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Parent Readiness to Change Differs for Overweight Child Dietary and Physical Activity Behaviors



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ABSTRACT

Parent involvement is important to help overweight children lose weight. However, parent readiness to make changes around child eating and physical activity (PA) behaviors can differ across domains. Using a cross-sectional design, our aim was to examine which factors were associated with parents being in the Action/Maintenance stage of change in each domain. From November 2008 to August 2009, parents of overweight/obese children (n=202) attending a tertiary care obesity clinic in Providence, RI, answered questions assessing their stage of change, beliefs about child health and weight, and provider behaviors. Separate multivariate logistic regression models were created to determine which factors were associated with parent readiness to make changes for child dietary and PA behaviors. Almost 62% of parents were in the Action stage of change for child dietary behaviors, but only 41% were in the Action stage of change for PA behaviors. Parents who believed their own weight was a health problem were less likely to be ready to make changes to their child's dietary behaviors. Physician discussion of strategies was related to readiness to make changes for child dietary behaviors, but not PA behaviors. In the PA domain, parents of younger children were more likely to be ready to make changes. Training health care providers to address PA readiness and be aware of factors influencing dietary and PA readiness may result in more effective conversations with parents and improve behavior change efforts for pediatric weight loss.

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PARENTS PLAY AN IMPORTANT ROLE IN HELPING children develop healthy eating and physical activity (PA) behaviors.¹ They are also critical in helping overweight and obese children successfully lose weight.²⁻⁴ However, before weight loss can occur, parents need to be ready to make eating and PA changes to assist and support their children. In the Transtheoretical Model, there are five stages of change: Precontemplation, Contemplation, Preparation, Action, and Maintenance.⁵ Behavior change occurs when one recognizes the importance of change, has the confidence to change, and is ready to change—that is, in the Action stage of change. Being in this stage has also been associated with increased engagement in healthy lifestyle behaviors.⁶⁻⁸ A previous study showed that parent confidence to change child dietary and PA behaviors was related to treatment adherence and child weight loss.⁹ By virtue of enrolling in this program, parents presumably recognized the importance of making changes. Therefore, without both confidence and belief in its importance, parents may not be ready to help children develop healthier habits and lose weight.

Several studies have examined factors related to parent readiness to make changes for overweight children.^{10,11} One study found that parents who had older children and perceived child weight to be a health problem were more likely to help children lose weight.¹⁰ Another study found

that physician assessment of parent confidence appeared to influence readiness level.¹¹ Discussing parent confidence and readiness is often used in motivational interviewing and can help parents move along the stage of change continuum.¹² However, weight loss is a complex behavior that involves making changes to both eating and PA habits. Often, parents may find making changes in one domain easier than another. Yet assessment of weight-loss readiness typically combines these behaviors and assumes that readiness to make changes in one domain applies to the other, affecting weight loss equally.^{10,11,13} A recent study among adults found that low confidence to make changes in PA behaviors was the best predictor of weight-loss treatment failure.¹⁴ Identifying domain-specific factors that influence parents' readiness to assist their children in making changes in the area of eating and PA may lead to more tailored messages for parents. These messages might affect parents' decisional balance (the value of making behavioral changes vs the value of not making any changes) and the likelihood of treatment success for children.

The aim of this study was to identify parents who were actively making eating and PA changes for their overweight child and determine what factors were associated with readiness in each domain. To our knowledge, only one other study examined readiness in these domains separately.¹⁵ They found that parent's perception of elevated child

weight was associated with readiness to decrease portion sizes and dietary fats in the child's diet, but not increase PA or decrease sedentary behaviors. The impact of other factors like parent health, weight, and physician behaviors was not assessed. Given previous reports on the importance of the health care provider,^{10,11} we hypothesized that physicians' discussions would be associated with parent readiness to change in both domains. We also hypothesized that more parents would be ready to make changes around their child's eating behaviors than their child's physical activity behaviors.

METHODS

Study Design

In this cross-sectional study, a convenience sample of parents or guardians (herein identified as "parents") of children attending a tertiary care pediatric obesity clinic at Hasbro Children's Hospital (the Pediatric Division of Rhode Island Hospital, Providence) were given a survey to assess their readiness to make behavior changes around child dietary and PA habits. They also provided information on demographics, child eating and PA behaviors, their child's and their own weight and health, and physician behaviors. Children were typically referred to this clinic by their primary care provider (PCP) if they were overweight (body mass index [BMI] \geq 85th and $<$ 95th percentile) or obese (BMI \geq 95th percentile) and had metabolic complications of obesity, such as insulin resistance, abnormal glucose tolerance, type 2 diabetes, hyperlipidemia, or hypertension. Families attending the clinic between November 2008 and August 2009 were given the surveys when they arrived at the clinic as part of their initial paperwork. All surveys were completed via paper and pencil by the parent and were available in English and Spanish. One of the authors (R.M.) was available to clarify questions regarding survey items and collected the surveys on completion. Parents who brought their children for follow-up visits were not given the surveys to complete again because the investigators were interested in assessing initial readiness to change levels. During this time, 227 families had an initial visit. Of these, 209 parents (92%) of children between the ages of 5 and 20 years old completed the survey. Eighteen families refused to participate. Seven children were not overweight or obese and were excluded. The final sample included 202 parent-child dyads. The study was approved by the Rhode Island Hospital Institutional Review Board and all parents provided written informed consent.

