al., 2016). Caloric imbalance is associated with modifiable behavioral factors such as poor nutrition, poor screen habits, and decreased physical activity. The authors also noted that a decline in family prepared meals and high caloric intake was linked to increased obesity prevalence rates.

The medical and psychosocial consequences of childhood obesity are extensive, and they include: cardiovascular diseases, asthma, anxiety, depression, stroke, gastrointestinal problems such as esophageal reflux, depression, anxiety, and other mental issues. These complications have been linked to poor-quality life, increased mortality and morbidity rates, and significant economic burden on the healthcare system (Mead et al., 2017; Resnicow et al., 2016; Stoner et al; 2016; Tucker et al., 2013). One of the most significant complications associated with childhood obesity is the increased risk of adulthood obesity. A longitudinal cohort study conducted in Australia sought to determine the risk of obesity in early adulthood (20 years) in relation to childhood obesity and parental weight status (Magarey, Daniels, Boulton, & Cockington, 2003).

The sample consisted of 155 (*N* =155) healthy participants aged 2-15 years and their parents. The participants provided anthropometric measurements (height and weight) at the age of 2, annually from age 4 to 8, biannually from 11 to 15 years, and final measurements at 20 years. The parents BMI scores were collected once during the study. Of those determined to be obese at 2 years, approximately 50% were classified as overweight or obese at the age of 8, 11, or 15, whereas 82% of the participants were identified as obese at 20 years. A Pearson's correlation coefficient was utilized to analyze the relationship between the participant's BMI at 20 years and previous weight scores (from 6 to 15 years) and parental weight status. The study established that the participant's weight status at an earlier age (6 years old) was a significant predictor of early adulthood obesity ($r > 0.6$) than parental weight scores. As such, strategies to prevent childhood obesity should be implemented at an early age to help reduce the risk of childhood obesity and the progression of obesity into adulthood. The study also determined that children with obese parents are at a high risk of developing childhood obesity, therefore healthcare providers should implement patient-centered strategies that target environmental modification to reduce the risk of childhood obesity (Magarey et al.).

Data from the Literature Supporting Need for the Project

According to the World Health Organization (WHO) (2019), an estimated 41 million children under the age of 5 years were overweight or obese in 2016. Similarly, WHO reports that over 340 million children and adolescents aged 5 - 19 were overweight or obese in 2016. WHO further notes that the incidence of overweight and obesity among children and adolescents aged 5 - 19 has risen dramatically from just 4% in 1975 to over 18% in 2016. On a national level, CDC (2019) reports that the prevalence of obesity in 2015 - 2016 in children aged 2 - 19 was 18.5% and affected about 13.7 million children and adolescents. The CDC notes that the obesity prevalence was 13.9% among 2-to 5-year-olds, 18.4% among 6- to 11-year-olds, and 20.6% among 12- to 19-year-olds. According to the state of Indiana (2019), the prevalence of obesity among Indiana children and teenagers in 2016 - 2017 was 18%, the 11th highest rate of obesity

in the U.S. for this age group.

Childhood obesity is associated with medical and physiological complications including gastrointestinal problems, musculoskeletal problems, depression, anxiety, and other medical issues. The American Heart Association (AHA) defines severe childhood obesity as a BMI of equal to or greater than 120% of the 95th percentile in children over two years of age (Bolling, Armstrong, Reichard, & Michalsky 2019). This definition is used to identify children and adolescents at risk for developing chronic comorbidities secondary to obesity such as hypertension, glucose impairment and hyperlipidemia. The authors report that AHA does not recommend the use of actual BMI scores to determine the risk for obesity related complications due to inaccuracies in determining adiposity, thus introducing measurement bias. Similarly, the WHO has also established childhood obesity guidelines to aid in identifying children at risk of developing chronic illnesses related to obesity. Class 2 childhood obesity is defined as a BMI of 120% or greater of the 95th percentile or a BMI of 35 or greater. Class 3 obesity is classified as a BMI of 140% or greater of the 95th percentile or BMI above 40 (Bolling et al.).

Bolling et al. (2019) report that the prevalence rates of severe childhood obesity and obesity related comorbidities are increased among the socioeconomically disadvantaged and minority populations. The authors note that the obesity prevalence rates in African Americans and Hispanics are approximately 1.5 to 2 times higher than Caucasian obesity prevalence rates for age and sex. Further, American Indian children have been identified to be at a higher risk of developing severe obesity and DM II. Girls of all age groups were also determined to have high obesity prevalence rates, therefore controlling for gender is essential to eliminate measurement bias (Bolling et al.). In addition, data from 2014 established that adolescents had significant comorbidities related to severe obesity. Ten percent of the adolescents were determined to have class 2 obesity based on the WHO obesity classification of comorbidities associated with childhood obesity. Five percent of adolescents were identified to have class 3 obesity which correlates with a BMI of equal to or greater than the 140% of the 95th percentile or a BMI of equal

or greater than 40 (Bolling et al.). In addition to medical complications, the American Academy of Pediatrics [AAP, 2019] has identified psychological problems related to childhood obesity including social bullying, suicide, and substance abuse. Strategies to address these issues such as cognitive behavioral therapy should be included in the patient's treatment plan.

Childhood obesity is a global pandemic; therefore, it is imperative to identify EBP recommendations to treat obesity. The synthesis of literature revealed that the best practice recommendation for treating childhood obesity is a multicomponent approach that incorporates diet education, physical education, healthy screen time habits, and family involvement. The evidence also recommended the use of MI to enhance behavior change ((Elvsaas et al.,2017; Jang et al., 2015; Mead et al., 2017; Resnicow et al., 2016; Small et al., 2015; Tucker et al., 2013). A multicomponent obesity program such as the *Let's go 5-2-1-0* program has been found to be effective in treating childhood obesity (Tucker et al.). The 5-21-0 healthy habits messages include: 5- five servings of fruits or vegetables a day, 2- two or less hours of daily screen time, 1- one or more hours of physical activity per day, and 0- zero consumption of sugary drinks and increased water consumption. The *Let's go 5-2-1-0* program originated in Maine, and the healthy habits messages can be delivered in a group or individualized MI approach (Tucker et al).

Data from the Clinical Agency Supporting Need for the Project

The clinical site for this EBP project was a rural, private-owned, family care practice located in Northwest Indiana. The practice was opened in 2018 to improve healthcare access in the small rural town in Northwest Indiana. The family practice is owned and operated by a certified family and gerontology nurse practitioner who works under the supervision of a family practice physician. The nurse practitioner (NP) provides comprehensive medical care to patients of all ages. Ninety-eight percent of the patients seen were insured, whereas 2% used subscription medicine. The clinic utilizes the direct primary care (DPC) model to provide a subscription billing option that allows patients to pay a monthly fee for most primary care services. These services include: one wellness visit a year, laboratory services and access to the NP in the office, by phone,

email, or house calls. With more people having high-deductible health plans, the providers in the clinic believe the DPC model is more cost effective.

The EBP project targeted children ages 6-18 at the clinic with a BMI of equal to or greater that the 95th percentile. This clinical site was chosen because the NP at the clinic had identified childhood obesity to be a major clinical problem in the targeted population. Out of the 33 patients in the clinic, 18 children with a BMI equal to or greater that the 95th percentile were identified via a retrospective electronic health records (EHR) review. As such, it was determined that it was necessary to implement interventions to combat childhood obesity in the targeted patient population.

Purpose of the Evidence-Based Practice Project

The purpose of this EBP project was to reduce the BMI scores of obese children using a multicomponent lifestyle intervention program that incorporated healthy eating, physical activity, healthy screen habits, and family involvement.

PICOT Question

This EBP project addressed the PICOT question: In children aged 6-18 years with a BMI equal to or greater than 95th percentile (P), does a Let's Go! 5-2-1-0 obesity intervention program that incorporates diet modification, physical activity, and screen time limit (I) compared to usual care (C) affect BMI (O) over a six-week period (T)?

Significance of the EBP Project

Childhood obesity is associated with medical and psychosocial complications that originate during early childhood and persist into adulthood. These conditions include cardiovascular diseases, diabetes mellitus, gastrointestinal, musculoskeletal, and asthma, which are often associated with poor quality life and decreased life expectancy. To effectively combat childhood obesity, health care providers must address these underlying causes. (Elvaaas et al., 2017; Mead et al., 2017; Resnicow et al., 2016; Stoner et al; 2016; Tucker et al., 2013). Therefore, it is imperative for patients to receive family-based interventions that target genetic, biological,

psychological, sociocultural, and environmental factors to help reduce the BMI scores and lower the childhood obesity prevalence rates.

CHAPTER 2

EBP MODEL AND REVIEW OF LITERATURE

Evidence-based Practice Model

This evidence-based practice (EBP) project was guided by the results of an extensive literature search and review of current literature. Consequently, The Johns Hopkins nursing evidence- based practice (JHNEBP) model was used to facilitate the implementation of this EBP project.

Overview of EBP Model: The Johns Hopkins Nursing Evidence Based Practice

After reviewing the seven models of evidence-based practice (EBP), The JHNEBP model was determined to be the best fit for this EBP project. The project leader chose the JHNEBP model because it provided a linear process to translate research findings into practice. The model includes three nursing concepts, practice, education, and research (Dearholt & Dang, 2017). The model considers evidence-based research (external factors) as well as patient preferences and provider experiences (internal factors) before a decision to change practice is made (Dearholt & Dang).

The JHNEBP model includes three major phases: practice question, evidence, and translation (Melnyk & Fineout-Overholt, 2015). Within these phases, there are 18 linear steps that guided the implementation of this EBP (see Table 2.1). During the first phase (practice question), an EBP question is created using a PICOT format, a multidisciplinary team is created, and a leader is elected. In the second phase, evidence phase, literature search is conducted for external and internal evidence. Next, the evidence is critically appraised to determine its strength and quality, and recommendations for practice change. The third phase, translation phase, determines the appropriateness and feasibility of translating recommendations into practice. An action plan is then created for implementation, and evaluation of outcomes is completed following the implementation phase. Dissemination of research findings is the last step in the JHNEBP model (Melnyk & Fineout-Overholt).

Application of EBP Model to DNP Project

Practice Question. The first phase of the JHNEBP model is the practice question phase. A PICOT format clinical question was used to facilitate a useful search to find relevant answers for the identified clinical problem, childhood obesity, in step one. In step two, define the scope of the practice question, the scope was limited to children ages 6-18 because they could communicate effectively with their parent(s) or guardian (s) and participate meaningfully in the intervention. In step three, assign responsibility for leadership, the leadership responsibilities were assigned to the project leader and the project advisor. The project leaders completed step four by recruiting a multidisciplinary team which consisted of project leader, project advisor, clinical staff, and medical receptionists. In step five, the project leader scheduled meetings with the project team to discuss childhood obesity and to review the EBP recommendations. Based on the childhood obesity rates at the project site, the multidisciplinary team determined it was imperative to search for the best available evidence and reconvene the team once the evidence was summarized.

Evidence. In the second phase, the project leader completed step six by conducting internal and external searches for evidence. Research revealed that most interventions geared towards childhood obesity are multifaceted in that they incorporated nutrition, family-based interventions and physical activity. In steps seven through ten, all types of evidences were reviewed, including clinical practice guidelines, randomized control trials (RCTs), cross-sectional analysis, observational cohort studies, prospective clinical studies, case-controlled studies, and systematic reviews. The evidence was summarized and then reviewed based on the strength and the overall quality. Evidence strength and quality were assessed using the standardized scoring system found within the JHNEBP appraisal tools.

Translation. The final phase includes steps 10 through 18. Once all the evidence was gathered and recommendations were developed, the project leader and project facilitator

organized a meeting with the project team. During this meeting, the summary of evidence was presented; step 11 of the JHNEBP model, and the team discussed the appropriateness and practicability of implementing the recommendations. The project team felt that the actions were appropriate considering the supporting evidence; however, there were concerns regarding the feasibility of delivering MI sessions in a group setting due to scheduling challenges. Upon further investigation, it was concluded that switching from group-focused MI to participant-focused MI would not only be more effective to implement, but also allow us to implement interventions tailored to the unique needs of the participant. In Step 12 (create action plan), the project team created an action plan for implementing the changes. One medical assistants (MA) was assigned with the task of collecting pre and post BMI measurements. The project leader was assigned the role to recruit the potential participants identified through the EHR. The RN and the other MA were assigned the roles to identify potential participants during patient visits and provide informational letters for the project. The medical receptionists were assigned the role of obtaining contact information of potential participants interested in the project. The project leader and project facilitator were assigned to deliver participant-focused MI sessions. Once all processes were mapped out, to complete Step 13 (implement change), an implementation date of August was determined. The implementation process started with recruitments of participants. Potential participants were contacted and meetings to meet with interested participants were arranged. During the recruitment process, BMI measurements were obtained from participants identified through retrospective chart review to ensure they still met the inclusion criteria. Individualized-MI sessions were initiated following the completion of the recruitment process. Baseline BMIs and healthy habits surveys were completed during the first MI session and after the six-week intervention period. Evaluation of outcomes (Steps 15-18) were completed following the six-week intervention period.

Strengths and Limitations of EBP Model for DNP Project

One strength of the JHNEBP Model is that it provides a linear step-by-step approach that is easy to follow. Furthermore, the model was created by nurses for nurses, therefore nurses find it easy to implement in the clinical settings (Melnyk & Fineout-Overholt, 2015). Another strength of the model is that it utilizes the best and current EBP findings to facilitate quality patient outcomes. One limitation of the model is that the 18 descriptive steps may hinder the implementation of the project if one step is not completed in a timely manner.

