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Does Increasing Parental Knowledge of Healthy Behaviors Lead to Lifestyle Changes for Overweight or Obese Children? A Prospective Study

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Abstract

The prevalence of childhood obesity and metabolic syndrome have increased in the United States in recent decades, causing significant concern among experts and practitioners in kinesiology and medicine. However, exercise and dietetic science suggest that the risk factors and associated health concerns could be mitigated with regular physical activity and proper nutrition. However, many individuals face barriers to a healthier lifestyle due to misinformation and a lack of awareness. One group that may be especially susceptible to these obstacles is children, since they rely on parents or guardians for setting rules and boundaries, establishing routines and habits, and acting as role models. This prospective study was designed to determine if educating parents of overweight or obese children on healthy and unhealthy lifestyle choices would translate to changes in the reported behaviors of their children. An initial survey identified and addressed risk factors for metabolic syndrome in children, and a follow-up survey inquired about change in nutrition, physical activity, and screen time. While there was a moderate correlation between the intervention and reported changes in nutritional practices, there was little lifestyle change overall. These findings suggest that simply diagnosing risk factors or providing educational opportunities are not likely to be sufficient to elicit behavioral change in family units. Since the health behaviors of parents and children are intertwined, parents should be informed on issues relating to health. Interventions that are tailored to specific families or individuals may be more successful.

Keywords: Childhood Obesity, Metabolic Syndrome, Health And Fitness Education, Nutrition Education.

INTRODUCTION

Obesity is not only prevalent among the adult population of the United States, it has become an epidemic among children and youth as well. According to the Centers for Disease Control (CDC), the number of obese children tripled from 1980 to 2005, with the percentage growing from 5% in 1978 to 18.5% in 2016, and the prevalence of obesity in children tends to carry over into adulthood at a rate of 70-80%. [1,2]. Data from the National Health and Nutritional Examination Survey collected from 1976-1980 and 2003-2006 showed an increase in the prevalence of obesity in all ages of children. Obesity rates in children ages 2-5 years have increased from 5% to12.4%, rates in children ages 6-11 years increased from 16.5% to17%, and rates in adolescents ages 12-19 years increased from 5% to17.6% [3,4]. Data collected for age growth charts from 2003-2006 that utilized Body Mass Index (BMI) found that 11.9% of children and adolescents, ages 2-19, were at or above the 85th percentile, which is classified as overweight. Additionally, 16.3% of the same population was above the 95th percentile, which is considered obese. These trends are likely due to shifts in cultural influences and lifestyle changes that have occurred over time.

Many children in the United States have become increasingly sedentary, developed unhealthy eating patterns, and fail to engage in adequate physical activity based on recommendations from organizations such as the Centers for Disease Control, the American Heart Association, and the American College of Sports Medicine. Sedentary behavior, such as sitting and watching television or playing video games for extended periods of time, has been cited as a contributing factor to the rise of obesity rates among American children [5]. Previous research has found positive associations between screen time and higher BMI or obesity rates [5-9]. In addition to factors associated with physical activity, nutritional factors have also likely played a key role. In many cases, convenience and price have taken precedence over the quality and nutritional value of food that is being prepared and consumed by many Americans. Regular consumption of calorically dense, processed meals and snacks combined with an inactive lifestyle often leads to a caloric surplus and unhealthy weight gain, which can lead to comorbidities and exacerbate potential health problems. Since young children do not make lifestyle choices for themselves in many

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instances, the case of childhood obesity needs to be addressed at the parental level as well as the child.