MEASURES

Dependent Variables

The primary outcome of interest was parent readiness to change in two different domains: helping children eat a healthy diet and helping children engage in PA. Eating a healthy diet was defined as having five or more servings of fruits and vegetables per day and consuming foods high in fiber and low in fats as per the 2007 Expert Committee Recommendations Regarding the Prevention, Assessment, and Treatment of Child and Adolescent Overweight and Obesity.¹⁶ PA was defined as having at least 60 minutes of active movement per day, including running, playing outside, walking to school, or playing a sport. The questions were modeled from previously used questions¹⁰ and designed to categorize respondents into the five stages of change:

Precontemplation, Contemplation, Preparation, Action, and Maintenance.⁵ These stages are typically operationalized around intent or actual behavior change that has occurred during 1 to 6 months.¹⁷ For example, people in the Precontemplation stage of change do not intend to make any changes within the next 6 months, although people in the Contemplation stage of change are thinking about making changes, typically within the next 6 months. People in the Preparation stage of change are typically ready to make changes in the next 30 days and have begun to take small steps toward engaging in these new behaviors. People in the Action stage of change have been engaging in the new behaviors for 1 to 6 months, and people in the Maintenance stage of change have been engaging in these behaviors for longer than 6 months.

Based on this model, the survey included three questions for each of the two domains: Do you intend to find ways to improve (the way your child eats/your child's PA level)? In the past month, how often did you do things to help your child (eat healthier foods/be more physically active)? How long have you been doing things to help your child (eat healthier foods/be more physically active)? Parents who indicated that they were not making behavior changes for their child, not intending to make changes within the next 6 months, or were making sporadic changes less than once a month were categorized into the Precontemplation/Contemplation stage of change. Parents who indicated that they were already making behavior changes for their child or intending to in the next month, but were only making changes one to three times per month or had only been making more frequent behavior changes for 1 month or less, were categorized into the Preparation stage of change. Parents who indicated that they were already helping their child eat healthier/be more physically active, implementing these changes more than once a week, and engaging in these behaviors for more than 1 month, were categorized into the Action/Maintenance stage of change.

To examine the validity of these stage of change categories, parents were asked to report on child eating and activity habits, such as drinking sugar-sweetened beverages and watching television (see Figure 1 for survey items). Diet soda was included as a sugar-sweetened beverage because it is classified as a "red food" in the Traffic Light diet,¹⁸ and children are discouraged from consuming it. Child behaviors served as a proxy for parent behaviors because children are not likely to make behavior changes without their parent's involvement and this allowed the investigators to determine what children were actually consuming and doing. Items used to assess dietary behaviors were similar to those used in previously validated brief dietary assessment tools.^{19,20} Dietary behaviors were assessed around sugar-sweetened beverages, snacks, and fast food rather than a full assessment of fat and fiber intake because these foods are often more easily defined and understood by participants than identifying those foods that are high in fat and low in fiber. A briefer assessment of dietary behaviors was also conducted to ease participant burden. PA and television-viewing behaviors were measured according to guidelines set by the 2007 Expert Committee Recommendations.¹⁶ PA and leisure time behaviors for the weekday and weekend were assessed separately. All responses to food and PA items were dichotomized to reflect previously reported minimal levels or suggested requirements.^{16,21,22} Cut points for breakfast and

Survey items	Response choices
<p>1. In a typical week, how often does your child drink a glass (8 oz) of sugar-sweetened beverages (eg, soda, diet soda,^a sweetened ice tea, Hawaiian punch,^b Kool-Aid,^c Gatorade,^d lemonade, fruit punch)? (Do not include 100% fruit juice, like orange juice or apple juice.)</p> <p>2. In a typical week, how often does your child eat salty snack foods (eg, a bag of chips, crackers, pretzels, popcorn, cheese doodles, tortilla chips, nuts)?</p> <p>3. In a typical week, how often does your child eat sweet snack foods or dessert (eg, cookies, cake, candy, chocolate, pie, ice cream)?</p> <p>4. In a typical month, how often does your child eat at a fast-food restaurant?</p>	<p>Response choices for items 1 to 4:</p> <p>a. Never or less than 1 time per week</p> <p>b. 1 to 3 times per week</p> <p>c. 4 to 6 times per week</p> <p>d. Once a day</p> <p>e. More than once a day</p>
<p>5. In a typical week, how often does your child have at least one serving of fruit?</p> <p>6. In a typical week, how often does your child have at least one serving of vegetables?</p>	<p>Response choices for items 5 to 6:</p> <p>a. Never or less than 1 time per week</p> <p>b. 1 to 3 times per week</p> <p>c. 4 to 6 times per week</p> <p>d. 1 to 2 times per day</p> <p>e. 3 or more times per day</p>
<p>7. On a typical week day, including school hours and evenings, how many hours a day is your child involved in active play or other activities like walking, running, dancing, jumping, playing ball, playing sports, etc?</p> <p>8. On a typical weekend day, how many hours a day is your child involved in active play or other activities like walking, running, dancing, jumping, playing ball, playing sports, etc?</p> <p>9. On a typical weekday, how many hours a day does your child watch television, play on the computer (not including homework time), or play video games?</p> <p>10. On a typical weekend day, how many hours a day does your child watch television, play on the computer (not including homework time), or play video games?</p>	<p>Response choices for items 7 to 10:</p> <p>a. None</p> <p>b. Less than 1 hour per day</p> <p>c. 1 to 2 hours per day</p> <p>d. 3 to 4 hours per day</p> <p>e. More than 4 hours per day</p>
<p>11. In a typical week, how many days a week does your child eat breakfast?</p> <p>12. In a typical week, how many days a week does your family eat dinner together as a family?</p>	<p>Response choices for items 11 to 12:</p> <p>0 1 2 3 4 5 6 7</p>
<p>^aDiet soda was included as a sugar-sweetened beverage because it is classified as a “red food” in the Traffic Light diet.¹⁸ Children enrolled in this weight-loss program are encouraged not to drink diet soda because it reinforces the desire to drink sweet drinks. One of the goals of this program is to change taste preferences so that children learn to make healthier choices.</p> <p>^bDr Pepper/Seven Up Inc.</p> <p>^cKraft Foods, Inc.</p> <p>^dPepsiCo.</p>	