Table 2.1

The Johns Hopkins Nursing Evidence-Based Practice Model

Steps	Application
Step 1: Identify an EBP question	"In children aged 6-18 years with a BMI equal to or greater than 95th percentile (P), does a Let's Go! 5-2-1-0 obesity intervention program that incorporates diet modification, physical activity, and screen time limit (I) compared to usual care (C) affect BMI (O) over a six-week period (T)?"
Step 2: Define scope of practice question	Population based
Step 3: Assign responsibility for leadership	Project leader and project advisor
Step 4: Recruit a multidisciplinary team	Project leader, project advisor, nursing staff, and clinic secretary
Step 5: Schedule a team conference	Project leader and project advisor will meet at least once a week, meetings will be held with the multidisciplinary team as needed
Step 6: Conduct an internal and external search for evidence	Internal: clinical expertise, patient preferences External: literature search, regulatory and professional standards, and clinical guidelines
Step 7: Critique all types of evidence	Clinical practice guidelines, randomized control trials, cross-sectional analysis, observational cohort studies, prospective clinical studies, case-controlled studies, and systematic reviews.
Step 8: Summarize the evidence	Evidence summarized in body of paper
Step 9: Rate the strength of the evidence	JHNEBP appraisal tools used to appraise the evidence Level I evidence: six publications applied Level II evidence: one publication applied

Step 10: Develop recommendations for change in processes or systems of care based on the strength of evidence	1. Provide education on healthy eating habits 2. Provide education to enhance physical activity 3. Utilize motivational interviewing as a communication style for childhood obesity treatment 4. Involve parent (s) or caregiver(s) in the obesity treatment plan.
Step 11: Determine appropriateness and feasibility of translating recommendation into the specific practice setting	Multidisciplinary group met to discuss the applicability of a multicomponent lifestyle intervention for childhood obesity and the cost of the implementation.
Step 12: Create action plan	Tasks were assigned by the project leader.
Step 13: Implement change	Implementation start date was determined and the action plan was implemented.
Step 14: Evaluate outcomes	Pre-intervention and post-intervention data analyzed to determine if there was reduction in BMI and increased healthy habits
Step 15: Report the results of preliminary evaluation to decision makers	Results communicated to key stakeholders
Step 16: Secure support from decision makers to implement recommended change internally	Measures to sustain practice change developed
Step 17: Identify the next steps	Project facilitator will continue to monitor staff compliance with the 5-2-1-0 obesity program
Step 18: Communicate the findings	DNP presentation on April17, 2020.

Note: BMI= body mass index; JHNEBP=Johns Hopkins Nursing Evidence-Based Practice

Adopted from: Dearholt & Dang, 2017

Literature Search

The following section will review the literature search process and the sources of evidence applied to this EBP project.

Sources Examined for Relevant Evidence

After the development of a PICOT question, a computer-based, electronic search was undertaken. The databases searched included Joanna Briggs Institute (JBI), Cochrane library, CINAHL, National Guideline Clearinghouse, PsycINFO, and MEDLINE (via EBSCO). Many keywords were tested to generate significant evidence. The final key terms used were: (therap* OR treat* OR interven* OR manage") AND (child* OR paediatric* OR pediatric*) AND (obes* OR "BMI ≥ 95th percentile") AND ("family clinic" OR "family practice" OR "primary care"). The search terms for JBI and Cochrane library were kept simple and they included ("treat* AND child* AND obes* AND "primary care"). Inclusion and exclusion criteria were developed to help narrow down evidence that best addressed the PICOT question. Articles that met the inclusion criteria included: 1) articles published between 2014-2019, 2) articles published in English, 3) scholarly or peer reviewed journals, and 4) articles that focused on childhood obesity. One article published in 2013 was included because the evidence-based weight loss intervention program is relevant to this project. Studies were excluded if they 1) focused on secondary causes of obesity 2) focused on adult obesity, 3) failed to report relevant outcomes, and 4) focused on pharmaceutical interventions for childhood obesity. The electronic database search generated 191 relevant articles for inclusion. The project leader reviewed the 191 abstracts and 35 were chosen for literature review based on inclusion criteria. Full-text versions of each of the 35 articles were obtained and the articles were reviewed in full and critically appraised. A total of seven articles were selected based on the level of evidence and inclusion criteria.

Levels of Evidence

A total of seven sources of evidence were selected to be included in the review of literature. The seven sources were each assigned a level based on the *Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) Rating Tools* (Dearholt & Dang, 2017).

Appraisal of Relevant Evidence. The JHNEBP Rating Tools were utilized to appraise each piece of evidence. The JHNEBP evidence level tool include five levels of evidence ranging from level I, highest level of evidence, to level V, lowest level of evidence (Dearholt & Dang, 2017). Consequently, the seven sources of evidence were each appraised using the JHNEBP research evidence appraisal tool. The JHNEBP research evidence appraisal tool is designed to be used with the first three levels of evidence (Level I-III). A grade of A is high quality, B is good quality, and C is low quality or major flaws (Dearholt & Dang). Grade A includes consistent, generalizable results, definitive conclusions, sufficient sample size, adequate control, and consistent recommendations based comprehensive literature review. Grade B comprises of reasonably consistent results, sufficient sample size, some control, definitive conclusions, reasonably consistent recommendations based on a comprehensive literature review. Grade C includes little evidence with inconsistent results, no conclusions drawn, and an insufficient sample size (Dearholt & Dang).

One systematic review, in which all studies included RCTs, with meta-analysis is considered level I evidence, grade A (Elvsaas et al., 2017). The other systematic review also includes all RCTs and is considered is level I, grade B (Jang, Chao & Whittemore, 2015). The last systematic review includes all RCTs and is considered level I, grade B (Mead et. al, 2017) One meta-analysis is considered level I, grade A (Stoner et al. 2016). One RCT is considered level I, grade A (Resnicow et al., 2016); the other RCT is considered level I, grade B (Small et al., 2014). The quasi-experimental is considered level 2, grade A (Turk et al., 2013). The details of the seven sources of evidence including outcomes and findings are demonstrated in the Appraisal of Evidence Table.

Table 2.2

Appraisal of Evidence Table

Citation (APA)	Purpose	Design	Sample	Measurement/ Outcomes	Results/Findings	Level/ Quality
Elvsaas, I. K. Ø., Giske, L., Fure, B., & Juvet, L. K. (2017).	To evaluate the impact of multicomponent lifestyle interventions including two or more lifestyle components on weight reduction	A systematic review with meta-Analyses	-39 RCTs	- BMI *z*-scores -Improvement in BMI	-Determined that the utilization of multicomponent interventions that include diet modification and/or physical activity and family involvement improves the BMI and BMI *z* scores in obese and overweight children and adolescents. - Post-intervention BMI z scores were statistically significant after 6 months (MD −0.12 (95% CI −0.17 to −0.06), (MD −0.16 (95% CI −0.21 to −0.11) after 12 months, and (MD −0.16 (95% CI −0.21 to −0.10) after 24 months.	1/A
Jang, M., Chao, A., & Whittemore, R. (2015).	Assess the impact of parent involvement in childhood obesity intervention programs using RE-AIM framework	A systematic review	-7 RCTs	-BMI z-scores -Reduction in BMI	-Intervention studies demonstrated a significant difference of BMI or BMI z-score reduction in children compared to a wait-list control group or usual care group.	I/B
Mead, E., Brown, T.J., Rees, K.L., Azevedo, L.B., Whittaker, V.J., Jones, D.N., Olajide,	Sought to establish the efficacy of diet, physical	A systematic review with meta-analyses	-55 RCTs	- Mean difference (MD) in BMI -MD in BMI z-scores	- The MD in BMI was -0.53 kg/m2 (95% confidence interval (CI) -0.82 to -0.24); P < 0.00001. The MD in BMI z score was -0.06	I/B

J., Mainardi, G.M., Corpeleijn, E., Beardsmore, E., Beardsmore, E., Baur, L.A., Metzendorf, M., Demaio, A.R., & Ells, L.J. (2017).	activity, and behavioral interventions in the management of overweight or obese children.			-MD in weight Outcomes -Changes in BMI, BMI z score, weight, and adverse effects.	units (95% CI -0.10 to -0.02); P = 0.001 whereas the MD in weight was -1.45 kg (95% CI -1.88 to -1.02); P < 0.00001.	
Resnicow, K., Harris, D., Wasserman, R., Schwartz, R., Perez-Rosas, V., Mihalcea, R., & Snetselaar, L. (2016).	To assess the impact of a BMI trial using brief motivational interviewing in weight reduction	Randomized Controlled Study (RCT)	-Overweight and obese children ages two to eighteen from 42 primary care practices.	- Net difference in BMI percentile between groups one, two, and three - Reductions in BMI percentile	-The net difference in BMI percentile between groups three and one was 3.2 percentile units and 2.2 percentile units between groups two and one. -The BMI trial intervention achieved statistical significance and clinically meaningful reductions in BMI percentile between group one and three	1/A
Small, L., Bonds-McClain, D., Melnyk, B., Vaughan, L., & Gannon, A.M. (2014).	-Evaluate the impact of primary care-based, parent-focused overweight and obesity intervention.	RCT	67 (n = 67). overweight or obese children	- BMI percentile rates - ANOVA -BMI percentile, --waist circumferences -waist by height ratio	- Reduced waist circumference and waist to weight ratio immediately after the intervention that persisted for 3 (f = 0.33) and 6 months (f = 0.35), despite a small sample. - BMI and BMI percentile were not differentially affected. -Findings suggest that a primary care-based, parent-focused overweight/obesity intervention is feasible and established positive effects.	I/B
Stoner, L., Rowlands, D., Morrison, A., Credeur, D., Hamlin,	To examine the impact of exercise	Meta-analysis	-15 RCTs - Number of participants in	-Effect size- -Sub analyses	Results determined a decrease in BMI (mean 2.0 kg/ m^2, 95 % CI 1.5–2.5: ES)	I/A

M., Gaffney, K., … Matheson, A. (2016).	intervention in weight loss in overweight and obese adolescents.		each trial ranged from 15 to 152	-Decrease in BMI, waist circumference, body fat percentage and lean tissue mass	- A small decrease in waist circumference (3.0 cm, 95 % CI 1.3–4.8; ES) -A small reduction body fat percentage (3.1 %, 95 % CI 2.2–4.1; ES) -Statistically insignificant improvement in lean tissue mass (mean 1.6 kg, 95 % CI 0.5–2.6). - The analysis also revealed that exercise intervention led to a moderate decrease in systolic blood pressure; a large improvement in glucose handling with improved insulin sensitivity.	
Tucker, S.J., Ytterberg, K.L, Lenoch, L.M., Schmit, T.L., Mucha, D.I., Wooten, J.A., Lohse, Ch.M., Austin, C.M., & Wahlen, K.J. (2013).	-Evaluate the applicability and effects of (*Let's Go 5-2-1-0*) in a primary care setting	Quasi-experimental study	130 (n=130) families	-BMI percentile -healthy habit changes -Weight reduction -Applicability of *Let's Go 5-2-1-0*	- There was a significant increase in the number of fruits and vegetables consumed per day from baseline to 6-months follow up among the intervention families compared to the control families ($p < .001$). -The intervention families decreased the hours of television viewing per day compared to the control families (63% versus 39%; $p = 0.035$). -The intervention families increased the hours of activity per day compared to the control	2/A

					families (61% versus 27%; *p* = .004). -BMI percentile trended toward decline but was not statistically significant (*p* = 0.057).	

Level I evidence. Mead et al. (2017) conducted a systematic review to assess the effectiveness of diet, physical activity, and behavioral interventions for the treatment of overweight or obese children. The review was an update of a Cochrane review published first in 2003 and updated previously in 2009. The review included 70 RCTs with 8461 participants aged 6 to 11 years. The participants were randomized to either the intervention or control groups. Fifty-five trials compared a behavior-changing intervention with no treatment or usual care in the control group, and 15 trials assessed the impact of including an additional component to a behavior modification intervention compared to usual care. The authors concluded that behavioral interventions that promote healthy eating habits, physical activity, and behavior modification are beneficial in reducing the BMI, BMI *z*-score and weight over short and long durations in the targeted age group.

Mead et al. (2017) reviewed literature by searching CENTRAL, MEDLINE, Embase, PsycINFO, LILACS, CINAHL, trial registers ClinicalTrials.gov and ICTRP Search Portal on July 14, 2016. The authors identified the search terms and additional literature retrieval methods used in their review. No restrictions on the language of publication or geographic location were applied. Studies were organized based on age group studied and were reviewed independently by two authors. Any discrepancies were resolved through consensus or by consultation with a third review author. The authors used the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) instrument to evaluate the quality of the evidence. The Cochrane 'Risk of bias' assessment tool was used to determine the level of bias.

In total, 70 trials in the review and 55 RCTs in the meta-analyses were obtained that met the authors' criteria: randomized controlled trials (RCTs) or cluster RCTs, intervention with or without follow-up for a minimum of six months, with the goal of studying behavior-changing interventions to prevent obesity in children aged 6 - 11 years. The median age of the participants was 10 years old. Behavior-changing interventions included any of dietary, physical activity and/or behavioral therapy provided as single or multifaceted intervention in any setting.