Childhood obesity is a metabolic disease that is caused by several behavioral factors. Habits associated with obesity include unhealthy eating patterns, oversized portions, large amounts of screen-based activity time, and low levels of regular physical activity [5-9]. Parents play a vital role in implementing healthier choices, as well as being a role model for children [10]. An emphasis on healthy choices can be facilitated through early intervention and education [11]. Increased physical activity in children has been found to decrease weight, improve test scores, and help with self-esteem [12]. Metabolic syndrome is a cluster of conditions, including a high waist circumference, hypertension, hypertriglyceridemia, low high-density lipoprotein cholesterol (HDL-C), and high blood sugar, that increases one's risk of heart disease, stroke, and type 2 diabetes [13-17]. It has become a growing health concern for children and adolescents; for example, metabolic syndrome is a contributing factor leading to one in three children becoming diabetic. Parents and practitioners should not only be concerned with treating children who are overweight or obese, they should also be concerned with assessment of risk factors and prevention as well due to the costs of healthcare and decreases in productivity that can arise from these conditions.

The American Diabetes Association has developed guidelines for children and adolescents at risk for diabetes. An elevated BMI greater than the 85th percentile, as well as two additional risk factors put children at a greater risk for diabetes and it is suggested that they be referred for further evaluation [18]. These guidelines closely resemble those of metabolic syndrome. In a study by Adams (2007), researchers found a few repetitive risk factors in a sample of 2,444 rural school children ages 5-21 years. These included high-risk racial/ethnic population (30.5%), overweight/obesity (48.31%), and abnormal blood pressure (22.86%). Of their sample, 14.12% had a total cholesterol level of 200 mg/dl and 44.16% reported a positive family history for diabetes. According to Kaufman [19]. Most children who develop type 2 diabetes have a family member with the disease: 45-80% have a parent while 74-90% report at least one affected first-or second-degree relative [20].

The family dynamic is important to consider because children and adolescents may mimic parental behaviors. Previous research suggests that parents significantly influence their child's physical activity and food consumption behavior. Parents act as role models for both healthy and unhealthy energy balance behaviors [21-29]. A study by Hearst *et al* [20]. was based around family time demands, family rules, and weight status of both the parents and the children of the household. Although the study consisted of a predominately white and college-educated population, results indicated that overweight parents with overweight children reported fewer rules with a greater difficulty enforcing those rules, as well as greater time demands, which can influence eating patterns such as purchasing fast food for convenience. Families who lack rules and guidelines for food choices or activities of children tend to exhibit unhealthy weight gain [22-24]. A study by Sobko [30]. targeted overweight and obese parents with children, starting at one year of age until six, and featured regular interventions from a life coach. Interventions consisted of healthy food choices and eating patterns, increasing physical activity/reducing sedentary behavior, and regulating sleeping patterns. This was the first randomized control study with a family-based, lifestyle program that evaluated sustainability and effectiveness of life coaching along with the effects it had on the children over a sustained time period. Predictive associations indicated that a child has a threefold increase of becoming obese with one parent of the household being overweight/obese, and a tenfold likelihood of becoming obese if both parents fall in the category of overweight or obese [29]. A change in the family dynamic can provide children with more options for healthy choices, guidance, and physical activity participation.

Another factor linked to the prevalence of obesity is socioeconomic status (SES) – those in poverty tend to have higher rates than the wealthy [31]. The U.S. Census Bureau revealed that 35.6 million people lived in low-income families and poverty in 1991. Of the 35.6 million people living in poverty, 13.7 million were children under the age of 18. Poverty rates tend to follow the trend of unemployment rates; in 1991, 943,000 more children lived in poverty compared to the rates in 1990, which was an increase of 7.4% [32]. A study by Miqueleiz [33]. examined socioeconomic status, educational level of the primary household earner, and the income of the residence in relation to overweight and obese children who resided in the household. The survey found a significant increase among those aged 10-15 years from families whose primary household earner had a lower educational level. The prevalence of overweight boys in this group was 13.1 % in 1987 but increased to 31.5% in 2007. From 1997 until 2007, the prevalence of overweight and obesity among boys and girls aged 10-15 years increased in both the richest families as well as lower income families. Specifically, there was an overall increase from 18% to 28.9%. In a study by Navalpotro [31]. the prevalence of obesity was 1.45 times higher among individuals living in areas of lower wealth in relation to individuals living in areas of higher wealth. Parents reported not only feeling additional pressure to provide for their families, but also felt stressed due to time demands and restraints related to their jobs.