Figure 1. Dietary and physical activity assessment items used in a study to examine parent readiness to make eating and physical activity changes for their overweight/obese child between the ages of 5 and 20 years old.

family meals were based on previous literature, suggesting levels that provide beneficial effects.^{23,24} In addition to assessing child behaviors, parents were asked whether they were trying to help their child decrease unhealthy behaviors or increase positive behaviors, such as consuming fruits and vegetables or being more active. If parents responded “yes” and they were making changes more than once a week for more than 1 month, they were labeled as “actively making changes” for that behavior.

Independent Variables

Independent variables included parents’ perceptions of their child’s weight and health and their own weight and health. Weight categories spanned a 5-point Likert scale ranging from “very underweight” to “very overweight.” Health categories were also divided into a 5-point scale with 1=excellent and 5=poor. Parents were asked whether they thought their child’s weight was a health problem. Responses were categorized as “yes” or “no/don’t know.” Parents were then asked

whether their child's PCP ever mentioned that he or she was concerned about their child's weight. Responses were categorized as "yes" or "no/don't know." Parents were also asked whether their child's PCP had previously talked to them about what strategies they could use to help their child be healthy. Responses were rated on a 5-point Likert scale ranging from "never" to "very often." Finally, parents were asked to rate their level of health consciousness on a 5-point Likert scale ranging from 5=very health conscious to 1=definitely not health conscious.

Demographic information included parent and child age, BMI, race/ethnicity, education, and income. Child BMI was calculated and BMI percentile determined using norms from the National Center for Health Statistics growth curves.²⁵ Race/ethnicity was categorized as white, non-Hispanic, African American, Hispanic, and other. Education was dichotomized into "high school education or less" and "some college or more." Income was dichotomized at the median of \$40,000.

Statistical Analysis

Means and frequencies were used to describe the sample. To examine the validity of the stage of change categories, dichotomized responses to questions assessing child dietary

and PA behaviors were compared with parents' reported stage of change (Precontemplation/Contemplation, Preparation, Action/Maintenance) in the corresponding dietary or PA domain. The Cochran-Armitage test of trend was used to assess whether there were differences in the percent of parents who reported that their child was eating one or more fruits and vegetables, less than one sugar-sweetened beverages or sweet and salty snack per day, consuming fast foods less than four times per week, meeting PA and screen-time recommendations, eating breakfast five or more times per week, consuming family meals four or more times per week (Figure 2), and actively making changes around each of these behaviors (Figure 3) by the three levels of readiness (Precontemplation/Contemplation, Preparation, Action/Maintenance).

Separate univariate (unadjusted) logistic regression models for each child and parent characteristic were created to examine which factors were related to parent stage of change around eating and PA separately. Parent stage of change was dichotomized into a binary outcome: those who were in the Action/Maintenance stage of change and those who were not (Precontemplation, Contemplation, and Preparation stage of change). Although previous studies have created three categories (Action/Maintenance, Preparation/Contemplation, and