Most of the trials were multifaceted. The control group received no treatment or usual care or another behavior-changing intervention which was also provided in the intervention group. Fifty-five trials compared behavior changing interventions with no treatment or standard care and 15 assessed the efficacy of including an additional component to a behavior-changing intervention. A total of 8461 participants randomized to either the intervention or control groups. The length of trials ranged from six months to three years. The authors excluded 402 studies from the review. The main reasons for exclusion was lack of randomization, mean age below six years or above 12 years of age, studies that focused on preventing overweight or obesity, and follow-up duration of less than six months from baseline.

The primary outcomes measured were changes in BMI, BMI z-score, weight, and adverse effects. Secondary outcomes included: self-esteem, all-cause mortality, health-related quality of life, morbidity, anthropometric measures other than change in BMI, BMI *z*-score and weight, behavior change, participants' opinions of the intervention and socioeconomic factors. Mead et al. (2017) estimated the intervention effect by expressing dichotomous data as a risk ratio (RR) or odds ratio (OR) with 95% confidence interval (CI) if at least two included trials were available for a comparison and a given outcome. The intervention effect of continuous outcomes measured on the same scale was estimated using the mean difference with 95% CI. Consequently, the authors calculated the standardized mean difference (SMD) for continuous outcomes measuring the same underlying concept using different measurement scale.

Multi-faceted behavior-changing interventions that consist of diet, physical activity and behavior change were beneficial in short-duration weight reduction (Mead et al., 2017). The authors also revealed that the trials that compared behavior-changing interventions to no treatment over a longer duration reported a reduction in BMI, BMI z-score and weight. The mean difference (*MD*) in BMI was -0.53 kg/m^2 (95% confidence interval (CI) -0.82 to -0.24);

$p < 0.00001$. The *MD* in BMI z-score was -0.06 units (95% CI -0.10 to -0.02); $p = 0.001$, whereas the *MD* in weight was -1.45 kg (95% CI -1.88 to -1.02); $p < 0.00001$. Out of the 31 trials that investigated adverse events, 29 trials reported no occurrences RR 0.57 (95% CI 0.17 to 1.93); $p = 0.37$; 4/2105 participants in the intervention, compared to 7/1991 in the control groups. Two trials reported serious adverse effects but none of the effects were related to the study. Adverse events unrelated to the study documented in one trial included: seasonal influenza that required hospitalization *(n* = 3), hip surgery related to a chronic condition (*n* = 1), an ankle injury (*n* = 1), diagnosis of type 1 diabetes (*n* = 1), a blood clot (*n* = 1) and observation after a fall (*n* = 1). Similarly, the other trial documented two serious adverse events unrelated to the study in the intervention group (bowel replacement surgery and a dislocated hip) and three events in the control group (a cystectomy, a broken ankle, and two broken fingers). Twenty-one trials documented health-related quality of life or behavior change outcomes, but the results in the interventional group were not statistically significant. All-cause mortality or socioeconomic factors were not reported in any of the trials. Meta-analyses demonstrated a significant heterogeneity across all outcomes, but no significant subgroup effects for the subgroups were noted (Mead et al.).

Mead et al. (2017) summarized the results of 70 trials that examined the impact of behavior-changing interventions on weight reduction in overweight or obese children aged 6 -11 years. The authors concluded that behavior interventions that promote healthy eating habits, physical activity and behavior modification are beneficial in weight reduction in short-term and long-term durations. Further, the evidence identified a small number of adverse effects that were unrelated to the study; 4/2105 participants in the intervention compared to 7/1991 in the control groups. Other effects of the interventions-such as improvements in health-related quality of life did not yield significant results. Death from any cause, morbidity and socioeconomic effects were not investigated in any of the trials.

Elvsaas et al (2017) conducted a systematic review to assess the effects of

multicomponent lifestyle interventions on weight reduction in children aged 2-18 years. Thirty-nine RCTS were included in the review. The participants were randomized to either the intervention or control groups. The trials compared two or more multicomponent lifestyle intervention components with standard, minimal, or no treatment at 6, 12, and 24-months follow up. The review revealed that multicomponent lifestyle interventions are effective in reducing BMI and BMI *z*-score after 6, 12, and 24-months compared to the control groups.

Elvsaas et al. (2017) performed a systematic literature searches in the Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials (CENTRAL), Medline (Ovid), Embase (Ovid), CINAHL via EBSCOhost, PsycINFO, ISI Web of Science, Database of Abstracts of Reviews of Effects (DARE), and HTA. The authors searched for RCTs from January 2008 to February 2015. Search terms and additional literature retrieval methods were clearly identified by the authors. The abstracts and full-text articles were reviewed independently by two researchers. The risk of bias was assessed using the Cochrane Handbook for Systematic Reviews of Interventions, bias criteria were rated as low, unclear, or high risk. The GRADE instrument was used to assess the quality of the overall records from pooled results in meta-analyses.

RCTs were included in the Elvsaas et al.(2017) review if they a) examined the BMI and/or BMI *z* scores from baseline to 6, 12 and/or 24 months; b) targeted overweight or obese children between 2 to 18 years old with or without family involvement; c) studies the impact of interventions that consisted of two or more strategies involving diet modification, physical activity, and behavior changes; and d) trials were not exclusively primary care-based, representing hospital, other health institutions, and school-based interventions. The comparisons for the studies were standard, minimal or no treatment. Trials were excluded from the review if they included children younger than two years old, children with type 1 diabetes mellitus, pregnant participants, or those with secondary obesity causes. Thirty-nine RCTs with data that included in meta-analyses on the effect of multi- component interventions on change in

BMI and/or BMI *z* scores were found that met the inclusion criteria. The interventions consisted of at least two of the following interventions: diet modification, increase in physical activity, behavioral interventions including motivational reviewing and decreased sedentary activity levels. Thirty-two trials included behavioral changes, nutrition, and physical activity interventions. One study targeted change in diet and eating behavior, while another study examined the impact of modifying eating behaviors coupled with family-based lifestyle intervention. The studies included overweight children and adolescents only (≥ 85 percentile to ≥ 95 percentile, *n* = 1), overweight and obese (≥ 85 percentile, *n* = 21), and obese alone (≥ 95 percentile, *n* = 17).

Elvsaas et al. (2017) review determined that the utilization of multicomponent interventions that included diet modification and/or physical activity and family involvement improved the BMI and BMI *z*-score in obese and overweight children and adolescents. The positive outcomes of these interventions were sustained at six, 12, and 24-month follow-up compared with standard, minimal, and no treatment. The post- multicomponent lifestyle intervention BMI at 6 months was (*MD* −0.99 (95% CI −1.36 to −0.61); *(MD* −0.67 (95% CI −1.01 to −0.32) after 12 months; and (*MD* −0.96 (95% CI −1.63 to −0.29) after 24 months compared to the control groups. Similarly, the post-intervention BMI *z* scores were statistically significant after six months (*MD* −0.12; 95% CI −0.17 to −0.06), (*MD* −0.16; 95% CI −0.21 to −0.11) after 12 months, and *(MD* −0.16 (95% CI −0.21 to −0.10) after 24 months. The multicomponent lifestyle interventions noted a significant impact in specialist health care compared to primary health care and school-based interventions at six and 12-month follow-up, but the subgroup analyses did not show any statistical differences at 24 months. The authors report that the statistical differences maybe be attributed to lack of standardized protocols in primary care.

Elvsaas et al. (2017) summarized 39 RCTs to assess the impact of multicomponent

lifestyle interventions in reducing BMI and BMI *z*-score in overweight and obese children aged 2 -18 years. The authors noted significant difference in BMI and BMI *z*-score at six, 12, and 24-months follow-up in favor of multicomponent lifestyle interventions.

Jang, Chao and Whittemore (2015) conducted a systematic review to assess the impact of parental involvement in childhood obesity intervention programs using the Reach, Efficacy, Adopt, Implementation, and Maintenance (RE-AIM) framework. The review included 15 RCTs. The participants were randomized to either the intervention or control groups. The trials compared two or more multicomponent lifestyle intervention components with standard, minimal, or no treatment at six, 12, and 24-months follow up. The review revealed that multicomponent lifestyle interventions are effective in reducing BMI and BMI z-score after six, 12, and 24-months compared to the control groups.

Jang et al. (2015) conducted a literature search using PubMed, CINAHL, SCOPUS, and PsycINFO. Search terms used by the authors included: parent, parent-only, children, overweight, obesity, management, and intervention. The inclusion criteria for the review were: RCTs that assessed a childhood overweight or obesity treatment program; studies that included only parent(s) or caregiver(s); and RCTs published between January 1990 and April 2015. Studies were excluded if they included pregnant participants, parents of infants, children involvement in the program, non-English studies, and interventions for participants with comorbidities. The abstracts and full-text articles were reviewed independently by one author. Two authors independently assessed the risk of bias of the studies using the collaboration tool that consists of selection bias, performance bias, detection bias, attrition bias, reporting bias, and other bias. The bias criteria were judged as low, unclear, or high risk. The two authors also utilized a guideline tool to code and score each study independently to determine the indicators within each of the five RE-AIM dimensions. A total of seven studies met the authors' inclusion criteria.

Jang and colleagues (2015) categorized the individual strategies developed to improve children's healthy behaviors into three main categories: education and skill development, enhancing parental skills and cognitive behavior therapy (CBT). All studies consisted of knowledge and skill development, promoting parent self-efficacy to enhance healthy eating and physical activity of their children. Information on the causes and consequences of overweight and obesity and healthy behaviors was included in the education component. Enhancing parenting skills was another main component that included information on motivating and communicating with children and promoting healthy child feeding behaviors. Two studies incorporated CBT to enhance parenting strategies by utilizing controls or rewards to alter child behaviors. Interventions programs were previously designed programs or developed for a study. The duration of the intervention program was 2 to 12 sessions; many of the programs were delivered in 6 - 12 sessions. The intervention programs sought to target families of young children. The mean age of the children included in the seven trials was less than 10 years old.

The findings of the RE-AIM framework demonstrated that the intervention programs that include parents are effective in improving in 3 - 24 months. (Jang et al., 2015). The primary outcome of the review was children's BMI. The authors evaluated the impact of the parent-focused intervention programs by measuring BMI or BMI *z*-score, behavioral, and/or psychological outcomes of the children and their parents. All intervention studies had a positive impact on decreasing BMI of children post intervention. Intervention studies demonstrated a statistically significant difference of BMI or BMI z-score reduction in children compared to a wait-list control group or usual care group. Children also improved their healthy behaviors and negative thinking patterns. Although improvements in parenting skills and health behaviors were reported in some studies, the findings were not consistent. One limitation of the RE-AIM intervention program is that its efficacy has not been studied in families of diverse races and low socioeconomic status. As such, generalizability of findings may be limited.

Jang et al. (2015) systematic review sought to determine the impact of parental

involvement in childhood obesity intervention programs using the RE-AIM framework. The review established that intervention programs targeting parents are effective in improving childhood overweight and obesity in the short-term and two years post implementation. Furthermore, these programs demonstrated an improvement in children's and parents' healthy behaviors including diet and physical activity. Improvement in parenting skills was also reported in various studies. Research on intervention programs targeting parents of diverse races and socioeconomic status is limited. Further research is warranted to investigate the effectiveness of these programs in these populations.

Stoner et al. (2016) conducted a meta-analysis to examine the impact of an exercise intervention on weight loss in overweight and obese adolescents. The analysis also aimed to review the implications of the findings regarding New Zealand's primary healthcare and public health laws. Fifteen RCTs were eligible for inclusion for metanalysis. The participants were either randomized to receive structured exercise intervention, alone or combined with another type of intervention, whereas the control group received standard care, no treatment, Tai Chi or Red Cross safety program. The analysis determined that an exercise intervention led to a reduction in BMI, waist circumference and body fat percentage. The subgroup analysis, however, noted that an exercise plus nutrition cointervention resulted in a more significant reduction in BMI compared to an exercise intervention only.

Stoner et al. (2016) searched PubMed, Web of Science, SPORTDiscus, and Google Scholar databases for articles meeting their inclusion criteria: RCTs; English-language; interventions targeting exercise intervention alone or in addition to other lifestyle interventions intervention targeting obesity; control interventions without structured exercise or behavioral modifications to enhance physical activity; and participants with a BMI of equal or greater than the 85th percentile aged between 10 and 19 years. No restrictions were applied to the duration of the study or exercise intensity. A detailed description of the key words and search process

was included. In total, 15 trials met the authors' inclusion criteria. The number of participants in each trial ranged from 15 - 152, while the mean age ranged from 12.2 years (range 10–16 years) to 17.0 years (*SD* 0.6). The exercise prevention program included schools, research laboratories, hospitals, or unreported setting. Five trials included aerobic exercise only; one trial included aerobic plus strength training; six trials combined aerobic exercise and nutrition or behavior interventions; two trials combined nutrition and behavior interventions; and one study included aerobic plus strength training and nutrition or behavior co-intervention. The control groups included: standard care or untreated waitlist (*n* = 10), Tai Chi (*n* = 1), Red Cross safety program (*n* = 1), and unreported (*n* = 3). The duration of intervention varied from 8 - 36 weeks, with a median of 12 weeks. Three trials included female participants only and two trials included male participants only. Two trials enrolled Latino participants and one trial recruited mixed ethnicity adolescents. Meta-analyses on five body composition and 10 cardio metabolic parameters were conducted. The effect sizes (ESs) were calculated as mean differences and standardized mean differences to determine the effect magnitude.

