Research Article

Validation of 5 Stage-of-Change Measures for Parental Support of Healthy Eating and Activity

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ABSTRACT

Objective: To assess the validity of 5 parental stage-of-change (SOC) measures: (1) providing 5 servings/d of fruits and vegetables (FV), (2) limiting television (TV) to 2 h/d, (3) helping children achieve 1 h/d physical activity (PA), (4) limiting sugary drinks (SD) to 1 serving/wk, and (5) limiting fruit juice (FJ) to 4–6 oz/d.

Design: Cross-sectional instrument development study. Construct validity was evaluated by examining whether parental self-efficacy, parental readiness ladder (ladder), and child's behavioral levels (eg, FV consumption) exhibited a theoretically consistent pattern across the SOC.

Setting/Participants: Convenience sample (n = 283) of parents of children aged 4–10 years.

Measures: Survey assessed SOC, ladder, and child's behavioral level score for each topic (FV, TV, PA, SD, and FJ), and parental self-efficacy for measure except TV.

Analysis: Analysis of variance with Tukey–Kramer *post hoc* tests examined whether variables differed by SOC.

Results: Percentages of parents in the pre-action SOC were 34% (PA), 39% (FV), 42% (SD), 45% (TV), and 63% (FJ). Parental self-efficacy, ladder, and child's behavioral level differed significantly by SOC for each topic area ($P < .001$). Maintenance SOC was significantly higher than pre-action SOC.

Conclusions and Implications: Measured variables exhibited a theoretically consistent pattern across SOC, suggesting construct validity and potential usefulness for obesity prevention efforts.

Key Words: readiness, measures, parents, nutrition, television, stages of change, sugar-sweetened beverage, obesity (*J Nutr Educ Behav*. 2015;47:134-142.)

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INTRODUCTION

A third of all children are either overweight or obese,[1] which puts them at risk for a range of adverse outcomes including diabetes and cardiovascular disease.[2,3] Interventions for children are needed to prevent immediate consequences of obesity (eg, type 2 diabetes) as well as its related risks in adulthood.[4] Health care providers including pediatricians, dietitians, nutrition educators, and other allied health care professionals (*providers*) have an important role in addressing this problem.[5,6] Practice recommendations put forth by the Expert Committee,[7] a panel representing major professional health organizations (eg, American Academy of Pediatrics, Academy of Nutrition and Dietetics, American College of Sports Medicine) urged providers to assess self-efficacy and readiness to change for specific dietary practices and levels of physical and sedentary activity at each well-child visit.[7] However, a lack of validated measures has been available to assess parents' readiness to support their child's healthful eating and activity behaviors.

Readiness to change a behavior, also known as stage of change (SOC), is the central organizing construct of the transtheoretical model (TTM), a behavior change framework that explains the processes and principles of health behavior change.[8,9] The TTM categorizes readiness into 5 stages: (1) precontemplation (PC), when the person is not intending to change behavior to meet a specified behavioral criterion such as consuming 5 servings of fruit and vegetables (FV) a day; (2) contemplation (C), or thinking about making a change to meet the criterion in the next 6 months; (3) preparation (PR), or intending to change and meet the criterion in the next month; (4) action (A), or meeting the health criterion but for < 6 months; and (5)

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maintenance (M), when the person meets the health criterion for > 6 months. The TTM posits that individuals progress through the stages on their way to making a long-term behavior change, and this movement is produced to a greater or lesser extent by the model's independent variables: decisional balance, self-efficacy (SE), and the processes of change.[8,9] Stage of change is often assessed repeatedly so that the intervention for a particular person is adjusted (ie, stage-based) to promote movement from the person's current stage to the next higher stage and to prevent the person from moving backward to an earlier SOC.[10,11]

The current study evaluated the validity of 5 separate SOC measures for parental readiness to help their children meet the following health recommendations[6,7]: (1) provide the child with 5 servings of FV daily; (2) limit television time (TV) to ≤ 2 h/d; (3) promote 1 hour of moderate intensity physical activity (PA) every day; (4) avoid sugary drinks (SD); and (5) limit fruit juice (FJ) to 4–6 oz/d. Four studies examined parental readiness to help children with healthful behavior changes,[12-15] none of which used validated behavioral measures to assess parent helping behaviors. This study addressed this gap.