A study by Tibbs [34]. examined eating patterns of low-income African American parents using a questionnaire. For the study, a delegate educated parents about the effect of their diet and the possibilities of healthier nutritional choices. The study described "parents as teachers," indicating that parents are a child's first and most influential teacher, while also attempting to empower parents and strengthen the family. Results indicated that parents believed they were generally making healthy choices and modeling healthy behaviors for their families. Data collected from the surveys indicated that the participating parents sit with their children at mealtimes, but they infrequently reported modeling intake of low-fat snacks as well as setting rules about the number of fruits and vegetables their children should eat. Addressing family commitments as well as the family dynamic and financial challenges will help those family units that are struggling with these overlapping issues. This will better help healthcare providers target families in need of health coaching and other forms of assistance for healthier choices, such as an increase in time spent together enjoying physical activity.

Prior research has found relationships between parenting styles and children's behavior in eating patterns, physical activity, and weight status [11-13,35-37]. The evidence indicates that targeting and promoting healthy behaviors can be critical for childhood development and preventing childhood obesity. A study by Dickin [38]. sought to educate low-income parents in a program called, "Healthy Children, Healthy Families, Parents Making a Difference!" The intervention was an 8-week, 90-minute session addressing parenting with authoritative styles, nutrition, and physical activity recommendations. There was significant improvement from a pre- to post-questionnaire that featured a 1-2 point improvement on a 5-point scale. Questions analyzed specific parenting behaviors, such as eating together, adult and child activity level, children's time watching television, and fruit and vegetable availability. Other questions addressed food consumption such as food intake, dairy intake, the amount of soda consumed, energy dense foods, and fast food. The overall findings indicated that educating parents about nutrition, physical activity, parenting styles, and home environment could improve behaviors in the family, and eventually pass behaviors on to their children. Educating parents has been found to be an effective strategy to implement healthier choices not just for the parents, but also for the family unit [39-42].

Encouraging individuals to be more physically active should be one of the main strategies in diminishing the incidence of obesity. The CDC

states that children should be participating in 150 minutes of moderate exercise a week, or 75 minutes of vigorous exercise a week to maintain weight [43]. For weight management, the CDC states that children should engage in sufficient amounts of physical activity as well as maintaining a healthy eating pattern. Benefits of regular physical activity include controlling weight, reducing future risk of illness or disease (i.e., cardiovascular and metabolic disease, diabetes, and certain cancers), strengthening bones and muscles, improving mental health, and increasing the chances of living longer while enhancing overall quality of life. According to the American Heart Association (AHA), children and adolescents should participate in at least 60 minutes of moderate-to-vigorous physical activity every day [44]. The AHA's benefits of physical activity are closely related to those of the CDC's, while also addressing improved psychological well-being targeting children for improvements in self-esteem and in self-confidence. The AHA's recommendations for improving physical activity include reducing sedentary behaviors (e.g., screen time, video games, and phone access), teaching children that physical activity can be enjoyable, and getting involved: parents should be the primary role models for creating opportunities for physical activity and implementing a healthy lifestyle. Framing physical activity for children plays an important role in decreasing the incidence of obesity. It is necessary to address childhood obesity and the likelihood of children carrying obesity into their adulthood years, or even passing unhealthy behaviors onto their future children that increase the risk of future obesity. Several factors have been identified that relate to children being overweight, including early growth, parental weight status, lack of adequate physical activity, and sedentary behaviors [40].