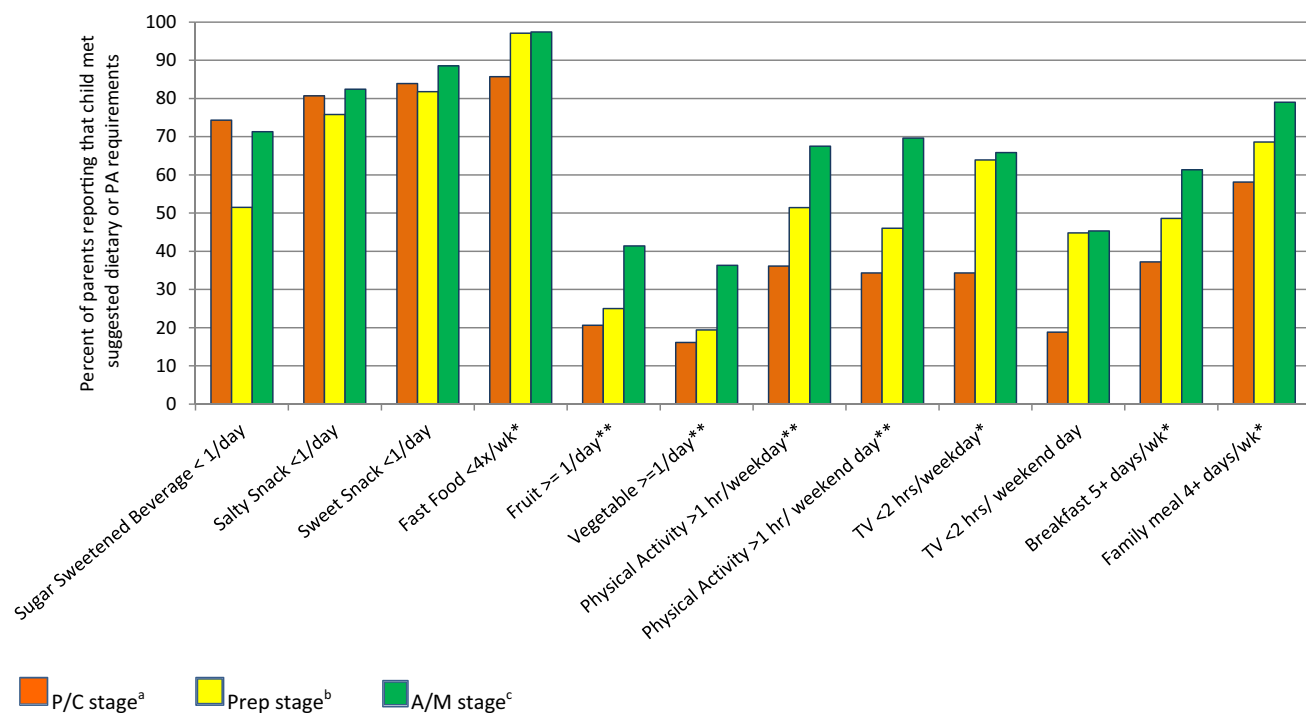


Figure 2. Relationship of parents' stage of change to make dietary and physical activity changes for their child and whether the child met suggested dietary and physical activity requirements. Parents were categorized as being in the Precontemplation/Contemplation, Preparation, or Action/Maintenance stage of change in two different domains: helping children eat a healthy diet and helping children engage in physical activity (PA). Parents also reported on their child's dietary and PA behaviors. Responses for each item were dichotomized into those who were meeting minimal or suggested requirements or not (eg, being physically active more than 1 hour per day or not). Test of trend was used to determine whether the percent of parents who reported that their child was meeting certain dietary or PA behavior requirements varied by the three levels of readiness (Precontemplation/Contemplation, Preparation, and Action/Maintenance). For child dietary behaviors, parents were categorized by their stage of readiness to help children eat a healthy diet. For child PA and sedentary behaviors, parents were categorized by their stage of readiness to help children engage in PA. * $P < 0.05$; ** $P < 0.01$. ^aP/C stage=Precontemplation/Contemplation stage of change. ^bPrep stage=Preparation stage of change; ^cA/M stage=Action/Maintenance stage of change.