There were 3 hypotheses for the current study based on the extant literature[8,16-22] and the theoretical framework of the TTM. The first was that parents in stages A and M report that their children engaged in healthier levels of the behavior than those in pre-action stages (PC, C, and PR). More specifically, FV and PA behaviors were hypothesized to increase across the stages whereas TV, SD, and FJ were hypothesized to decrease. The second hypothesis was that SE for meeting the criterion increases across the SOC.[8,9,18,22] The third hypothesis was that the 2 measures of parental readiness, ie, SOC and the readiness ladder, correspond to each other such that ladder scores increase across the SOC.

METHODS

Sample

The researchers used passive methods to recruit this convenience sample. Flyers were posted in health and community centers in the city of Boston and advertisements were posted in local newspapers and online on Craig's List. Parents or legal guardians (*parents*) were eligible for the study if they: (1) self-identified as the principal caregiver of a child aged 4–10 years, (2) attended the child's last 2 well-child annual exams, (3) spoke and read English, and (4) were willing to bring their child into the study office for assessments.

Overview of Procedures

The institutional review boards at the University of Massachusetts–Boston and Boston University Medical Campus approved this study. The first study procedure was to review the literature for existing SOC measures and for the researchers to develop a draft of the parental SOC measures using guidelines outlined by Reed and colleagues.[17] Six content experts were mailed the survey draft and a follow-up phone call was performed to discuss feedback. The expert feedback, including input on wording, was incorporated into the revised SOC measures and the resulting measures were pilot-tested with 6 parents of children aged 4–10 years. The parents were interviewed about their understanding of the meaning of the SOC measures. These cognitive testing results were used to maximize comprehension, through edits to the wording. The next step was a cross-sectional survey study using a convenience sample of parents with children aged 4–10 years. The authors obtained written informed consent from the parents and verbal assent from the children. Parents completed a paper-and-pencil survey that included demographics, psychosocial, PA, TV, and dietary questionnaires. Parent and child height and weight were measured. Parents received a $20 gift card incentive. Survey data were collected at research offices from August, 2009 to August, 2011.

Measures

Stage of change. The 5 SOC measures created for the study can be found in Supplemental Materials. The structure of the measure included a specific behavioral criterion based on public health guidelines.[17] A 5-item response format was used for each behavior except for SD and FJ, because content experts proposed that the survey distinguish between parents in M whose child used to consume these unhealthy beverages but stopped doing so and parents in M whose child never consumed these beverages. Each response option corresponded to a single stage: 1 = PC; 2 = C; 3 = PR; 4 = A; and 5 = M.[8]

Readiness ladder. A readiness ladder was created for each target behavior (Supplemental Materials). Readiness ladders have been used as an alternate method of assessing readiness to change.[17] These measures used the same behavioral criterion as the corresponding stage measure combined with the stem *How ready are you to …* and the response options to *on a scale from 0 to 10?* Participants were asked to circle a number from 0 (not ready) to 10 (very ready) or the option *already do [criterion behavior].* Each number was equally spaced across the page. The response *already do it* was coded as 11. The scale was divided into categories of 0–2, 3–4, 5–6, 7–8, 9–10, and 11 *(already do it)* for ease of interpretation.