Results determined that the implementation of an exercise intervention in overweight or obese adolescents resulted in a moderate decrease in BMI (mean 2.0 kg/ m^2, 95 % CI 1.5–2.5; ES); a small decrease in waist circumference (3.0 cm, 95 % CI 1.3–4.8; ES); a small reduction body fat percentage (3.1 %, 95 % CI 2.2–4.1; ES); and a statistically insignificant improvement in lean tissue mass (mean 1.6 kg, 95 % CI 0.5–2.6). The subgroup analysis, however, noted that exercise intervention only led to a small reduction in BMI, while an exercise plus nutrition cointervention resulted in a large improvement in BMI and body fat, and insignificant improvement in lean tissue mass. The analysis also revealed that an exercise intervention led to a moderate decrease in systolic blood pressure, a large improvement in glucose handling with improved insulin sensitivity. The effects of exercise on cholesterol and fasting blood glucose

were inconclusive. The implications of findings were incorporated in the primary and public healthcare provisions.

Stoner et al. (2016) meta-analysis aimed to examine the efficacy of an exercise intervention on weight loss in overweight and obese adolescents. The study concluded that an exercise intervention improves body composition by lowering the BMI, body fat percentage and waist circumference. An exercise plus nutrition cointervention had a significantly higher effect on weight loss compared to an exercise intervention only. Limited studies reported that an exercise intervention is beneficial in reducing cardiometabolic risk factors.

Resnicow et al. (2016) conducted an RCT study that examined the effects of a Brief Motivational Interviewing to Reduce Child Body Mass Index (BMi2) trial approach on childhood obesity in primary care settings. The authors tested two increasingly intensive interventions (moderate and high dose motivational interviewing) compared to usual care (baseline BMI percentile and at 1 and 2-year follow-up, and educational materials). The participants were randomly assigned to one of the three groups. The BMi2 trial intervention achieved statistical significance and clinically meaningful reductions in BMI percentile in group two and three.

The BMi2 trial included overweight and obese children ages two to 18 from 42 primary care practices. The inclusion criteria included: 85th to 97th percentile BMI, English speaking parent (s) or caregiver(s), and a working telephone. Children under subspecialty care or weight-altering medication were excluded from the study. The participants were randomly assigned to three groups: group one received usual care (n = 158), group two received three motivational interviewing sessions form a primary care provider in the first year and one booster visit in year two (n = 145), and group three received the same three motivational interviewing sessions from a primary care provider plus six registered dietician-delivered motivational interviewing sessions over two years (n = 154). The primary outcome was the child's percentile BMI change between the baseline and two-year follow-up. Secondary outcomes included behavior change around fruits and vegetables, sweetened beverages, and exercise.

At the two-year follow up, the BMI percentile rates were 90.3, 88.1, and 87.1 for group one, two, and three, respectively. There was an overall group effect (p = 0.049). The planned post hoc analysis showed that group three mean was significantly (p = 0.02) lower than the usual care group. Group three's mean was statistically significant (p = 0.02) lower than group one. The net difference in BMI percentile between groups three and one was 3.2 percentile units and 2.2 percentile units between groups two and one. The BMi2 trial intervention achieved statistical significance and clinically meaningful reductions in BMI percentile between group one and three. Child gender, child age, child race, baseline BMI, parent income, parent education, or parent BMI moderated intervention effects. Parent self-reported fruit and vegetable intake of the index child was higher with group three.

Resnicow et al. (2016) implemented a BMi2 trial approach to reduce childhood obesity in primary care settings. The study established that there was a larger decrease in BMI percentile for children in group three than in group two; children in group two had a larger decrease in BMI percentile compared to group one. Children in group three had a significant behavior change compared to other groups.

An RCT by Small et al. (2014) aimed to determine the feasibility and effects of a parent-focused, multifaceted intervention on children's anthropometric measures (BMI percentile, waist circumference, and waist-by-height ratio). The pilot study was conducted with a small sample- 67 parent-child dyads from 14 primary care offices. The children included in the study were ages four to eight years. The parent-child dyads were randomly assigned to the control group where they received four standard MI sessions on parent-focused obesity interventions, while those in the treatment group received four brief MI sessions on parent-focused multifaceted interventions. The children in the intervention group noted a reduction in waist circumference and waist to weight ratio immediately after the intervention that persisted for three months (f = 0.33) and six months (f = 0.35). The BMI and BMI percentile, however, were not distinctively affected.

The pilot study by Small et al. (2014) was conducted in 14 primary care offices. The study included 67 overweight or obese children ages four to eight years. Parents in both the treatment and control group parents were scheduled to attend a total of four sessions at their child's primary care. Parents in the treatment group (n = 34) were offered educational information about the development of healthy habits in young children, nutritional information, information regarding increasing physical activity and decreasing sedentary time, and age-specific information regarding the child's behavior in response to change. The parents assigned to the control condition (n = 33) were provided with educational age-appropriate, evidence-based health and safety information. The impact of the intervention was evaluated by collecting BMI percentile, waist circumferences, and waist by height ratio at baseline, three months, and six months. Using ANOVA models, the intervention group showed reduced waist circumference and waist to weight ratio immediately after the intervention that persisted for three (f = 0.33) and six months (f = 0.35), despite a small sample. BMI and BMI percentile were not differentially affected. Although the study included overweight and obese children, most of the children were at the 96th BMI percentile. The sample had higher BMI percentiles than the US population, since more children in the US are overweight than obese. The study findings suggest that a primary care-based, parent-focused overweight and obesity intervention is feasible and established positive effects (Small et al.).

Small et al. (2014) aimed to determine the applicability of a parent-focused, multifaceted intervention in primary care, and its effects on childhood obesity. The study resulted in a medium effect size on the mean waist circumference and waist-by-height ratio of the children whose parents participated in the treatment intervention. The intervention did not have any effects on children's BMI or BMI percentile.

***Level II evidence*.** Tucker et al. (2013) completed a quasi-experimental study to test the impact of the *Let's Go 5-2-1-0* program delivered via motivational interviewing (MI) on childhood obesity. The *Let's Go 5-2-1-0* healthy habits interventions include: five or more fruits and

vegetables; two hours or less of recreational screen time; one hour or more of physical activity; and zero sugary drinks, more water and only low-fat milk. The registered nurse (RN) led 5-2-1-0 intervention was delivered to overweight children and their parents over a six-month duration. Both the intervention and the control groups received standard care which entailed healthy weight management printed materials and review of BMI and BMI percentile. In addition, the intervention group received a structured, RN-led MI integrating 5-2-1-0 healthy habits. The study noted a significant improvement in healthy habits among the intervention participants and reduction in BMI percentile at six months.

Turk and colleagues (2013) recruited parents and children participants from a Midwestern pediatric primary care office in an academic center. The Inclusion criteria for the study were children ages four to 18, BMI between 85th to 95th percentile, and patients presenting for a well-child visit. The exclusion criteria included: 1) patients presenting for acute care reasons or with other comorbidities; 2) pregnant participants; 3) patients on birth control; 4) non-English speaking; and 5) patients with a mental disorder. The study compared 60 families receiving the usual care, printed educational materials on healthy weight management and review of BMI measurements, to 70 families who received usual care in addition to the *5-2-1-0*-health habits message through motivational interviewing. The outcomes of the study were to reduce the BMI percentiles and improve healthy habits. Positive healthy habits were described as increased fruits and vegetables consumption; decreased screen time; increased physical activity; decreased intake of whole milk and sugary drinks (Turk et al.).

The Intervention group reported an increase in fruit/vegetables consumption, physical activity, and decreased screen time at the 12-month follow up, compared to the control families (Turk et al., 2013). There was a significant increase in the number of fruits and vegetables consumed per day from baseline to six months follow up among the intervention families compared to the control families ($p < .001$). The intervention families decreased the hours of television viewing per day compared to the control families (63% versus 39%; $p = 0.035$).

Additionally, the intervention families increased the hours of activity per day compared to the control families (61% versus 27%; p = .004). After the RN-led intervention, BMI percentile trended toward decline but was not statistically significant (p = 0.057). It is important to note the dropout rates were 35% at six months and 41% at twelve months. Intervention effects included several significant healthy habit changes among the intervention families and BMIs trended down in both groups. Long-term follow up was suggested since behavior change takes time (Turk et. al).

Tucker et al. (2013) sought to determine the impact of an RN-led MI intervention integrating 5-2-1-0 healthy habits on childhood overweight. The study noted positive healthy habits and reduction in BMI percentiles at six months among the intervention families. The reduction in BMI percentiles at 12-months was non-significant among the intervention and control groups.

Construction of Evidence-based Practice

Synthesis of Critically Appraised Literature

Diet modification and Physical activity. The synthesis of the appraised literature revealed that most interventions geared toward childhood obesity treatment are multifaceted in that they incorporate nutrition education, physical activity, and behavior modification. Tucker et al. (2013) compared 60 families receiving healthy weight management and BMI education to 70 families who received usual care plus the *5-2-1-0*-health habits which promotes healthy eating habits, screen time limit, and physical activity. Intervention effects were found for self-reported fruit/vegetables consumption, physical activity, and screen time at the 12-month follow up, compared to the control families. The post-intervention BMI percentile trended down, but the results were not statistically significant (p = 0.057). Elvsaas et al. (2017) evaluated the impact of two or more lifestyle components on reduction in BMI or BMI z scores in children between the ages two and 18. The intervention effect on BMI at 6 months was (*MD* −0.99 (95% CI −1.36 to −0.61), *(MD* −0.67 (95% CI −1.01 to −0.32) after 12 months, and (*MD* −0.96 (95%

CI −1.63 to −0.29) after 24 months compared to the control groups. Mead et al. (2017) review aimed to establish the efficacy of diet, physical activity, and behavioral interventions in the management of overweight or obese children. Multi-faceted behavior-changing intervention that consisted of diet, physical activity and behavior change were effective in attaining small, short-duration weight loss. Trials that compared behavior-changing interventions to no treatment at the longest follow-up duration reported a reduction in BMI, BMI *z*-score and weight. Stoner et al. (2016) analysis examined the impact of an exercise intervention on weight loss in overweight and obese adolescents. Although the results demonstrated a moderate decrease in BMI (mean 2.0 kg/ m2, 95 % CI 1.5–2.5; ES); the subgroup analysis revealed that the exercise intervention only led to a small reduction in BMI, while the exercise plus nutrition cointervention resulted in significant improvements in BMI and body fat percentage.

Motivational interviewing (MI). The literature review supported MI to address childhood obesity. MI training varies greatly based on the provider and the nature of training. Tucker et al. (2013) study utilized an RN delivered health habits message (*Let's Go 5-2-1-0*) via motivational interviewing. The study reported a significant increase in the number of fruits and vegetables consumed per day from baseline to six months follow-up among the intervention families compared to the control families ($p < .001$). The intervention families also decreased the hours of television viewing per day compared to the control families (63% versus 39%; $p = 0.035$).

Small et al. (2014) aimed to determine the feasibility and effects of a parent-focused, multifaceted intervention on children's anthropometric measures. The parent-child dyads were randomly assigned to the control group where they received four standard MI sessions on parent-focused obesity interventions, while those in the treatment group received four brief MI sessions on parent-focused multifaceted interventions. The children in the intervention group noted a reduction in waist circumference and waist to weight ratio immediately after the intervention that persisted for three months ($f = 0.33$) and six months ($f = 0.35$).

Resnicow et al. (2016) examined the effects of a Brief Motivational Interviewing to Reduce Child Body Mass Index (BMi2) trial approach on childhood obesity. The participants were randomly assigned to three groups: group one received usual care, group two received three motivational interviewing sessions form a primary care provider in the first year and one booster visit in year two, and group three received the same three motivational interviewing sessions from a primary care provider plus six registered dietician-delivered motivational interviewing sessions over two years. The BMi2 trial intervention achieved statistical and clinically significant reductions in BMI percentile between group two and three.

***Family involvement*.** The recommendation for current childhood obesity treatment noted that family involvement is necessary for effective obesity treatment in children. Jang et al. (2015) review assessed the impact of parent involvement in childhood obesity intervention using the Reach, Efficacy, Adopt, Implementation, and Maintenance (RE-AIM) framework. Intervention studies demonstrated a significant difference of BMI or BMI *z*-score reduction in children compared to a wait-list control group or usual care group. Children also improved their healthy behaviors and negative thinking patterns. Smalls et al. (2014) assessed the applicability of a parent-focused overweight and obesity intervention. The study findings suggested that a primary care-based, parent-focused overweight/obesity intervention is feasible and established positive effects. Elvsaas et al. (2017) review determined that the utilization of multicomponent interventions that include diet modification and/or physical activity and family involvement improves the BMI and BMI *z*-score in obese and overweight children and adolescents.

Best Practice Model Recommendation

Appraisal and summary of the relevant evidence indicated that the best practice recommendation for childhood obesity treatment is the implementation of comprehensive approach that includes diet modification, physical activity, and family involvement. Further, MI should be utilized with parents and children to increase autonomous motivation and to modify

health behaviors. The goals of this EBP project was to reduce BMI and increase healthy habits in obese children.

Based on these goals and the relevant literature, the implementation of the *Let's Go! 5-2-1-0* intervention would be beneficial in the treatment of childhood obesity. The 5-2-1-0 healthy habits originated from the Maine Youth Overweight Collaboration (Rogers et. al., 2013). The mnemonic, 5-2-1-0 represents healthy eating and physical activity habits each day: five or more fruits and vegetables per day, two hours or less screen time per day, one hour or more of physical activity per day, and zero sugar drinks coupled with plenty of water, and low-fat milk consumption (Rogers et al.). The evidence supports the use of MI techniques to deliver the 5-2-1-0 healthy habits message to obese children and their parents to improve lifestyle choices (Roger et al.; Tucker et al., 2013). Tucker et al. quasi-experimental study determined that the 5-2-1-0 healthy habits program was effective in weight reduction in the pediatric primary care setting. Further, the CDC (2019) and the AAP (2019) also support the 5-2-1-0 message as an effective plan for reducing childhood obesity.