The study known as INPACT addressed the issue of parental involvement and behaviors related to the involvement of their children. The study included a survey, which addressed diet and activity-related parenting practices, child and parental background characteristics, and child behaviors toward diet and activity. It revealed five clusters of parenting practices: 1) high visibility and accessibility of screens and unhealthy food, 2) diet- and activity-related rules, 3) low availability of unhealthy food, 4) diet and activity-related positive modeling, and 5) positive modeling on sports and fruit. Low parental education was associated with unhealthy cluster 1, while high(er) education was associated with healthy clusters 2, 3, and 5 [45]. The community needs to target educating children about being physically active for a healthy life, as well as targeting parents with studies confirming that children learn many of their behaviors from parental role models. Fogelholm [42]. created a three-day physical activity questionnaire for parents and children to complete. Results found that the biggest predictor for childhood inactivity was associated with parental inactivity while another strong predictor was parents possessing a higher BMI, which predicted that children were at an unhealthy or obese weight. Each of these findings suggest high associations between parental behaviors and overweight status in children.

Parents or guardians should strive to be aware of the behaviors they wish to model for their children, with a focus on healthy behaviors such as being physically active on a regular basis and following a healthy diet. Educating parents about both diet and exercise may improve the chances of passing on healthy behaviors to allow the possibility of decreasing the risk of their children falling into the high-risk category for metabolic disease. This can assist parents in preventing children from becoming overweight or obese into their adulthood years and can affect their overall quality of life in the future. Early prevention can help parents and children improve the family dynamic, which can create a healthy environment for all.

At a midwestern university in the United States, the Cardiovascular Health Intervention Program (CHIP) is an ongoing research program that has addressed the obesity epidemic among children by assessing risk factors associated with metabolic syndrome and cardiovascular disease and providing parents with this information regarding their child's current health status. A follow-up study would be beneficial to address potential changes in parental decision-making in the household after receiving such educational information. Therefore, the purpose of this study was to identify those parental choices that impacted children's lifestyle by asking parents how they used CHIP information to address risk factors associated with the incidence of metabolic syndrome and increasing understanding of the role parents have in their children's decisions about diet and daily activity.

METHODOLOGY

The original CHIP data were collected two years prior to the follow-up study and included 326 children ages 9-12 years, who lived in a midwestern town in the United States. For the follow-up study, the sample included parents of children who participated in the CHIP and were identified as high risk (i.e., two or more risk factors) for metabolic syndrome (*n* =140). Participants who did not possess two or more risk factors for metabolic syndrome were excluded, as well as those with limited contact information. Metabolic syndrome risk factors identified as inclusion criteria included a high BMI for the age of the child, high blood pressure (i.e., greater than 126/82 for either systolic or diastolic values), diminished aerobic capacity (i.e., boys < 42 ml/dl and girls < 139 ml/dl), elevated blood lipids (i.e., total cholesterol > 170 mg/dl, and HDL < 39 mg/dl), elevated glucose levels (i.e., fasting > 100 mg/dl, non-fasting > 140 mg/dl), and a family history of heart disease for an immediate family such as biological parents or siblings.

Procedures

This research was approved by the institutional review board prior to beginning the study. After identifying qualifying parents whose children had or were at high risk for metabolic syndrome, an online survey was created for parents to determine the impact of the CHIP results. The survey was developed by the researchers and consisted of open- and closed-ended questions regarding parent demographics, household rules and restrictions, and potential changes the parents implemented in diet, exercise, and use of leisure time after receiving results from the CHIP program addressing their child's high risk or diagnosis of metabolic syndrome. Once the follow-up survey had been developed, existing CHIP data were analyzed to determine the number of potential participants who fit the inclusion criteria. If an email address was present in the previous data set, participants were sent a link to complete the survey. If an email address was not present and a phone number was given, a phone call was placed to the household to determine a current email address. If an email address remained unavailable, and the parent was willing to continue the survey via phone, it was administered verbally and the conversation was recorded to ensure response accuracy. Prior to completing the survey in either format, each parent was informed that the results were kept anonymous and confidential. After the data were collected, researchers analyzed the data. Correlations were derived from information from the CHIP data set that included a high risk for metabolic syndrome of participating children along with responses to questions regarding potential changes parents made in their household. Pearson correlations were examined between results received from parents participating in the CHIP intervention and reported changes parents made to their child's nutrition, physical activity, and screen time.