Self-efficacy. Self-efficacy was defined as parents' confidence in their ability to help their child engage in the healthful behavior under a variety of difficult situations.[23] The current authors developed SE scales for FV, PA, SD, and FJ (inadvertently, a scale for TV was not developed for this study).[24] Each scale included 4 items that reflected a range of difficult situations. All scales used the same stem, *How sure are you that you could …*, followed by the criteria for the target behavior. For example, *How sure you are that you could help your child get 1 hour of moderate-intensity PA every day when there are too many other things to worry about?* Items were rated 1 = *not sure* to 5 = *extremely sure.* A sum score for each of the 4 scales was calculated. Cronbach alphas for these SE scales[24] was .80 (PA), .84 (FV), .86 (FJ), and .87 (SD), which are comparable to alphas for adolescent and adult SE scales for FV (.86)[20,21] and PA (.82)[22]

and a similar parental SE scale developed for FV consumption (.70).[25]

Physical activity. Parents were asked to report whether their child had participated in a list of 20 different physical activities in the past 7 days, the number of days each activity was done, and the minutes each time.[26] Parents were given the option to report other physical activities not on the list. Metabolic equivalents were assigned to each of the 20 PAs and any other activities reported using the youth compendium.[27] Metabolic equivalent hours (metabolic equivalent hours per day) were then calculated to estimate the child's level of PA.

Television time. The researchers used a reliable 12-item proxy measure of recreational time to assess TV time.[28,29] Parents reported the time their child had spent in leisure activities during the previous day (eg, TV, computer, reading).

Dietary intake. The authors assessed FV and average daily calories from SD with the Block Dietary Data Systems Kids Food Screener, version 2 (NutritionQuest, Berkeley, CA), which asked about the number of days in the past week 39 items were consumed and the portion size eaten for each item.[30] Parents completed the screener for their child. Because the Block combines FJ in the fruit CE, a separate question was used to assess FJ consumption. The question asked, *How much 100% pure FJ with no added sugar does your child drink on a typical day?* and provided examples such as *100% orange, apple, grape, or Juicy Juice.* Response options were 0 = *none*, 1 = < *6 oz (< 1 juice box)*, 2 = *about 6 oz (1 juice box)*, 3 = *about 12 oz (2 juice boxes)*, 4 = *about 24 oz (3 juice boxes)*, and 5 = > *24 oz (4 juice boxes).*

Anthropometrics. A trained research assistant measured child's and parents' height and weight using a portable stadiometer (Model 214; Seca Corporation, Hamburg, Germany, 2006) and scale (Model 882; Seca Corporation, 2008). Participants were asked to remove shoes and heavy garments (coats, sweaters, and belts) before the measurement. Body mass index (BMI) was calculated (kilograms per square meter) and compared against adult standards[31] for parents and norms for BMI percentile for age and gender for children.[32]

Data Analysis

There are a number of ways to define validity and approach validation.[33] The current study used a construct-validation approach that assumed that observed variables (eg, dietary intake) are indicators of the construct (ie, SOC). Construct validation also depends on the relationship with other constructs in a theoretical context (ie, TTM). Convergent validity, a form of construct validity, is the convergence of different methods designed to measure the same construct.[33] This convergence provides some confirmation that the construct measures what it purports to measure. The readiness ladder was defined as an alternate form of SOC.[17] Both measures ask respondents how ready they are to meet a healthful criterion, but the readiness ladder used a visual analog scale from 0 to 10 whereas the SOC used a 5-item response format that includes a time frame (Supplemental Materials).

Means, SDs, and frequencies were used to describe the sample. The authors tested the study hypotheses using ANOVA with Tukey–Kramer *post hoc* analyses to examine pairwise stage comparisons for all analyses. The Tukey–Kramer tests used adjusted robust SEs that correct for non-normal or heteroscedastic data.[34] Stage of change for FV and PA had a small number of participants in PC and C (n = 3 and n = 12 participants, respectively); thus, PC and C were collapsed for these analyses. For the SD and FJ analyses, the sixth category of *My child does not drink [SD/FJ]* was collapsed with the M stage. Effect size estimates were calculated as eta-square. A variance of 1%, 6%, or 14% indicated a small, medium, or large effect, respectively.[35] For all analyses, alpha was set at $P < .05$. The researchers used IBM SPSS Statistics for Windows (version 20.0; Armonk, NY, 2011) for all analyses except the Tukey–Kramer *post hoc* tests, which is not available in SPSS. R open source software (R Foundation for Statistical Computing, Vienna, Austria) was used for the *post hoc* tests.