This best practice recommendation of a 5-2-1-0 intervention program was used to answer the clinical question by demonstrating the impact of multicomponent lifestyle interventions on BMI. The impact of this program will be compared to usual care through data collection pre and post implementation of the 5-2-1-0 intervention program.

CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

This chapter will focus on the implementation of the best practice recommendation for childhood obesity in the family practice project site. Implementing practice change is the 13th step in the JHNEBP model (Melnyk & Fineout-Overholt, 2015). The review of literature established that utilizing motivational interviewing to deliver multicomponent lifestyle interventions such as dietary habits and physical activity, and family involvement is considered best practice (Elvsaas et al.,2017; Jang et al., 2015; Mead et al., 2017; Resnicow et al., 2016; Small et al., 2015; Stoner et al; 2016; Tucker et al., 2013). The purpose of this EBP project was to reduce the BMI scores of obese school-aged and adolescent children using a multicomponent lifestyle intervention program that incorporates healthy eating, physical activity, healthy screen habits, and family involvement. The PICOT question for this project was: In children aged 6 -18 years with a BMI equal to or greater than 95th percentile (P), does a *Let's Go! 5-2-1-0* obesity intervention program that incorporates diet modification, physical activity, and screen time limit (I) compared to usual care (C) affect BMI (O) over a six-week period (T)?

Participants and Setting

Sample and Setting

This EBP project was initiated at a private-owned family practice in Northwest Indiana. The practice provides comprehensive medical care to patients of all ages. The family care practice has one full-time NP who serves as the project advisor. The NP is dual certified as an adult-gerontology acute care nurse practitioner (AGACNP) and a Family nurse practitioner (FNP) and has been practicing as an NP for six years. The clinical staff included one registered nurse (RN), two MAs, and two medical receptionists. Stakeholders in this project included the project leader, project advisor, clinical staff, pediatric patients, and their families/guardians. The inclusion criteria for participants in this project included: 1) male and female patients between

the ages of 6-18 and their families/guardian(s); 2) BMI equal to or greater than the 95th percentile; 3) English-speaking participants; and (4) parent and child who agree to attend all six sessions of the program. The exclusion criteria for participants included: 1) participants on pharmacological treatments for weight loss; 2) pregnant child at the time of enrollment or during the study; 3) children with significant co-morbidities; and 4) children with a diagnosis of any mental health problems such as Autism, ADHD, Mental retardation, depression, bipolar etc.

Pre-Intervention Group Characteristics. Following the recruitment process, the project leader collected detailed demographic characteristics of the participants using the demographic form in Appendix C. BMI measurements of all participants were collected by the same MA and used as baseline data for each participant. BMI percentile was determined using CDC growth charts that plot BMI along age and gender specific developmental percentiles (see Appendices A and B).The BMI percentile were auto-calculated within the electronic health record (EHR), and reviewed by the project leader for accuracy. A Healthy Habits Survey, developed by the Maine Youth Overweight Collaborative (Maine Center for Public Health, 2012), was administered on the first individual-focused MI meeting by the project leader to assess child's healthy habits (see Appendices C and D). The survey was administered to the same participants at the end of the project period.

Intervention

Recruitment Process

Recruitment of subjects started the first week of September 2019. A retrospective review of the EHR identified 18 patients with a BMI equal to or greater than the 95th percentile. Out of those identified five were excluded secondary to history of mental disorder. The project leader and the project facilitator contacted the parents of the remaining patients to discuss their willingness to participate in the project. Informational letters were sent to potential participants as well. The project leaders met with parents interested in enrolling their child in the project to discuss in detail the goals and interventions for the project.

Additionally, the project leader placed 5-2-1-0 flyers describing the project and instructions on how to sign in the waiting room of the clinic. The clinical staff also provided informational letters to parents of eligible children presenting for both well-child and acute visits. A sign-up sheet for potential participants was managed by the medical receptionist. The project leader would then contact the parents of the participants to schedule a meeting with at the clinic

Preparation Phase. In this EBP project, an individual-focused MI intervention integrating *Let's Go! 5-2-1-0* healthy habits message was implemented to decrease BMI of obese children, and to contribute to the development of healthy habits for all participants and their families. This intervention was based on Tucker et al. (2013) findings that showed the use of the *Let's Go 5-2-1-0* obesity intervention program reduced BMI percentiles (p = 0.57) and improved healthy habits. Positive healthy habits were described as increased fruits and vegetables consumption; decreased screen time; increased physical activity; decreased intake of whole milk and sugary drinks. The Let's Go 5-2- 1-0 Program, formerly known as the Keep Me Healthy 5-2- 1-0 Program, was developed as part of the Promoting Healthy Habits for Life Maine Youth Overweight Collaborative (MYOC) located in Maine. The program includes four primary health habit targets 5-2-1-0 that help children and parents focus on a behavior change they are ready to make (Tucker et al.). These four healthy habits include: 5-five or more fruits and vegetables per day; 2-two hours or less screen time per day; 1-one hour or more of physical activity per day; and 0-zero sugary drinks coupled with plenty of water, and low-fat milk consumption (Tucker et al.). The 5-2-1-0 program includes a framework and toolkits to help patients adopt healthy behaviors. The 5-2-1-0 out of school toolkit was purchased for each participant, and it included parents' resources, activity planning packet, 5-2-1-0 physical activity for any age guide, three water signs and five screen time posters. The director of the *Let's Go 5-2-0-1* program was contacted via email for permission to utilize the 5-2-1-0 program and to allow the project leader to print the tools in the EBP paper.

Implementation phase. Beginning the eighth week of the fall semester 2019, the

project leader met with each participant once per week for 6 weeks. Each week, a different 5-2-1-0 healthy habits message (see Appendix E) topic was provided at the clinic. The project leader, in conjunction with the project facilitator, spent approximately 30 minutes with each participant and their families per week. This allowed for adequate time to interact with the participants and provide the weekly sessions. Additionally, the project leader made a brief weekly phone call to monitor the participant's progress.

During the first week of individualized MI session, the project leader and facilitator spent approximately 45 minutes with each participant to get to know them and to administer the pre-intervention healthy-habits questionnaire. The baseline measurements were also obtained during this visit. Each child was asked to choose one goal that they were willing to change, which is question 10 on the healthy habits questionnaire. All participants received a journal and were instructed to keep a record of their daily food consumption as well as a daily record of their activities such as sleep time, video and TV watching time and how much drinks they drank. Their journal entries were reviewed at each session to evaluate the child's progress towards achieving their goal.

The focus of the second week of MI session included assessing the participants' understanding of BMI and discussing each component of the 5-2-1-0 message and providing ways to increase physical activity and healthy eating. The project leader discussed reviewed each participant's healthy habits questionnaire and discussed ways to increase physical activity and healthy based on their unique needs. The participants' parents were also provided with helpful tips to help the child incorporate healthy into their daily routine. Each participant was reminded to record their daily healthy habits in their journals. The focus of the third week of MI session was the five component-eating at least five fruits and vegetables every day. The project leader led an open discussion regarding child's fruits/vegetables intake, reviewing children and adults serving sizes, identifying ways to successfully introduce new fruits/vegetables and helpful shopping tips for shopping healthy foods on a budget. Parents and participants were also

educated on the importance of fruits and vegetables in promoting optimal immune function. Each participant's journal was reviewed, and their daily healthy habits results were compared to their baseline, and additional tips provided based on the child's progress towards achieving their goal.

The fourth MI session focused on the two component-limiting recreational screen time to less than two hours per day. Using the 5-2-1-0 healthy habits messages, participants were taught how to set screen time limits and provided with personalized alternatives activities to try. The participants were also provided tips with helpful strategies to develop positive screen time habits into their daily routine. Participant's journals were reviewed to track their progress and identify ways to address their weak areas. The fifth MI session focused on the one component-engaging in one hour of physical every day. The project leader led the participants in a discussion about their daily physical activity, identifying fun, moderate physical activity for each child, and other family-friendly outdoor activities. Fortunately, most participants found this intervention easier to incorporate into their routine because they have daily gym time at school. Participants were encouraged to be creative in choosing their exercises. The sixth week of MI session was on the zero components-zero sugary drinks and increased water consumption. Participants were provided with ways to limit their intake of sugary drinks and increase water consumption. Participants were also provided with a 5-2-1-0 nutritional chart form for common drinks and their sugar content. Week seven of MI session was delivered two weeks after the previous session due to the project leader being sick. This session was used to review all topics taught throughout the previous six weeks. The project leader provided each participant with a handout covering the major 5-2-1-0 healthy habits strategies they had learned as part of the intervention. Participants discussed their strengths and weakness during the intervention process. At the end of each MI session, the BMI measurements of each participant were obtained, and a healthy-habits questionnaire for post-intervention data assessment was completed.

Comparison

The project compared pre-implementation to post-implementation data. The pre- implementation data included BMI measurements collected prior to the initiation of the 5-2-1-0 obesity program and the post- implementation data consisted of BMI data collected after the program initiation. Data were collected by taking the height and weight measurements of the same participants at the beginning and end of the intervention. BMI percentile were determined using CDC growth charts that plot BMI along age and gender specific developmental percentiles (see Appendices A and B). The post-implementation data consisted of data from the beginning of the project implementation (October 2019) to the end of completion (December 2019). A paired *t*-test was used to compare the pre-implementation data to the post-implementation data. The impact of the 5-2-1-0 intervention program on participants' healthy habits was compared before and after implementation using the health habits pre- and post- surveys. Data obtained from the demographic information of each participant and their parent was analyzed using descriptive statistics to describe the sample population. Data were analyzed using the SPSS statistics software program. At Valparaiso University (VU), as of January 2020, we have used the SPSS version 22 for data analysis.

Outcomes

This EBP project incorporated a multicomponent, family-oriented, lifestyle modification program to promoted positive healthy habits to reduce BMI in obese children. Consistent with the reviewed literature, the primary outcome measure was BMI of all children participating in the intervention (Tucker et al., 2013). Height and weight were measured using the clinic's Seca 216 plastic wall mount stadiometer and Uline industrial platform scale. The participants were weighed with their shoes off and wearing lightweight clothing. This collection procedure is consistent with what is found in the literature (Elvsaas et al.,2017; Jang et al., 2015; Mead et al., 2017; Resnicow et al., 2016; Small et al., 2015; Tucker et al., 2013). BMI percentile was determined using CDC growth charts that plot BMI along age and gender specific

developmental percentiles (see Appendices A and B). The BMI percentile was auto calculated within the EHR; the project leader and facilitator verified the BMI data for accuracy.

The secondary outcome for this EBP study is changes in healthy habits related to nutrition, screen time, physical activity, and child's eating patterns. The 5-2-1-0 healthy habits surveys (see Appendix C) were used to assess self-reported healthy habits among children pre-and post-intervention. The 5-2-1-0 healthy habits survey was designed specifically for the 5-2-1-0 obesity program (Tucker et al., 2013). The healthy habits survey includes six questions where the respondents are asked to rate frequency to which they consume or engage in the item, two questions that require a yes or no response, and two multiple choice response options. The healthy habits survey comes in two versions: the 2-9 years old version and the 10-18 years old version. The content on both surveys is similar, but wording is based on the age and the developmental level of the child. The 2-9 years old version is designed for patients to complete for the child, whereas the 10-18 version is worded to be completed independently by the child. These healthy habits surveys were used according in this project, with the parents completing the survey if the child was younger than 10, and self-completion for children over the age of 10 (Tucker et al.).

The 5-2-1-0 health habits questionnaire was administered by the project leader during the first week of MI session with the participant and at the completion of the intervention period. The project leader was available for assistance during the time the participants and their families completed the questionnaire. The 5-2-1-0 healthy habit survey has been used in multiple childhood obesity studies as both a pre- and post-test measure of healthy habits (Tucker et al., 2013). Participants and their families were asked to recall the child's daily diet and physical activity habits and complete the questionnaire to the best of their ability.

Time

The implementation of the practice change consisted of two months. The project consisted of three phases. The first phase was the pre-implementation phase and the project

leader collected data prior to the implementation of the obesity program. The implementation phase consisted of implementing the obesity program. The implementation of the practice change started with the recruitment process in September 2019, followed by six weeks of implementing the obesity intervention program. The clinical staff were educated on the obesity intervention plan during weekly meetings before the initiation of the program. Support from the clinical staff was received. The post-implementation phase consisted of data evaluation and finding ways to sustain the obesity program.

Protection of Human Subjects

The project leader completed the appropriate Collaborative Institutional Training Initiative (CITI) to maintain the ethical considerations regarding the protection of human participants. A request was submitted to the Institutional Review Board for the Protection of Human Subjects (IRB) at VU. The IRB determined an IRB approval was not needed because the EBP project is categorized as non-research. Permission to implement the proposed intervention was granted from the owner of the project site after it was determined an IRB approval was not warranted. An informational letter (see Appendix E) describing the details of the EBP project was sent to the parents of potential participants and given to patients who met the inclusion criteria during clinic visits. The project leader's contact information was included on the informational form and parents were encouraged to contact the project leader with any concerns or questions. The informational form was approved by the project advisor and project facilitator prior to the initiation of the recruitment process. Confidentiality was maintained by the assignment of a code number to each participant. The code will allow the project leader to compare individual results pre- and post-intervention. The key including the participants' names, code number, and personal data was kept in a separate file which was stored in a locked drawer in a secure location. The project leader and project facilitator were the only people with access to the drawer.