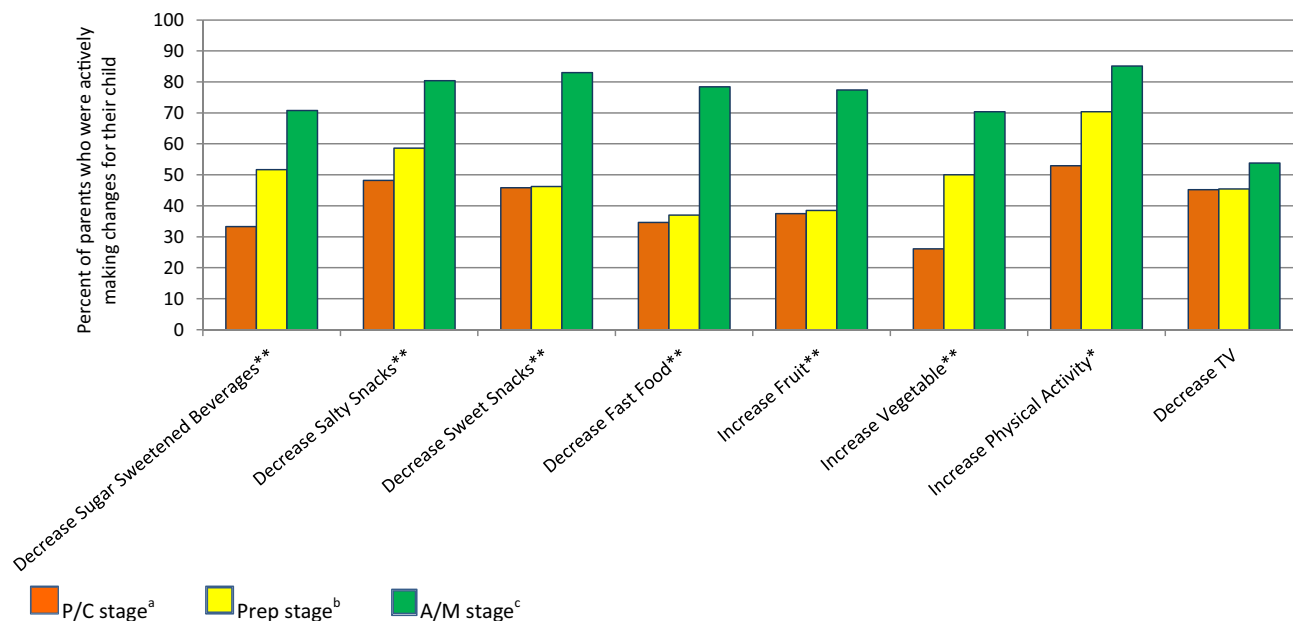


Figure 3. Relationship between parents' stage of change to make dietary and physical activity (PA) changes for their child and whether they were actively making these changes. Parents were categorized as being in the Precontemplation/Contemplation, Preparation, or Action/Maintenance stage of change in two different general domains: helping children eat a healthy diet and helping children engage in PA. Parents were also asked whether they were "actively" making changes around specific behaviors. Parents who responded that they were making changes more than once a week for more than 1 month were categorized as "actively" making changes for their child around that specific behavior. Test of trend was used to determine whether the percent of parents who reported that they were "actively" making changes for their child varied by the three levels of readiness (Precontemplation/Contemplation, Preparation, and Action/Maintenance). For child dietary behaviors, parents were categorized by their stage of readiness to help children eat a healthy diet. For child PA and sedentary behaviors, parents were categorized by their stage of readiness to help children engage in PA. * $P < 0.05$; ** $P < 0.01$. ^aP/C stage=Precontemplation/Contemplation stage of change. ^bPrep stage=Preparation stage of change; ^cA/M stage=Action/Maintenance stage of change.

Precontemplation),¹⁰ we opted to combine Preparation, Contemplation, and Precontemplation to allow us to focus on the factors that were associated with being in the Action/Maintenance stage of change. Independent variables included whether parent viewed child/him- or herself as "overweight/very overweight" or not; parent viewed child's/own health as "excellent/very good" or "poor/fair/good"; parent viewed child's/own weight as a health problem or not; provider expressed concern about the child's weight or not; provider talked about strategies for behavior change "often/very often" or "sometimes/almost never/never"; and parent's thought of him- or herself as "very/somewhat" health conscious or "occasionally/not very/definitely not" health conscious. All variables with a 5-point Likert scale were dichotomized at the median. Other covariates included child age (dichotomized at the median), child sex, income (dichotomized at the median), and parent education (dichotomized as high school degree or less vs some college or more). Odds ratios (OR) and 95% CIs were generated to assess the magnitude and direction of significant associations. ORs < 1.0 indicated that parents were less likely to perform the behavior, and ORs > 1.0 indicated that parents were more likely to perform the activity.

All variables with a P value ≤ 0.10 and standard demographic variables were entered into a multivariate (adjusted) logistic regression model. Backward stepwise regression with maximum-likelihood ratio testing was

performed to determine the most parsimonious model. Variables with a P value ≤ 0.10 were retained in the model. Variables with a P value ≤ 0.05 were considered significant and the Hosmer-Lemeshow goodness-of-fit test was used to examine model fit. A P value < 0.05 indicates a poor fit for the logistic model, and larger P values indicate a better-fitting model. All analyses were performed using Statistical Analysis Software (version 9.2, 2011, SAS Institute Inc).

RESULTS

Children in this sample ($n=202$) had a mean age of 13.8 years and most were female (68.8%) (Table 1). Many also had impaired fasting glucose, dyslipidemia (low high-density lipoprotein and/or high triglycerides), or hyperlipidemia (high low-density lipoprotein). Most children were in the obese category (94.1%) and most parents (93.5%) recognized that their child was overweight or obese. However, 31.4% of parents perceived their child's health as excellent or very good and 28.0% of parents did not perceive their child's weight to be a health problem.

With regard to helping their child eat a healthier diet, 17.3% of parents were in the Precontemplation/Contemplation stage of change, 21.3% in the Preparation stage of change, and 61.4% in the Action/Maintenance stage of change. With regard to helping their child be more physically active, 41.1% of parents were in the Precontemplation/Contemplation stage

Table 1. Characteristics of 202 children and parents attending a tertiary care obesity clinic and participating in a study examining parent’s readiness to make eating and physical activity behavior changes to help their child lose weight and be more healthy

Characteristics	Children	Parents
Age, years, mean (SD) ^a	13.8 (2.7)	41.4 (7.4)
BMI ^b percentile, mean (SD)	98.4 (1.8)	—
≥85th and <95th percentile (%)	5.9	—
≥95th percentile (%)	94.1	—
BMI, mean (SD)	—	32.5 (6.8)
<25 (%)	—	25.7
≥25 and <30 (%)	—	27.7
≥30 (%)	—	46.5
Sex (%)		
Male	31.2	12.6
Female	68.8	87.4
Race/ethnicity (%)		
White, non-Hispanic	26.7	35.1
African American	10.9	8.9
Hispanic	35.6	33.7
Other ^c	26.7	22.3
Income ≥\$40,000 (%)	—	29.2
Education, high school degree or less (%)	—	55.0
Child metabolic panel: (fasting levels) (%)	—	
Glucose ^d		
100 to 125 mg/dL	10.9	—
>125 mg/dL	0	—
Total cholesterol ^e		
≥200 mg/dL	11.4	—
170 to 200 mg/dL	23.3	—
LDL ^f cholesterol ^e		
≥130 mg/dL	11.4	—
110 to 130 mg/dL	18.3	—
Triglycerides ^g		
≥130 mg/dL	30.7	—
90 to 130 mg/dL	22.3	—
HDL ^h cholesterol ^e		
<45 mg/dL	78.1	—
Parent’s stage of change (%)		
Dietary/Eating Behaviors domain:		
Precontemplation/Contemplation stage	—	17.3