RESULTS

Of the 319 parents who indicated interest in participating, 304 (95%) completed the survey. Six percent (n = 21) of the 304 were not included because of missing data or language or comprehension issues, for a final sample of n = 283. Table 1 displays demographic characteristics of the parents. No racial group was in the majority, and the distribution of black/African American was higher than the Boston urban population. The majority of parents were single (56.9%) and reported an income < $40,000 (57.8%), which is less than Boston's median household income of $51,739. About 72% of parents and 44% of children were overweight or obese (adults, BMI ≥ 25; children, BMI ≥ 85th percentile for age and gender).

Table 2 displays the distribution of participants' responses to the SOC and readiness measures. The percentages of the sample in pre-action stages were 34% (PA), 39% (FV), 42% (SD), 45% (TV), and 63% (FJ). For the readiness ladder, the highest proportion of responses fell in the 8–10 category for most behaviors. Less than 8% of the sample used the lower end of the ladder for FV, PA, TV, and SD. Table 2 also provides a mean for the ladder, which was calculated by removing those who responded *already do it* to display a mean that was more representative of how the question is typically asked (on a scale of 1–10 or 0–10).[17]

Table 3 displays the means and SDs of the variables used to assess construct validity for each SOC measure and the results of the ANOVAs and Tukey–Kramer *post hoc* analyses and effect size estimates (eta-square). All omnibus ANOVAs were significant at $P < .001$. Maintenance was significantly different from the pre-action stages for all *post hoc* comparisons. There were medium to large effect sizes for all behavioral comparisons by SOC (η^2 range, .08 to .16), large effect sizes for all readiness ladder comparisons by SOC (η^2 range, .28 to .62),

Table 1. Anthropometric and Socioeconomic Data for Parents and Their Children Aged 4–10 Years

Variable	%	Mean	SD	Sample Reporting, n
Parent				
Age		37.5	8.3	239
Gender (female) (%)	88.3			265
Married	43.1			276
Income level (< $40,000)	57.8			277
Employment (full-time)	39.7			277
Education level				277
High school or less	20.2			
Some college or trade school	38.6			
College degree or more	41.1			
Hispanic/Latino origin	18.7			278
Race				269
Black/African American	42.8			
White	39.8			
Mixed	7.1			
BMI		30.4	7.7	252
Overweight but not obese (%)	26.6			
Obese (%)	45.6			
Number of children at home, n		2.1	1.1	279
Child				
Age		6.6	2.1	251
Gender (female) (%)	53.6			252
BMI 85th to 94th percentile	22.0			
BMI 95th percentile and above	21.6			250

BMI indicates body mass index; BMI overweight but not obese, adults with a BMI between 25 and 29.9; BMI obese, adults with a BMI > 30.
Note: Children's BMI of 85th through 94th percentile for age and gender is considered overweight; children's BMI of 95th percentile and above for age and gender is considered obese.

and medium to large effect sizes for SE comparisons by SOC (η^2 range, .10 to .23). Figures 1 and 2 display the readiness ladder and SE scores and SEM across the respective stage measures.

> Assessing readiness to change can be done using these brief validated measures.