CHAPTER 4

FINDINGS

The purpose of this EBP project was to reduce the BMI scores of obese children using a multicomponent lifestyle intervention program that incorporated healthy eating, physical activity, healthy screen habits, and family involvement. Additionally, it was hoped that the project would improve the frequency to which the child consumed or engaged in healthy habits related to healthy eating, physical activity, and screen time. The intervention was designed to answer the identified clinical question and determine the effectiveness of implementing a multicomponent intervention for obese children in the primary care setting. The findings associated with this intervention will be presented in this chapter.

Participants

Size

At initiation of the project, there were nine participants that completed the self-reported healthy habits survey and the baseline BMI measurements. Of these nine participants, seven completed the six-week MI intervention based upon 5-2-1-0, yielding an attrition rate of 22.2%.

Children Characteristics. Detailed characteristics of the participants *(N* = 9) and their families were collected using the demographic form (see Appendix C) and analyzed using descriptive statistics. The characteristics of age were reported via mean and range, while gender, grade and race were reported via frequencies. The mean baseline age of the participants (*N* = 9) was 12.67 (*SD* = 3.74). The sample comprised of five females 55.6% (*n* = 5) and four males 44.4% (*n* = 4). The grades ranged from 3rd to 12th with most participants in 12th grade (33%) *n* = 3. Eight participants were Caucasian 99.9% (*n*=8) and one participant was African American 0.1% (*n* =1). Descriptive statistics describing the demographic data for participants are represented in Table 4.1.

Family characteristics. Nine parental demographic forms were completed and returned to the project leader. The sample characteristics are described here. Of the nine forms that were returned, 88.9% *(n* = 8) were completed by the mother of the participants and 11.1% (*n* =1) were completed by the father of the participant. The mean age of the participants' mothers was *M* = 42.8 and the mean age of the participants' fathers was *M* = 46.29. Four parents 44.4% (*n* = *4*) reported "both parents" were responsible for parenting, and 55.6% (*n* = 5) reported "mothers" as the primary person responsible for parenting. Additional basic demographic information including level of education, age, level of income, and marital status were collected and can be seen in Table 4.2.

Table 4.1

Children Demographics

Characteristic	Mean	Median	SD	Range
Age in years (*N* =9) at baseline	12.67	12.00	3.74	8-17
Age in years (*N*=7) post-intervention	11.86	11.00	3.80	8-17

Characteristic	Frequency (n)
Gender	44.4% (*n* =4) Male 55.6% (*n* =5) Female
Ethnicity	99.9% (*n* =8) Caucasian 0.1 (n =1) African American
Education	22.2% *(n* =2) Third grade 11.1% (*n* =1) Fifth grade 11.1% (*n* =1) Sixth grade 11.1% (*n* =1) Seventh grade 11.1% (n =1) Ninth grade 33.3% (*n* =3) Twelve grade

Table 4.2

Family Demographic

Characteristic	Mean	SD	Range
Mother's age in years *(N = 9)*	42.78	5.36	33-48
Father's age in years (*N* = 7)	46.29	3.99	40-49

Characteristic	Frequency (n) Results
Parent completing form (*n* = 6)	88.9% (*n* = 8) Mother 11.1% *(n* =1) Father
Primary person responsible for parenting	44.4% (*n* = 4) Both mother and father 55.6% (*n* = 5) Mother
Marital status	77.8% (*n* = 7) Married 22.2% (*n* = 2) Single
Mother's highest education level	44.4% (*n* = 4) High school or GED diploma 11.1% (*n* = 1) Some college or vocational training 44.4% (*n* = 2) 2-year college degree
Father's highest education level	55.6% (*n* = 5) High school or GED diploma 11.1% (*n* = 1) Some college or vocational training 11.1% (*n* = 1) 4-year college degree
Annual income	22.2% (*n* = 2) 40,001-50,000 44.4% (*n* = 4) 70,001-80,000 33.3% (*n* = 3) 80,001+

Changes in Outcomes

The primary outcome of this project was BMI of the participants. The MA weighed and measured each child and calculated his or her BMI prior to the initiation of the intervention. This data was recorded in an Excel spreadsheet, de-identified, and shared with the project facilitator. After completion of the intervention, the same MA weighed and measured each participant using the same scale and stadiometer which were used at baseline. BMI was calculated and entered into the existing spreadsheet. The secondary outcome was changes in healthy habits. Data used for the analysis was obtained from completed pre and post answers of the 5-2-1-0 healthy habit questionnaire (Appendix C). The questionnaire responses were entered into Excel software. Other sources of data obtained included demographic information of the participants. All data has been compiled in Statistical Package for Social Sciences (SPSS) software for analysis.

Statistical Testing and Significance

Using SPSS version 22.0 software, paired t-tests were calculated to compare mean BMI of each participant at baseline and post-intervention. Analysis of the female and male sub-populations were performed. A paired *t*-tests was also used to identify if there was an improvement in healthy habits at baseline and post intervention. It was established that statistical significance for all analyses would be $p < 0.05$.

Healthy Habits. Healthy habits were measured by the age specific 5-2-1-0 Healthy Habits Survey (Appendix C). The survey is a 10-item measure of health habits related to nutrition, screen time, physical activity, and family eating patterns. Seven items ask respondents to rate frequency to which they consume or engage in the item, two items are yes/no responses, and one include multiple choice response options. A paired-*t* test was calculated to compare the means of the healthy habits at baseline compared to the six-week follow up. Question one (daily servings of fruits or vegetables) had a baseline mean of 2.43 ($SD = 0.98$), and the mean at the six-week follow up was 4.00 ($SD = 0.82$). A statistically (need to identify between

statistically significant and clinically significant) significant increase in the number of servings of fruits or vegetables per day from baseline to six-week follow up was found (p = 0.01). Question two (frequency to which the child eats dinners with family per week) had a baseline mean of 6.00 (SD =1.29), and the mean at the six-week follow up was 5.86 (SD = 1.21). A statistically significant increase in the number of times the child engaged in dinners with family (Question 2) from baseline to six-week follow up was not found (p = 0 .604). Question three (breakfast consumption per week) had a baseline mean of 6.29 (SD = 0.95), and the mean at the six-week follow up was 6.43 (SD = 0.79). A statistically significant increase in weekly breakfast consumption (Question 3) from baseline to six-week follow up was not found (p = .356). Question four (weekly fast food consumption) had a baseline mean of 2.14 (SD = 1.21), and the mean at the six-week follow up was 2.29 (SD = 1.98). A statistically significant decrease in weekly fast food consumption (Question 4) from baseline to six-week follow up was not found (p = 0.859). Question five (hours of screen time per day) had a baseline mean of 4.29 (SD = 3.09), and the mean at the six-week follow up was 2.57 (SD = 1.4). A statistically significant decrease in the hours of daily screen time (Question 4) from baseline to six-week follow up was found (p = 0.045).

Question eight (hours of physical activity per day) had a baseline mean of 1.00 (SD = 0.58), and the mean at the 6-week follow up was 1.07 (SD = 0.35). A statistically significant increase in physical activity per day (Question 8) from baseline to six-week follow up was not found (p = 0.689). Question nine asked the participants to rate the daily frequency to which they consume 8-ounce servings of the following drinks: soda or punch; skim or low-fat milk; fruit or sports drink; whole milk; juice; and water. The baseline mean of the daily 8-ounce servings of soda or punch was 0.57 (SD = 0.79), and the mean at the 6-week follow up was 0.43 (SD = 0.53). A statistically significant decrease in the daily consumption of soda or punch from baseline to six-week follow up was not found (p = 0.356). The baseline means of the daily 8-ounce servings of skim or low-fat milk was 1.29 (SD = 0.76), and the mean at the six-week

follow up was 0.71 (*SD*=0.49). A statistically significant decrease in daily consumption of nonfat/reduced fat milk from baseline to six-week follow up was not found ($p = 0.103$). The baseline mean of the daily 8-ounce servings of fruit or sports drinks was 0.57 (*SD* = 0.79), and the mean at the six-week follow up was 0.29 (*SD* = 0.49). A statistically significant decrease in daily consumption of soda or punch from baseline to six-week follow up was not found ($p = 0.172$). The baseline mean of the daily 8-ounce servings of whole milk was 1.14 (*SD* = 0.69), and the mean at the six-week follow up was 0.43 (*SD* = 0.76). A statistically significant decrease in daily intake of whole milk from baseline to six-week follow up was not found ($p = 0.289$). Lastly, the baseline mean of the daily 8-ounce servings of water was 3.29 (*SD* = 1.38), and the mean at the six-week follow up was 5.14 (*SD* = 1.68). A statistically significant increase in daily consumption of water from baseline to six-week follow up was not found ($p =0.059$).

The Healthy Habits Survey consists of two questions that ask if the child has a TV or PC in their bedroom (Questions 6 & 7). Five participants 55.6% (*n* = 5) reported they had a TV in the bedroom at baseline and 57.1% (*n* = 4) at the six-week follow-up. Four participants 44.4% (*n* = 4) reported they had a PC in the bedroom at baseline and 57.1% (*n* = 4) and 28.5% (*n* = 2) at the six-week follow-up. A paired-t test was also calculated comparing the total score determined by responses on questions 6 & 7, at baseline and at six-weeks post intervention. The mean TV score at baseline was 1.57 (*SD*= 0.53), and the mean at six-weeks was 1.42 (*SD* = 0.53). A statistically significant decrease from initial to six-weeks was not found ($p = 0.356$). The mean PC score at baseline was 1.57 (*SD*= 0.53), and the mean at six-weeks was 1.71 (*SD*= 0.49). A statistically significant decrease from initial to 6-weeks post intervention was not found ($p = 0.356$). Results for the healthy habits are presented in Table 4.4.

BMI results. Seven (*N* =7) participants provided full datasets from baseline to the six-week visit. The mean baseline weight was 143.13 (*SD* = 46.83), *N* = 9, and the mean post-intervention weight was 126.53 (*SD* = 45.15), *N* =7. The mean baseline height was 59.28

(*SD* = 5.26; *N* = 9). The mean BMI at baseline of the nine participants (*N* = 9) was 96.71 (*SD*=1.7) and the mean post-intervention BMI (*N* = 7) was 95.43 *(SD* = 2.57). A statistically significant decrease in the overall BMI from baseline to six-week follow up was noted (*p* = 0.012). BMI results are presented in Table 4.3.

Table 4.3

BMI Results

Population	Mean baseline BMI (*N* = 9)	Mean post intervention BMI *(N* = 7)	Mean difference	Significance (2-tailed)
All participants	96.71 (*SD* =1.7)	95.43 (*SD* = 2.57)	1.29	0.012*

Note: (*) means statistically significant

Table 4.4

Child's Healthy Habits

Characteristic	Baseline Mean (*N* = 9)	Post intervention Mean (*N* = 7)	Mean difference	Significance (2-tailed)
Daily servings of fruits or vegetables	2.43 (*SD* = 0.98)	4.00 (*SD* = 0.82)	-1.57	0.01*
Dinners with family per week	6.00 (*SD* = 1.29)	5.86 (*SD* = 1.21)	0.14	0.604
Breakfasts per week	6.29 (*SD* = 0.95)	6.43 (*SD* = 0.79)	-0.14	0.356
Fast food per week	2.14 (*SD* = 1.21)	2.29 (*SD* = 1.98)	-0.15	0.859
Hours of screen time per day	4.29 (*SD* = 3.09)	2.57 (SD = 1.4)	1.71	0.045*
Hours of active play per day	1.00 (*SD* = 0.58)	1.07 (*SD* = 0.35)	-0.07	0.689
Servings of 100% fruit juice per day	1.71 (*SD* = 0.76)	1.29 (*SD* = 0.49)	0.43	0.289
Servings of fruit/sports drinks per day	0.57 (*SD* = 0.79)	0.29 (*SD* = 0.49)	0.26	0.172
Servings of soda/punch per day	0.57 (*SD* = 0.79)	0.43 (*SD* = 0.53)	0.14	0.356
Servings of water per day	3.29 (*SD* = 1.38)	5.14 (*SD* = 1.68)	-1.86	0.059
Servings of whole milk per day	1.14 (*SD* = 0.69)	0.71 (*SD* = 0.76)	0.43	0.289
Servings of nonfat/reduced fat milk per day	1.29 (*SD*=0.76)	0.71 (*SD*=0.49)	0.57	0.103

Characteristic	Baseline (*N* = *9*)	Post intervention (*N* =7)
	Frequency (*n*)	
TV in room	55.6% (*n* = 5)	57.1% (*n* = 4)
PC in room	44.4% (*n* = 4)	28.5% (*n* = 2)

Child's target goal	22.2% (*n* = 2) Eat more fruits and vegetables
	22.2% (*n* = 2) Play outside more often
	33.3% (*n* = 3) Limit screen time
	11.1% (*n* = 1) Drink more water
	11.1% (*n* = 1) Drink less soda, juice, or punch

Note: (*) means statistically significant

CHAPTER 5

DISCUSSION

The purpose of this EBP project was to reduce the BMI scores of obese children using a multicomponent lifestyle intervention program that incorporated healthy eating, physical activity, healthy screen habits, and family involvement. This chapter will further describe the findings presented in chapter four, evaluate the EBP model used to guide this project, identify the strengths and limitations of this EBP project, as well and the implications for the future based on the project findings.