RESULTS

Based on inclusion criteria and available contact information, the follow-up survey was distributed to 82 parents of children who had participated in the CHIP program and were categorized as high risk for metabolic syndrome (i.e., two or more risk factors), with 20 participants responding. When asked how many adults resided in the household, 16 indicated two parents, while four were single parents.

The majority of respondents attended at least some college with more than half having earned a bachelor's degree or higher. Forty percent of respondents indicated the household had a mean income salary range of $50,000-80,000. Eighteen participants categorized themselves as full-time employees (i.e., 40 hours per week or more), while two participants categorized themselves as part-time employees. Respondents had daily commutes to work that varied greatly, ranging from five minutes to 2.5 hours. A majority of participants indicated having at least two children residing in the household. For children's lunch choices, the researchers found that the sources varied among the participants between free/reduced lunch (9), hot lunch at school (7), and packed lunch (4). When asked about family meals at home, 85% of respondents reported a consistent family dinner time each day, and 17 participants responded that they had meals together daily, while three responded that they had meals together less than five times a week. Table 1 presents demographic data for this sample.

Table 1: Descriptive Statistics

Sex			
	Male	10.0%	2
	Female	90.0%	18
Education			
	High School or less	5.0%	1
	Some college	35.0%	7
	Bachelor's Degree	40.0%	8
	Master's Degree	15.0%	3
	Doctorate	5.0%	1
Income			
	< $10,000	0.0%	0
	$10,000-30,000	15.0%	3
	$30,000-50,000	10.0%	2
	$50,000-80,000	40.0%	8
	$80,000-100,000	20.0%	4
	> $100,000	15.0%	3
Household			
	Single parent	20.0%	4
	Two parents	80.0%	16

Researchers examined Pearson correlations between results from parents participating in the CHIP intervention and reported changes parents made to their child's nutrition, physical activity, and screen time (See Table 2). Analyses were conducted using IBM SPSS Version 25 and the alpha level was set at .05 for all statistical tests. Among nutrition, physical activity, and screen time, nutrition was the only variable that showed statistical significance when associated with CHIP results (p = .026). The analysis indicated a moderately positive correlation (r = .537) between nutrition and the results of the CHIP intervention. When examining physical activity and screen time, there was no statistical significance (p = .259 and p = .668, respectively).

Table 2: Statistics Examining Correlations of Parents Making Changes to Child's Lifestyle after receiving CHIP Information *Statistically significant at the p = .05 level

		CHIP Result Impact	**Nutrition**	**Physical Activity**	**Screen Time**
CHIP Result Impact	Pearson Correlation	1	.537*	.290	.112
	Sig. (2-tailed)		.026	.259	.668
	N	17	17	17	17
Nutrition	Pearson Correlation	.537	1	.292	.022
	Sig. (2-tailed)	.026		.256	.935
	N	17	17	17	17
Physical Activity	Pearson Correlation	.290	.292	1	-.344
	Sig. (2-tailed)	.259	.256		.176
	N	17	17	17	17
Screen Time	Pearson Correlation	.112	.022	-.344	1
	Sig. (2-tailed)	.668	.935	.176	
	N	17	17	17	17

DISCUSSION

After looking for relationships between the implementation of the CHIP program and the impact it had on specific lifestyle areas (e.g., nutrition, physical activity, and screen time), the implementation of the program only had a statistically significant impact on the nutritional habits of individuals. This outcome is perhaps understandable because changing habits in each of these areas can be quite challenging once they are well established. When considering the area of nutrition, hurdles to making healthier choices include knowledge and understanding – nutritional advice can be complex and sometimes misleading, and availability – poor nutritional options tend to be quicker and cheaper (e.g., fast food) than healthier alternatives (e.g., a meal prepared from scratch). However, this finding may be due to the direct, immediate control that parents can have over what they prepare in the kitchen or purchase from restaurants for the family to eat. It may be more challenging for parents to control lifestyle choices such as physical activity and screen time. For example, parents can encourage higher levels of physical activity by putting their children in situations that involve movement such as organized sport or playing outside, but there is no guarantee that children will meet physical activity recommendations or guidelines because they must ultimately choose to perform and their enthusiasm, interest, and willingness to participate can fluctuate greatly. Regarding screen time, some parents may view these entertainment options in a largely positive light because it engages children and gives everyone a chance to relax. A definition of what constitutes excessive screen time can be subjective, and individuals may not perceive even large amounts of screen time negatively because they are either unaware of the potential consequences or unwilling to establish and enforce rules in this area. Additionally, it may be difficult to monitor exact amounts of daily screen time if a child has access to electronic devices such as a television, computer, phone, tablet, or game system in their bedroom.