DISCUSSION

This study assessed the construct validity of 5 SOC measures on parental readiness to help children engage in healthful behaviors associated with preventing childhood obesity. The findings from this study provided evidence for the validity of SOC measures that were congruent with the behavioral criteria. Overall, levels of behavior and theoretical constructs examined across their respective SOC measure produced the expected patterns based on theory.[8,9]

Few studies have reported on parental SOC and even fewer have been validation studies. Hildebrand and Betts[12] developed a parental SOC for serving more FV and asked experts to assess its face validity. They reported that 43% of low-income mothers with children aged 1–5 years were in the PC/C stages for serving more FV, 29% in PR, and 28% in A/M. In comparison, fewer parents in the current study reported being in the pre-action stages of PC/C (11% vs 43%) and many more reported A/M (61% vs 28%), although PR was similar (28% vs 29%). These differences may be the result of the criterion used to assess SOC (serving more FV [no amount specified] vs providing 5 servings of FV/d), the different target populations (parents with children aged 1-5 years vs 4–10 years), and demographic characteristics (eg, 50% vs 20% who reported high school education, respectively). Although awareness was not measured, it also is possible that the awareness of FV recommendations has increased over time, which could have affected the degree of socially desirable responding in the current study. Three other studies developed either a readiness ladder or SOC algorithm to assess parental readiness; however, those measures were designed for weight management behaviors in general (eg, readiness to make lifestyle changes to help your child lose weight[14]) and were administered to parents whose children attended a weight management clinic.[13-15]

The TTM posits that levels of the healthful behavior improve across the stages.[8,9] Although generally behaviors trended in this direction, the hypothesis that parents in the action stages (A and M) report behavioral levels that are healthier (ie, closer to the recommended level) than those in the pre-action stages was not supported. Only parents in M reported significantly healthier levels of the target behavior than the pre-action stages. Often SOC studies collapse stages,[12,13,18,20,21] which makes direct comparisons across studies impossible. For example, Hildebrand and Betts[12] reported that higher stages (A/M) were different from lower stages (PC/C) for parents providing FV. The current findings are similar to a study that examined the behavioral validation evidence of PA SOC in 9 adult studies.[19] Only 3 of 9 studies found that both A and M had significantly higher PA levels than PC, C, and PR, and 2 other studies found only M was higher than the earlier stages. Although more research is needed, A and M could have distinct behavioral profiles.

In the current study, behavioral profiles did not seem to be as strong in A as in M. Generally, the behavioral

Table 2. Distribution of Parents' Responses to Stage-of-Change and Readiness Questions

	Stage of Change, %							Readiness, %							
Behavioral Criterion	**n**	**PC**	**C**	**PR**	**A**	**M**	***Already Do It***	**n**	**0–2**	**3–4**	**5–6**	**7-8**	**9-10**	***Already Do It***	**Mean (SD)**
Fruits and vegetables	282	1.1	10.3	27.7	12.1	48.9	NA	285	0.4	1.1	4.9	22.8	47.0	23.9	8.8 (1.5)
TV	278	10.4	16.9	17.3	12.9	42.4	NA	282	5.7	7.1	12.8	14.5	34.5	25.5	7.3 (2.9)
TV^{Bed}	NA							279	25.1	5.7	13.3	5.4	14.7	35.8	4.4 (3.9)
Physical activity	281	3.6	9.6	21.0	20.6	45.2	NA	283	0.7	2.1	8.5	13.8	53.7	21.2	8.7 (1.9)
Sugary drinks	280	8.2	20.4	13.2	18.6	21.4	18.2	283	4.2	7.4	14.1	13.4	36.4	24.4	7.5 (2.8)
Fruit juice	283	23.0	21.9	17.7	14.1	18.7	4.6	284	7.7	10.6	23.6	20.8	28.5	8.8	6.7 (2.8)

NA indicates that it was not asked; PC, precontemplation stage; C, contemplation stage; PR, preparation stage; A, action stage; M, maintenance stage; TV, television.
Note: Mean (SD) excludes the *already do it* response option. Behavioral criteria for fruit and vegetables were: provide child with 5 servings of fruit and vegetables every day; limit child to ≤ 2 h of TV every day; readiness to remove television from the bedroom (TV^{Bed}); help child get 1 h of moderate intensity physical activity; limit child to 1 serving/wk of sugary drinks; and limit child's juice intake to no more than 6 oz of 100% fruit pure juice each day.