Explanation of Findings

Data were collected using the pre- and post-intervention measurements of height and weight as well as the children and family demographic forms. A 5-21-0 Healthy Habits Survey (Appendix C) was also administered at baseline and post-intervention to assess child's healthy habits. Statistical analysis was completed using SPSS version 22 software. Changes in participants' BMI measurements over the six-week intervention period as well as healthy habits were examined. Of the (N = 9) participants that enrolled in the project, seven completed the pre and post BMI measurements and healthy habits surveys for a total participation of 77.7%. Two participants (n = 2) were lost to follow up due to time constraints secondary to after school activities. After the six-week intervention period, a paired t-test was used to compare the mean BMI and the post-intervention BMI. The results showed a significant reduction in post BMI (p = 0.012) for the seven participants that completed the six-week intervention period. A paired t-test was also performed to compare the child's baseline healthy habits with the post-intervention habits for each category of the 5-2-1-0 healthy habits message: five servings of fruits or vegetables (or healthy eating patterns), limiting screen time to two hours, one hour of physical activity, and zero sugary beverages. The participants (N = 9) were asked to identify one target healthy habit they wanted to change during the six-week intervention period. Twenty two percent (n = 2) noted they wanted to eat more fruits and vegetables**,** 22.2% (n = 2) wanted to

play outside more often**,** 33.3% (*n* = 3) wanted to limit screen time, 11.1% (*n* = 1) wanted to drink more water**,** whereas11.1% (*n* = 1) reported they wanted to drink less soda, juice, or punch. The seven participants that completed the six-weeks MI sessions received individualized interventions to help them achieve their target goal.

A statistically significant increase in the number of servings of fruits or vegetables per day was found (*p* = 0.01) following the six-week intervention period. A significant change was noted in the frequency the child engaged one or more hours of physical activity per day, but the change was statistically insignificant (*p* = 0.689). Overall, a decrease in consumption of sugary drinks and nonfat/reduced fat milk was reported, but the change was not statistically significant: soda or punch (*p* = 0.356); skim or low-fat milk (*p* = 0.103); fruit or sports drinks (*p* = 0.172); whole milk (*p* = 0.289). A statistically insignificant increase in water consumption was also found (*p* = 0.059). The PICOT question, in children ages 6 -18 years of age with a BMI equal to or greater than 95th percentile, does the implementation of a *Let's Go! 5-2-1-0* intervention program that incorporates diet modification, physical activity, and screen time limit compared to usual care affect BMI over a six-week period was answered. Statistically significant BMI change reduction have been demonstrated, (*p* = 0.012).

The findings of this EBP project are consistent with program effects reported in the *Let's Go! 5-2-1-0* intervention program with regard to changes in servings of fruits and vegetables and hours of screen time, as well as trends for declining BMI percentile (Tucker et al., 2013).The themes identified in the 5-2-1-0 healthy habits pre-and post-surveys reflect the findings in the literature review. Several studies in the literature have attributed parental factors such as parental efficacy, snack choices, nutrition, physical activity level, and consumption of sugary drinks as contributors to childhood obesity. (Elvaaas et al., 2017; Mead et al., 2017; Resnicow et al., 2016; Stoner et al; 2016; Tucker et al., 2013).

Managing one's weight requires self-discipline and guidance. In the case of children and adolescents, parental guidance and participation is needed. Parents buy the groceries in the

house; parents make the choice to put computer or television in their child's room and parents must provide opportunity for their child to participate in physical activities by taking the child to a park. The 5-2-1-0 intervention program implementation focuses on promoting healthy habits message to children. Healthy habits such as eating five or more servings of vegetables a day, reducing screen time to less than two hours a day, increasing daily physical activity to more than one hour and drinking zero sugary drinks are interventions that are known to promote healthy weights. One noted common answer was the amount of time the child spent watching television or playing with their video games. Participants (n = 3) over the age of 13 reported over two hours a day of screen time. One participant stated that he spent over four hours after school playing video games. The ten questions on the questionnaires gave insights on the children's normal habits at home. The questions that asked if the child had television or computer in their rooms created a prompt for the parents to participate more and for the parents to realize that they must provide a healthy environment for the child. Comments from parents and children reflected the strengths of the individualized MI session based upon 5-2-1-0 program including the relationship with the project leader, increased healthy habits of the entire family, individualized intervention based on the child's goal and reinforcement in the follow-up calls.

Strengths and Limitations of the DNP Project

Applicability of the EBP Model

The Johns Hopkins Nursing Evidence Based Practice (JHNEBP) model served as a guide in the development and implementation of this EBP (Melnyk & Fineout-Overholt, 2015). The JHNEBP model is composed of three basic nursing concepts: practice, education, and research. The model relies on evidence-based research as well as patient or healthcare provider experiences. It considers internal and external factors before a practice can be changed (Melnyk & Fineout-Overholt).

Fit of the JHNEBP Model. The first phase of the JHNEBP model is the practice question phase. In this phase, the project leader designed a PICOT question and assigned a specific outcome for the EBP project, selected project team members, assigned leadership responsibilities and gathered clinical data that would support the importance of the project.

Evidence. The project leader completed the critical appraisal of evidence in this phase. Seven sources of evidence were appraised using the JHNEBP Rating Tools (Dearholt & Dang, 2017), and used to implement practice change. Based on the synthesized evidence, the decision to change practice was made using a multicomponent childhood obesity intervention program that includes diet modification, physical activity, and family involvement.

Translation. In this phase, the project leader designed a six-week, weekly, face-to-face-MI sessions based upon the 5-2-1-0 healthy habits (Tucker et al., 2013). Prior to implementation, the university and the project site IRB determined that an IRB review was not necessary for this project. One modification during the recruitment phase of the project was that the project leader was going to do group-focused MI sessions; however, individualized MI sessions were found to be more effective due to time and schedule constraints. Following the completion of the six-week period, the project leader collected the post intervention measurements for data analysis and reported the results to the project key stake holders. During the post-implementation phase, the project leader worked with key stakeholders to develop a strategic plan to ensure project sustainability. The clinic staff felt that implementation of the 5-2-1-0 healthy habits messages into their daily practice would be feasible. The clinic has pamphlets displayed the 5-2-1-0 message in the patient and waiting room. They project team also developed BMI based care packets that would include the 5-2-1-0 healthy habits as an easy guide for prevention, management, and treatment of childhood obesity to facilitate and sustain change in their practice.

Strengths and Limitations of EBP Model for DNP Project

Strengths

One strength of the JHNEBP Model was that the step-by-step approach was straightforward and easy to follow in all three phases of the EBP project-pre-implementation, implementation, and post implementation. Another strength of the model was the support from the project site. The project team members helped with BMI measurements, recruitment process, attended all staff meetings and were receptive to the change in practice and sustaining the 5-2-1-0 program.

Limitations. The primary limitation of this EBP project was the small *(N* = 7), homogenous 100% sample size, thus limiting generalizability to families with the same demographic make-up. Another barrier was that the healthy habits data were all self-reported and parents and participants may have over or underestimated their actual habits, especially to look more favorable after the intervention period. While the individualized MI sessions helped the project, leader develop tailored intervention plans based on the child's needs, the sessions were time consuming and might not be feasible for a large sample size. Other barriers identified during the recruitment phase of the EBP project included sensitivity of childhood obesity discussions and parents' perspective of their child's weight as being healthy.

Implications for the Future

Practice

The findings of this EBP project have implication for health care providers in the pediatric primary care setting. The findings support the use of a multicomponent approach, such as 5-2-1-0 obesity program, that incorporates nutrition, physical activity, screen time limit and family involvement to treat childhood obesity. The 5-2-1-0 program is easy to implement, and parents and children can use the interventions provided to increase healthy habits as well as self-manage their weight status. Education regarding BMI percentiles for children and health

risks related to childhood obesity should be discussed during acute and wellness visits. The clinic has implemented a 5-2-1-0 obesity protocol that will be beneficial in preventing and treating childhood obesity in the clinic. Further, strategies for project sustainability have been developed and the project facilitator will continue to monitor staff's compliance with the protocol.

EBP Model

The JHNEBP model was used to guide the development, planning, implementation, and post-implementation phases of this EBP project. The model was easy to follow, and it should be considered in implementing future projects regarding childhood obesity in the primary care setting.

Research

Based on the ROL, a multicomponent approach coupled with MI is a useful approach to treat childhood obesity in the primary care setting. Future EBP with large, diverse, population sizes are warranted to explore he significance and generalizability of the project findings.

Conclusion

The purpose of this evidence-based practice (EBP) project was to reduce the BMI scores of obese children using a multi-component 5-2-1-0 intervention program that incorporates healthy eating, physical activity, and family involvement. The primary outcome for the project was BMI reduction and the secondary outcome was increased healthy habits. A paired *t*-test was used to analyze the pre-and-post intervention measurements. Paired *t*-test analysis demonstrated statistically significant weight loss from the pre-intervention to the post-intervention ($p = 0.012$). A statistically significant increase in the number of servings of fruits or vegetables per day was found ($p = 0.01$) following the six-week intervention period. A significant change was noted in the frequency the child engaged one or more hours of physical activity per day, but the change was statistically insignificant ($p = 0.689$). Overall, a decrease in consumption of sugary drinks and nonfat/reduced fat milk was reported, but the change was not statistically significant: soda or punch ($p = 0.356$); skim or low-fat milk ($p = 0.103$); fruit or sports

drinks (p = 0.172); whole milk (p = 0.289). A statistically insignificant increase in water consumption was also found (p = 0.059).

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BIOGRAPHICAL MATERIAL

Suzy W. Free

Originally from Kenya, Suzy moved to the United States in 2009 to pursue her college education. She graduated from Ivy Tech Community College, South Bend, Indiana with her Licensed Practical Nursing diploma in 2012 and her Associate of Science in Nursing in 2014. She continued her education at Goshen College, Indiana, where she achieved her Bachelor of Science in nursing degree in 2016. For the past eight years, Suzy has worked as a licensed practical nurse and registered nurse (RN) in various skilled nursing facilities and hospital settings. She worked as an RN at Saint Joseph Regional Medical Center (SJRMC), Mishawaka, Indiana for six years. She was awarded the SJRMC Martin Luther King Jr. (MLK) Nursing Excellence Award in 2015 for promoting cultural competence, and the SJRMC Nurse DAISY Award in 2016 for extraordinary patient care. Suzy is a member of Sigma Theta Tau International Honor Society of Nursing and a student member of American Association of Nurse Practitioners. She also served as a member of Valparaiso University (VU) MLK student committee in 2019. She is currently completing her coursework for Doctor of Nursing Practice at VU with an expected graduation in May of 2020. She strongly desires to continue her career as a leader to reduce childhood obesity through her evidence-based project.

ACRONYM LIST

APN: Advanced Practice Nurse

BMI: Body Mass Index

CDC: Center for Disease Control and Prevention

CINAHL: Cumulative Index to Nursing and Allied Health Literature

DNP: Doctor of Nursing Practice

EBP: Evidence-based Practice

JBI: Joanna Briggs Institute

M: Mean

NP: Nurse practitioner

PICOT: Patient population, Intervention of interest, Comparison intervention, Outcome, Time