An assessment of screen time data revealed that the amount of screen time for the respondents closely mirrored that of their children (5% of both respondents and children having no screen time, 50% respondents/40% children having less than seven hours of screen time per week, and 45% respondents/55% children of watching more than seven hours of screen time per week.) According to Anderson [21]. parents provide role modeling for both healthy and unhealthy behaviors. Just over half of the respondents stated that they set restrictions on daily television time; however, the reported restrictions ranged from 20 minutes up to five hours, suggesting that researchers and practitioners need to develop stronger studies and clearer recommendations in this area, particularly with so many modern options for different forms of screen time and the recent rise in popularity of streaming services (e.g., Netflix, Amazon Prime, Disney+, Hulu, HBO Max, etc.) that allow users to "binge-watch" entire seasons of shows for hours at a time.

Respondents were also asked if they contacted a physician about the results of their child's participation in the CHIP program, and results indicated that none of the respondents conducted any form of follow up. When asked why, many stated that they already understood the information provided while others did not see the need to share the information with a family physician. This finding is alarming because all children were at high risk for metabolic syndrome at the time of the initial data collection. When parents were asked if they understood the results of their child's participation in the CHIP program, 90% responded yes and 10% reported a lack of understanding. While a failure to understand the results of the CHIP data could provide a potential explanation for the lack of action within a portion of those surveyed, it does not explain the lack of action taken by the majority. If parents understand the serious lifelong consequences for health and quality of life associated with metabolic syndrome, informing the family physician would help to address the issue and find a solution. Respondents may feel that the problem is not an immediate or serious threat to their children's health, or they may feel that they have the resources and knowledge to adequately address the problem. Overall, there was little evidence to suggest that actions were taken to change childhood behaviors or the parenting habits in their households. Changes in nutrition, physical activity, and screen time patterns were reported in less than 50% of respondents.

The current study provides evidence for the necessity of a follow-up session to educational/informational programs such as the CHIP, particularly with regard to concerns for individuals who may not fully understand the results and corresponding health risks revealed by their children's participation. Such a session could help participants better understand the scope and nuances of metabolic syndrome along with the potential negative health outcomes while also providing more specific suggestions or strategies for behavioral intervention that are tailored to families or individuals. Administrators of future surveys in these areas should also address how a family unit is defined while considering the inclusion of extended family members or acquaintances, rather than focusing solely on the children's status, due to the link between the health habits of parents and children and the potential for significant behavioral influence through close social relationships.

Research suggests that child health is exorbitantly impacted by the health behavior and knowledge of their caregivers [46,47]. Therefore, parents should be informed regarding best practices for healthy lifestyles along with current trends in health and wellness. Presumably, the more knowledge a parent has, the more informed and better lifestyle choices they can make for their children. However, as this study shows, even when parents are presented with the information that their children may be unhealthy based on bodyweight and they are presented with knowledge related to healthier alternatives, they may not seek out adequate avenues of change for a variety of reasons such as time constraints, financial concerns, or a lack of understanding regarding the significance of such feedback. Therefore, families with children who are overweight or obese need more than just a diagnosis and a set of basic facts, they need specific steps or strategies that will help them address current and future health issues based on their situation. Adding some perspective regarding the long-term consequences and decreased quality of life during later years may be helpful in comparison to short-term (i.e., day-to-day) views of current circumstances.

Conflicts of interest

None declared.

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