levels in the A stage were not different from the earlier stages except for the behaviors of FV and PA. Although A and M were generally not significantly different from each other, there was a clear distinction between M and the other stages. Possibly parents with intentions to achieve the health criterion may provide more socially desirable responses, resulting in no difference between PR and A for the behavioral levels except for FV and PA. Similarly, underreporting of behavioral levels of TV, SD, and FJ may explain the lack of differentiation between A and the earlier stages. Although the authors have no data to support this possible explanation, it is possible that parents who are in maintenance have different characteristics than those in the earlier stages, which suggests that A and M should not be combined. Studies by Rhee et al[14,15] regarding parents of overweight children found that parental factors were related to stage classification. More recently, they found that parents with a higher income were more likely to be in the A/M stage for improving their child's physical activity, and parents who viewed their own weight as a health problem were less likely to be in A/M for helping their child eat healthier foods.[15] Demographic factors such as income, education, and weight status have been associated with misreporting of dietary intake,[36] which suggests that if parents in M are different, those characteristics also could influence the accuracy of their reporting.

Examining the construct of SE across the SOC is consistent with the expected pattern (Figure 2) of an increase in SE across the stages[8,9]; however, only M stage had significantly higher confidence scores. Other studies have found that SE increases across SOC with significant differences between most stages,[18,21,22] although as mentioned previously, most studies compare collapsed stages and find action stages higher than pre-action stages.[12,20,21] The current study was cross-sectional, but there was some indication that those who are in M have a strong profile (higher SE, higher readiness, and better behavioral levels) that may have implications for focusing intervention or counseling efforts on early stages including A.

A strength of this study was the assessment of convergent validity, a subcategory of construct validity. Figure 1 depicts the linear correspondence between the readiness ladder and SOC measures. The data suggested that responses ranging from 3 to 5 corresponded with PC, whereas responses of 6 to 7 corresponded to C, and 7 to 8 to PR.

Limitations of the study included its cross-sectional design, use of a convenience sample, and the self-report format. Because parents reported on their child's behavioral levels, the reports were likely overestimates of PA and FV and underestimates of TV and SD. The accuracy of parent-reported FJ was more difficult to ascertain. Although the measure's stem provided a definition of 100% FJ, parents may not be able to distinguish fruit-flavored beverages (fruit drink) resembling 100% FJ from 100% FJ.

As suggested previously, parents may have given socially desirable responses to the measures, which may be a reason for the lack of distinction between the pre-action stages. The measures were phrased to understand how ready a parent was to help a child engage in healthful behaviors. Parents may be reluctant to report that they are not ready to help a child with a healthful habit. Obesity prevention efforts such as the 5–2–1–0 campaign[37] are becoming increasingly more common in clinical practice; therefore, it is possible that parents are more aware of what is recommended. Although this study did not evaluate this area, this response bias could intensify if parents are asked face-to-face by a provider, rather than on paper or a Web site. These limitations emphasize the need for objective measures of behavior to provide better estimates of the validity of the SOC measures.

Other limitations may have influenced the findings. One caveat is that the behavioral measures used in this study have not been validated with parents of 4- to 5-year-olds.