(continued)

Table 1. Characteristics of 202 children and parents attending a tertiary care obesity clinic and participating in a study examining parent’s readiness to make eating and physical activity behavior changes to help their child lose weight and be more healthy (continued)

Characteristics	Children	Parents
Preparation stage	—	21.3
Action/Maintenance stage	—	61.4
Physical Activity domain:		
Precontemplation/contemplation stage	—	41.1
Preparation stage	—	18.3
Action/Maintenance stage	—	40.6
Parents’ perceptions (%)		
Accurately assessed child’s weight status	—	93.5
Child’s health is excellent/very good	—	31.4
Did not perceive child’s weight as a health problem	—	28.0

^aSD=standard deviation.

^bBMI=body mass index.

^cOther includes those who identified themselves as being Asian, Pacific Islander, American Indian, or from mixed racial origin.

^dTo convert mg/dL glucose to mmol/L, multiply mg/dL by 0.0555. To convert mmol/L glucose to mg/dL, multiply mmol/L by 18.0. Glucose of 108 mg/dL=6.0 mmol/L.

^eTo convert mg/dL cholesterol to mmol/L, multiply mg/dL by 0.026. To convert mmol/L cholesterol to mg/dL, multiply mmol/L by 38.7. Cholesterol of 193 mg/dL=5.00 mmol/L.

^fLDL=low-density lipoprotein.

^gTo convert mg/dL triglyceride to mmol/L, multiply mg/dL by 0.0113. To convert mmol/L triglyceride to mg/dL, multiply mmol/L by 88.6. Triglyceride of 159 mg/dL=1.80 mmol/L.

^hHDL=high-density lipoproteins.

of change, 18.3% in the Preparation stage of change, and 40.6% in the Action/Maintenance stage of change.

As parents increased their stage of change for dietary behavior (from Precontemplation/Contemplation to Action/Maintenance), there was a significant increase in parent reports that their children were eating fast foods less than four times per week ($P<0.05$) and consuming one or more fruits and vegetables per day ($P<0.01$ for both) (Figure 2). There were no differences in trend for consumption of sugar-sweetened beverage and sweet and salty snack foods among children whose parents were in the different stage of changes. However, parents in the higher stages (ie, Action/Maintenance stage of change) were more likely to report that they were actively making changes to those behaviors (Figure 3). With regard to PA and screen-time behaviors, there was also a significant trend between increasing parent stage of change and parent reports of children meeting PA recommendations for the weekday and weekend days (both $P<0.01$), and screen-time recommendations during the weekday ($P<0.05$) (Figure 2). However, they only reported actively making changes to their child’s PA behaviors ($P<0.05$), not screen-time behaviors (Figure 3). These results

suggest that parents in the Action/Maintenance stage of change were more likely to be making changes to multiple eating and PA behaviors and to have children who were being more physically active and consuming less fast food and more fruits and vegetables than children of parents in the other stages.

Table 2 displays unadjusted associations between parents in the Action/Maintenance stage of change and parent/child characteristics. Several factors were associated with the Action/Maintenance stage of change. With respect to their child's diet, parents were more likely to be in the Action/Maintenance stage of change if their PCP talked to them about strategies they could use ($P \leq 0.05$). If parents viewed themselves as overweight or thought their weight was a health problem, they were less likely to be in the action/maintenance stage of change ($P \leq 0.05$). With respect to their child's physical activity, parents were less likely to be in the

Action/Maintenance stage of change if their child was 14 years or older ($P \leq 0.01$) or if they thought their child's weight was a health problem ($P = 0.09$). Higher income was associated with greater readiness to change.

Table 3 exhibits the adjusted association between parents in the Action/Maintenance stage of change and parent/child characteristics. Only two factors were associated with parents being in the Action/Maintenance stage of change with respect to their child's diet: whether the provider talked to them about strategies that they could use (OR=2.1; 95% CI 1.0 to 4.0), and whether parents thought their own weight was a health problem (OR=0.4; 95% CI 0.2 to 0.9). With respect to their child's physical activity, parents were less likely to be in the Action/Maintenance stage of change if their child was 14 years or older (OR=0.5; 95% CI 0.3 to 0.9); if their income was $\geq \$40,000$, they were also more likely to be in the Action/Maintenance stage of change (OR=3.8; 95% CI 1.6 to 8.7).