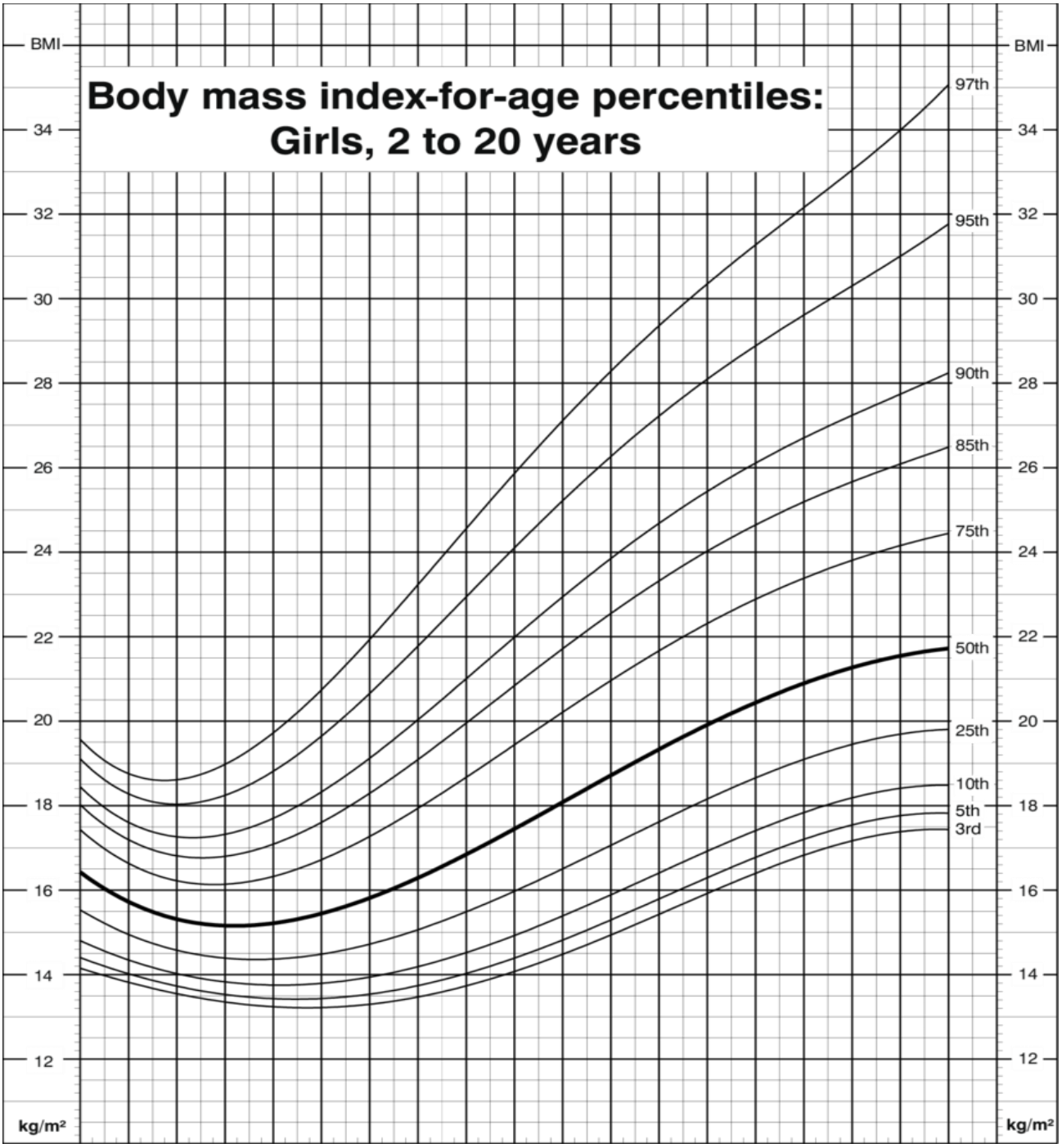
RCT: Randomized Control Trial

ROL: Review of Literature

SD: Standard Deviation

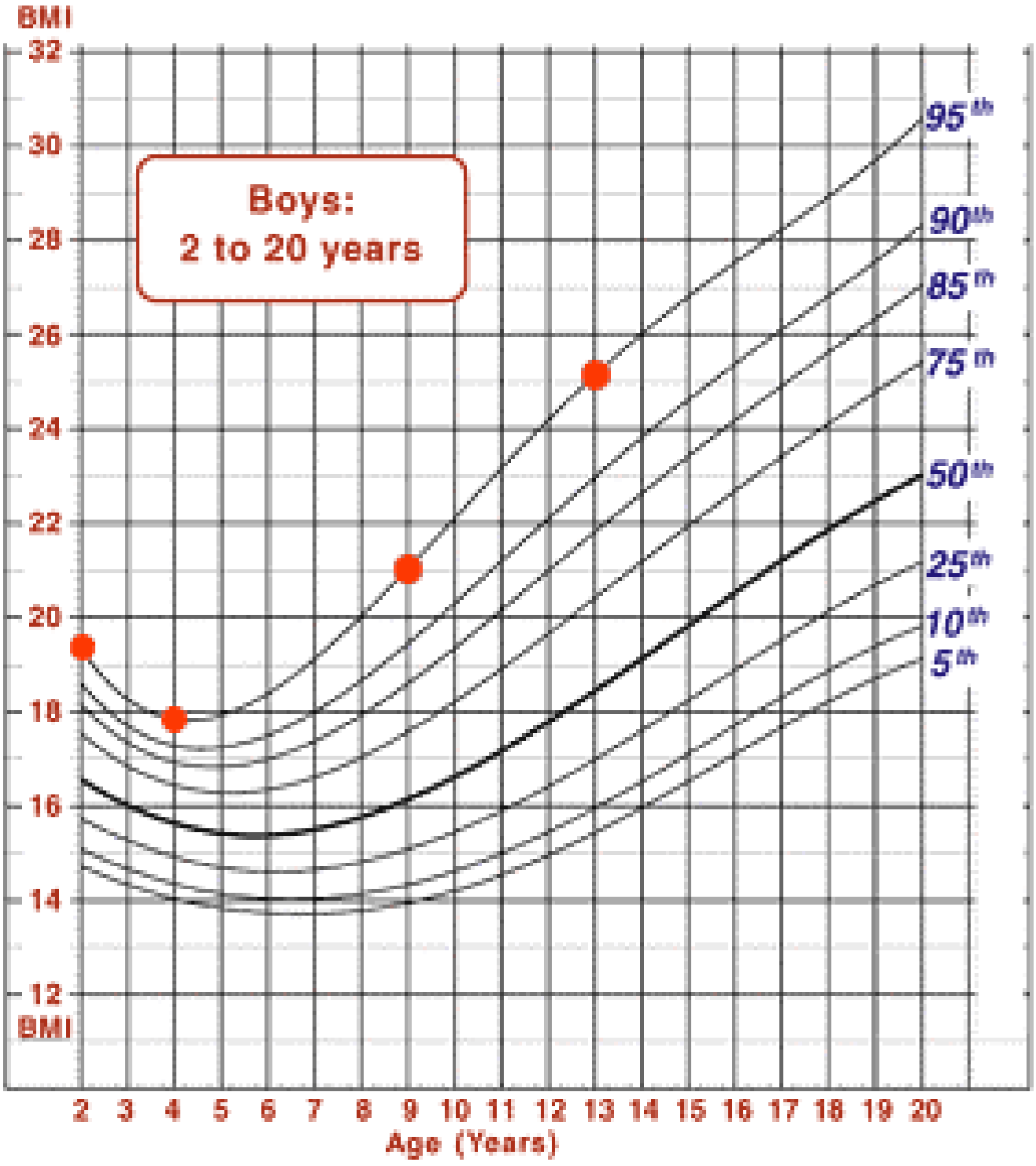
Appendix A

BMI Chart for Girls 2-20 years



Appendix B

BMI Chart for Boys 2-20 years



Appendix C

Demographics and Lifestyle Behaviors

To be completed by parent or guardian

We are interested in the health and well-being of your child. Please take a moment to answer the following questions.

A. Child's Demographics

1. Child's age in years: _____
2. Child's gender:
   a) Male_____
   b) Female_____
   c) Other_____
3. Child's grade: _____
4. Child's race:

a) Caucasian: _____
b) African American or Black: _____
c) Hispanic/Latino: _____
d) Asian: _____
e) American Indian and Alaska Native: _____
f) Native Hawaiian and other Pacific Islander: _____
g) Two or more races: _____
h) Prefer not to say: _____

B. Family Demographics

5. Parent completing form:
   a. Mother_____
   b. Father_____
   c. Other_____
6. Person responsible for parenting:
   a) Both mother and father____
   b) Mother_____
   c) Father_____
   d) Other_____
7. Mother's age in years: _____
8. Father's age in years: _____

9. Marital status:
    a) Married_____
    b) Single_____
    c) Living with a partner_____
    d) Divorced_____
    e) Separated_____
    f) Widowed_____
10. Mother's highest education level:
    a) Less than high school_____
    b) High school or GED_____
    c) Some college or Vocational training_____
    d) 2-year college degree_____
    e) 4-year college degree_____
    f) Post-baccalaureate degree_____
11. Father's highest education level:
    a) Less than high school_____
    b) High school or GED_____
    c) Some college or Vocational training_____
    d) 2-year college degree_____
    e) 4-year college degree_____
    f) Post-baccalaureate degree_____
12. Household income:
    a) 0–20,000_____
    b) 20,001–30,000____
    c) 30,001–40,000_____
    d) 40,001–50,000_____
    e) 50,001–60,000 _____
    f) 60,001–70,000 _____
    g) 70,001–80,000_____
    h) 80,001 +_____

5210 Healthy Habits Questionnaire (Ages 2–9)

To be completed by parent and/or child.

13. How many servings of fruits or vegetables does your child eat a day? _____
    One serving is most easily identified by the size of the palm of your child's hand.
14. How many times a week does your child eat dinner at the table together with the family? _____
15. How many times a week does your child eat breakfast? _____
16. How many times a week does your child eat takeout or fast food? _____
17. How many hours a day does your child watch TV/movies or sit and play video/computer games? _____
18. Does your child have a TV in the room where he /she sleeps? Yes____ No_____
19. Does your child have a computer in the room where he /she sleeps? Yes___ No_____
20. How much time a day does your child spend in active play (faster breathing/heart rate or sweating)? _____
21. How many 8-ounce servings of the following does your child drink a day?

    Soda or punch _____Nonfat (skim), low-fat (1%), or reduced-fat (2%) milk_____
    Fruit or sports drinks _____Whole milk ____100% juice _____Water____

22. Based on your answers, is there ONE thing you would like to help your child change now? Please check one box.

- ☐ Eat more fruits & vegetables.
- ☐ Take the TV out of the bedroom.
- ☐ Play outside more often
- ☐ Switch to skim or low-fat milk.
- ☐ Spend less time watching TV/movies and playing video/computer games.
- ☐ Drink less soda, juice, or punch.
- ☐ Drink more water.
- ☐ Eat less fast food/takeout.

Please give the completed form to the clinic staff. Thank you.

Adapted by MaineHealth® and Maine Medical Center from the High Five for Kids in Massachusetts and Keep ME Healthy in Maine.

5210 Healthy Habits Questionnaire (Ages 10–18)

To be completed by parent and/or child.

13. How many servings of fruits or vegetables do you eat a day?
(*One serving is most easily identified by the size of the palm of your hand.)* _____

14. How many times a week does your child eat dinner at the table together with the family?
_____

15. How many times a week do you eat breakfast? -_____

16. How many times a week do you eat takeout or fast food? _____

17. How many hours a day do you watch TV/movies or sit and play video/computer games?
_____

18. Do you have a TV in the room where you sleep? Yes _____No_____

19. Do you have a computer in the room where you sleep? Yes _____No_____

20. How much time a day do you spend in active play (Faster breathing/heart rate or sweating)?
_____

21. How many 8-ounce servings of the following do you drink a day?
Soda or punch _____Nonfat (skim), low-fat (1%), or reduced-fat (2%) milk_____
Fruit or sports drinks _____Whole milk ____100% juice _____Water_____

22. Based on your answers, is there ONE thing you would be interested in changing now? Please check one box

- ☐ Eat more fruits & vegetables.
- ☐ Take the TV out of the bedroom.
- ☐ Play outside more often
- ☐ Switch to skim or low-fat milk.
- ☐ Spend less time watching TV/movies and playing video/computer games.
- ☐ Drink less soda, juice, or punch.
- ☐ Drink more water.
- ☐ Eat less fast food/takeout.

Please give the completed form to your clinical staff. Thank you.

Adapted by MaineHealth® and Maine Medical Center from the High Five for Kids in Massachusetts and Keep ME Healthy in Maine.

Appendix D

5210 Key Talking Points

Quick Introduction:
Hey Kids! I am here today to talk to you about the 5210 messages. It is a great way to remember some healthy choices. Let's begin with the '5'. Does someone want to read what it says off the poster?

– or more fruits and vegetables

- Name some fruits and vegetables?
- Why are they important? How do they make us feel?
- What are some fruits and vegetables that you could bring in for your snacks or lunches? What kinds of fruits or vegetables could you have with breakfast? Lunch? Or dinner?
- Next time you go grocery shopping with your parents, surprise them by choosing a new vegetable for the cart!

– hours or less recreational screen time (Keep TV/Computer out of the bedroom)

- How much TV do you watch?
- Guess how many hours kids spend in school per year? 1206[1]
- Guess how many hours kids spend in front of the TV per year? 1456[2]
- Kids spend more time watching TV than learning at school! What do you think about that?
- Why do you think it is important to not have a TV or computer in your bedroom?
- Let's talk about some things you can do other than watching TV. Do you have any ideas? (Build a fort, play charades, dance to your favorite music, etc.)

–hour or more of physical activity

- Why be active? It makes you feel good and gives you more energy! Feeling tired? Do 10 jumping jacks. How do you feel now?
- How can you be active for 1 hour each day? Brainstorm some ideas.
- What are your favorite activities that get your moving?

– sugary drinks, more water and low-fat milk

- Use a sugar bottle display. (Many schools will have one– check in with them before hand to be sure.) Discuss the different amounts of sugar in the drinks. Which is the best choice? (water!).
- Why do you think sugary drinks are not a good choice for your body?
- Why are water and low- fat milk the best choices for kids? (up to 70% of body weight is water, calcium in milk, etc.)

Adapted by MaineHealth® and Maine Medical Center from the High Five for Kids in Massachusetts and Keep ME Healthy in Maine

Appendix E
Informational Letter for Parent or Guardian

Suzy Free, BSN, RN
Dedicated Family Health
117 N. Main Street, Hebron, IN 46341
219-509-3383(phone) 574-274-0654 (cell) 219-900-0038(fax) suzy.free@valpo.edu (email)

08//27/2019
Dear Parent or Guardian,

My name is Suzy Free. I am a Doctor of Nursing Practice Student in the Family Nurse Practitioner program at Valparaiso University. I am working on an evidence-based project (EBP) on childhood obesity intervention this semester.

My project will focus on the use of the *Let's Go! 5-2-1-0* program developed at the Barbara Bush Maine Children's Hospital to help children keep a healthy weight. The program encourages eating five or more vegetables a day, two or less hours of TV time per day, no sugary drinks and at least one hour or more of physical activity.

This project will take place over eight weeks and will require your commitment to make it work. It will require that you and your child attend a weekly, one-hour education session lasting over a six-week period. It is important that you and your child attend as many sessions as possible. However, if you and your child choose not to take part in the project or leave the project at any point in time, your decision will not involve any penalty or impact the care you receive. There are no associated costs with the participation of this program.

Any information that is collected in connection with this project that can identify you and your child will remain strictly confidential and will be disclosed only with your permission or as required by law. The summarized findings of this project with no identifying information will be shared with the public during the school's EBP presentation day. The group data findings may be published in an academic journal or presented at a scholarly conference. If you have any questions about this project, please feel free to call me via cell phone.