Table 3. Means and SD for Behavior, Readiness Ladder, and Self-Efficacy Scores Across Corresponding Stage-of-Change Measures

		Stage of Change													
		PC		C		PR		A		M					
Variable	**n**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	***F****	**DF**	**Tukey–Kramer[a]**	**η^2**
Behavior															
FV consumed, cup equivalent	254	*	*	1.85	0.89	2.15	1.11	2.82	1.48	2.83	1.48	6.97	3,250	PC/C, PR < M; PC/C < A	.08
TV watched, min/d	274	188.13	80.15	207.81	104.04	203.78	145.09	165.07	109.69	106.74	85.95	11.27	4,269	PC, C, PR, A > M	.14
PA, metabolic equivalent h/d	243	[b]	[b]	47.19	51.36	57.38	54.89	113.39	83.09	136.54	147.77	9.16	3,239	PC/C, PR < A, M	.10
SD sugary beverage, total kcal/d	252	44.24	57.19	40.32	54.12	30.05	34.38	26.36	68.63	7.12	22.35	6.15	4,247	PC, C, PR > M	.09
100% FJ, servings/d	282	1.95	.98	1.89	.91	1.88	.98	1.74	.88	.97	.76	13.17	4,277	PC, C, PR, A > M	.16
Readiness ladder															
FV to provide 5 servings/d	282	[b]	[b]	7.59	1.98	8.65	1.59	9.06	0.98	10.17	1.08	42.14	3,278	PC/C < PR, A < M	.31
TV to limit to 2 h/d	275	3.21	2.68	6.24	2.17	8.07	2.32	8.92	1.79	10.34	1.06	108.61	4,270	PC < C < PR, A < M	.62
PA to help get 1 h/d	279	[b]	[b]	6.81	2.50	8.63	1.81	9.32	1.43	10.06	1.16	42.62	3,275	PC/C < PR, A < M	.32
SD to limit to 1 servings/wk	278	4.48	3.20	6.28	2.55	7.68	2.35	9.03	1.86	10.18	1.53	56.03	4,273	PC, C, PR < A < M; PC < PR	.45
FJ to limit to 4–6 oz/d	283	4.92	3.21	6.45	1.96	6.90	2.50	7.94	2.48	9.30	2.19	27.17	4,278	PC < C, PR, A < M; C < A	.28
Self-efficacy score															
FV providing 5 servings/d	281	[b]	[b]	10.81	3.19	11.71	3.99	12.47	4.29	14.17	3.96	10.32	3,277	C, PR < M	.10
PA helping child get 1 h/d	278	[b]	[b]	8.65	2.89	9.88	3.16	11.89	4.07	13.81	3.95	26.57	3,274	C, PR, A < M; C, PR < A	.23
SD limit 1 serving/wk	278	11.65	4.71	12.94	4.41	13.51	4.34	13.62	4.39	16.61	4.62	11.29	4,273	PC, C, PR, A < M	.14
FJ to limit to 4–6 oz/d	275	11.78	4.83	12.39	3.94	13.04	4.49	12.85	4.10	15.73	4.66	7.30	4,270	PC, C, PR, A < M	.10

FV indicates fruits and vegetables; TV, television; PA, physical activity; SD, sugary drinks, FJ, 100% fruit juice servings with 1 serving equivalent to 4–6 oz/d; PC, precontemplation stage; C, contemplation stage; PR, preparation stage; A, action stage; M, maintenance stage.

[a]Tukey–Kramer *post hoc* comparisons are presented only for significant differences at $P < .05$; [b]PC/C is combined because there were so few participants in PC (3 for FV and 12 for PA); *All omnibus comparisons are significant at $P < .001$.

Note: Behavioral criteria for the FV stage were to provide the child with 5 servings of fruits and vegetables every day; to limit the child to ≤ 2 of TV every day; to help the child get 1 h of moderate intensity physical activity; to limit the child to 1 serving/wk of sugary drinks; and to limit the child's juice intake to no more than 6 oz 100% fruit pure juice each day. Eta-square is the estimate of the effect size.