Table 2. Association between parents in the Action/Maintenance stage for child dietary and physical activity with 14 parent and child characteristics

Characteristics ^b	Action/Maintenance Stage of Change ^a	
	Dietary behaviors, unadjusted OR ^c (95% CI)	Physical activity behaviors, unadjusted OR (95% CI)
View child as overweight	2.6 (0.8-8.6)	1.4 (0.4-4.8)
View self (parent) as overweight	0.5 (0.2-0.9)*	0.8 (0.4-1.5)
Child's health status	1.1 (0.6-2.0)	0.9 (0.5-1.5)
Parent's health status	1.2 (0.7-2.2)	1.2 (0.7-2.1)
Child's weight is a health problem	0.9 (0.5-1.8)	0.6 (0.3-1.1) [†]
Parent's weight is a health problem	0.5 (0.3-0.9)*	0.9 (0.5-1.6)
Provider expressed concern regarding child's weight	1.1 (0.4-2.9)	0.8 (0.3-1.9)
Provider talked about strategies	1.8 (1.0-3.4)*	1.3 (0.7-2.5)
Parent health consciousness	0.9 (0.4-1.6)	1.5 (0.8-2.8)
Child age (≥ 14 y)	1.3 (0.7-2.3)	0.5 (0.3-0.8)**
Child sex (female)	1.3 (0.7-2.4)	1.6 (0.8-2.9)
Income ($\geq \$40,000$)	1.6 (0.9-3.1)	1.8 (1.0-3.3)*
Parent education (some college or more)	1.3 (0.7-2.3)	0.9 (0.5-1.5)
Parent race/ethnicity		
White, non-Hispanic	1.0	1.0
African American	1.3 (0.4-4.2)	1.7 (0.6-4.8)
Hispanic	0.8 (0.4-1.7)	2.2 (1.1-4.4)*
Other ^d	0.5 (0.2-1.1) [†]	1.2 (0.5-2.5)

^aOdds ratio for parents in the Action/Maintenance stage of change compared with parents the Precontemplation/Contemplation/Preparation stage of change.

^bVariable definitions: view child/parent as overweight is coded as 1=overweight/very overweight, 0=very underweight/underweight/normal; child's/parent's health status is coded as 1=excellent/very good, 0=poor/fair/good; child's/parent's weight is a health problem is coded as 1=yes, 0=no/don't know; provider expressed concern about child's weight is coded as 1=yes, 0=no/don't know; provider talked about strategies is coded as 1=very often/often, 0=never/almost never/sometimes; parent health consciousness is coded as 1=very/somewhat, 0=definitely not/not very/occasionally; child age is coded as 1= ≥ 14 years, 0= < 14 years; child sex is coded as 1=female, 0=male; income is coded as 1= $\geq \$40,000$, 0= $< \$40,000$; parent education is coded as 1=some college or more, 0=high school degree or less.

^cOR=odds ratio.

^dOther included those who identified themselves as Asian, Pacific Islander, American Indian, or from mixed racial origin.

* $P \leq 0.05$.

** $P \leq 0.01$.

[†] $P \leq 0.10$.

Table 3. Association between parents in the Action/Maintenance stage for child dietary and physical activity with six parent and child characteristics

Characteristics ^a	Action/Maintenance Stage of Change ^b	
	Dietary changes ^c	Physical activity changes ^d
	←————— adjusted odds ratio (95% CI) ^e —————→	
Parent's weight is a health problem	0.4 (0.2-0.9)*	—
Provider talked about strategies	2.1 (1.0-4.0)*	—
Child's weight is a health problem	—	0.6 (0.3-1.1) [†]
Child age (≥14 y)	—	0.5 (0.3-0.9)*
Income (≥\$40,000)	—	3.8 (1.6-8.7)**
Parent race/ethnicity		
White, non-Hispanic	—	1.0
African American	—	2.4 (0.7-7.9)
Hispanic	—	4.0 (1.6-9.7)**
Other ^f	—	1.8 (0.6-5.5)

^aDefinition of the independent variables are: child's/parent's weight is a health problem is coded as 1=yes, 0=no/don't know; provider talked about strategies is coded as 1=very often/often, 0=never/almost never/sometimes; child age is coded as 1=≥14 years, 0=<14 years; income is coded as 1=≥\$40,000, 0=<\$40,000.

^bParents in the Action/Maintenance stage of change were compared with parents in the Precontemplation/Contemplation/Preparation change of stage.

^cHosmer-Lemeshow goodness of fit *P* value=0.23.

^dHosmer-Lemeshow goodness of fit *P* value=0.33.

^eOdds ratios (95% CI) were generated from a model adjusting for child age, child sex, family income, and parent education.

^fOther included those who identified themselves as Asian, Pacific Islander, American Indian, or from mixed racial origin.

**P*<0.05.

***P*<0.01.

[†]*P*≤0.10.

DISCUSSION

In this sample of families attending a tertiary care clinic, >60% of the parents were in the Action/Maintenance stage of change for dietary behaviors, and only 40% were in the Action/Maintenance stage of change for PA behaviors. Different factors were related to parent readiness within each of these domains. First, provider discussion of behavioral strategies was associated with significantly increased readiness to make dietary changes, but not PA changes. Changing dietary patterns can be difficult to initiate and maintain,²⁶ given that people eat multiple times a day and have many opportunities to falter when making healthy nutritional choices. Therefore, multiple methods might be needed to increase and maintain patient dietary motivation; for example, utilizing a multidisciplinary team approach to treatment,¹⁶ home-based interventions that target stage of change,¹⁷ and decision support via texting or other electronic devices.²⁷ However, providers are also an important source of information and support for behavior change.²⁸ As a result, it is important for physicians to engage in these discussions with parents and help them reach the action stage of change. However, it is unclear why provider discussions were not associated with increased readiness to make PA changes. It may be that pediatric providers were not addressing PA behaviors or spending less time discussing this issue. They may have also been more comfortable discussing nutritional issues. Closer analysis of provider behaviors may be able to reveal biases toward nutritional counseling and would suggest a need to increase efforts to discuss PA behaviors in the primary care setting.

We also found that parents who believed their own weight was a health problem were less ready to make changes to their child's diet. These parents may have tried making dietary changes in the past and were not effective, or felt overwhelmed by the situation and no longer felt capable of making changes. Previous studies have shown that a parent's ability to lose weight⁴ and make nutritional changes²⁹ is highly correlated with the child's ability to make similar changes. In addition, parent readiness to change level has been associated with successful BMI changes in teens.³⁰ Therefore, addressing these issues may be necessary before parents feel competent and confident to make dietary changes for their children. Use of brief motivational interviewing may enable health care providers to effectively engage in these conversations and increase their likelihood of moving parents along the readiness to change continuum.¹² Tools to help providers start these discussions and initiate obesity management in the primary care setting are being developed³¹⁻³³ and will hopefully increase provider behaviors in this area.

With regard to PA behaviors, parents with older children were less likely to be in the Action/Maintenance stage of change. This finding is in direct contrast to previous work that demonstrated parents of older children were more likely to be ready to make changes for weight loss.¹⁰ However, this work did not evaluate parent readiness to make changes in the dietary and PA domain separately, which may explain the discrepancy. In addition, the nature of parent-child relationships, particularly around PA, may be changing as children

become older and more independent. In post hoc analysis stratifying the sample by age, parents of teenagers had no significant factors related to being in the Action/Maintenance stage of change. Parents of older children may have particular difficulty promoting PA if the teenager had little or no history of being active when younger. Parents may also have difficulty if they are not physically active themselves and not modeling the appropriate behaviors. Although shaping PA behaviors may be easier when children are young, the benefits of being active apply at any age. Therefore, providers should work on motivating parents and children of all ages to be more physically active and brainstorm, in particular with parents of older children and the child, on how to initiate these behaviors.

Interestingly, parents who viewed their child's weight as a health problem were less likely to make PA changes. This is contrary to previous findings where belief that "weight is a health problem" was associated with greater readiness to help children lose weight.¹⁰ Specifying readiness to make PA changes, however, may somehow be different than helping a child lose weight. This finding may reflect parental perceptions that PA in particular is more difficult for their overweight child or that their child is not healthy enough to engage in these activities. This possibility raises the concern that as physicians try to emphasize the connection between obesity and poor health, they may have unforeseen effects of deterring parent support of PA in children. In additional post hoc analyses, parents of children with metabolic complications were less likely to be in the Action/Maintenance stage of change for PA behaviors (OR=0.50; $P=0.05$). As a result, health care providers may need to address this concern, reassure them of the benefits of PA, and recommend PA options that are perceived to be safe and achievable for their overweight patients. They should also be aware that families with higher incomes may be more ready and able to engage in PA behaviors than families with lower incomes. Therefore, they may need to identify PA options that are not costly and easily accessible for all. Although studies often cite decreases in energy consumption as key to achieving weight loss,³⁴⁻³⁶ PA is important in maintaining this weight loss^{37,38} and providing motivation for continued dietary changes.³⁹ Therefore, messages that overcome parent fears and address logistic or financial barrier to engaging children in PA should not be ignored.

There were several strengths to this study, including the separation of motivational factors for eating and PA behaviors and a clearer understanding of the factors associated with readiness in each domain. The results demonstrated that parents in the Action/Maintenance stage of change were trying to make changes to their child's dietary and PA behaviors. However, the cross-sectional nature of the study was a limitation, and fluctuations that may be occurring to parent readiness to change were not captured. The data were also obtained from a convenience sample in this practice setting, limiting the ability to apply these results to overweight children without metabolic complications. These children are typically not referred to tertiary care clinics and parents are less likely to have discussions about weight with their PCP, recognize their child's weight status, and be in the Action stage of change. Therefore, additional factors may be found to influence stage of change that were not captured in this population. Finally, a limited number of questions were asked

in the survey and it is unclear whether other factors related to parent confidence to make changes and feelings of autonomy or volition could have influenced behavior change.⁴⁰

CONCLUSIONS

The results of this study demonstrate that parents can be in different stage of changes for assisting their child to modify dietary and PA behaviors. Specifically, more parents appear to be in the Action/Maintenance stage of change for dietary behaviors than PA behaviors. In addition, different factors seem to affect parent motivation in each of these domains. In the area of dietary changes, provider discussions were associated with parent readiness to make changes for their child. However, greater training around useful behavioral strategies and motivational interviewing skills are likely needed before providers are comfortable engaging in these discussions. Systems changes, including the addition of registered dietitian nutritionists or health educators into the primary care setting, may also be needed to successfully engage families in these conversations. Additional attention should be paid to whether parents view their own weight or their child's weight as a health problem, because these factors can detract from a parent's readiness to make behavior changes in either domain. Including these assessments in future studies may help to elucidate factors that need to be addressed as we support parents to make changes for their overweight children. Ultimately, increasing parent readiness to make changes in both dietary and PA domains is important if we are to successfully improve the health of overweight children.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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