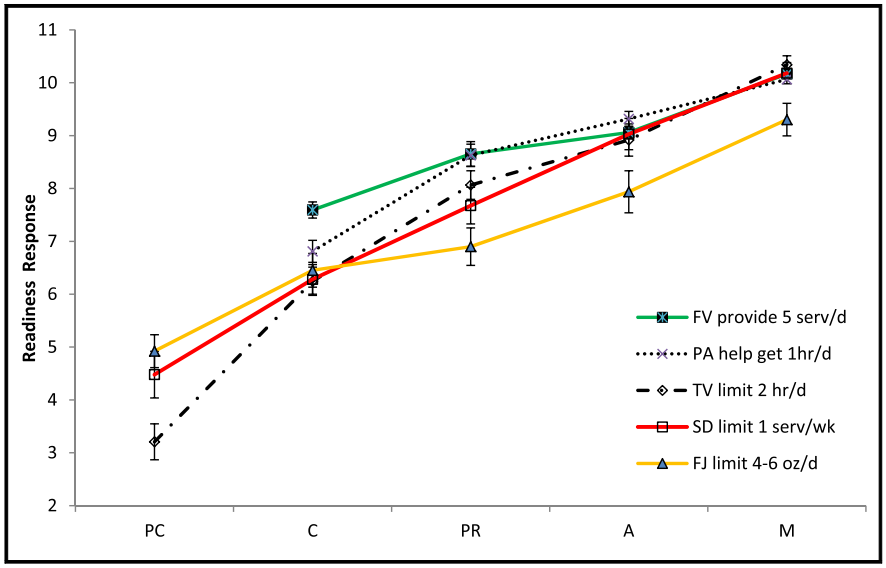


Figure 1. Readiness scores across the corresponding stages of change measure for the parent sample (n = 283). FV indicates fruits and vegetables; TV, television; PA, physical activity; SD, sugary drinks, FJ, 100% fruit juice servings (serv) with 1 serving equivalent to 4-6 oz/d. PC indicates Precontemplation Stage; C, Contemplation Stage; PR, Preparation Stage; A, Action Stage; M, Maintenance Stage. Behavioral criterion for the FV stage was to provide your child with 5 servings of fruits and vegetables every day; TV, to limit your child to 2 hr or less of TV every day; PA, to help your child get 1 hour of moderate intensity physical activity. SD, to limit your child to 1 serving per week of sugary drinks. FJ, to limit your child's juice intake to no more than 6 ounces of 100% fruit pure juice each day. PC and C were collapsed for FV and PA.

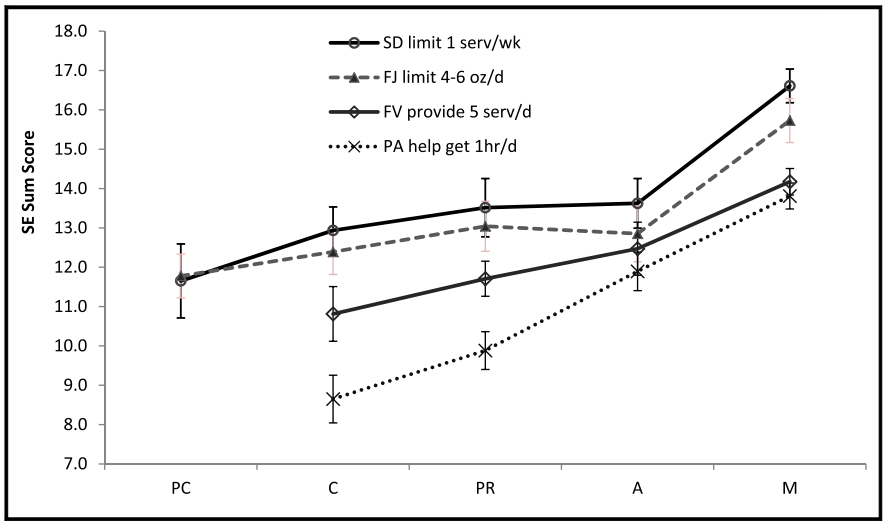


Figure 2. Self-efficacy scores across the corresponding stages of change measure for the parent sample (n = 281). FV indicates fruits and vegetables; PA, physical activity; SD, sugary drinks, FJ, 100% fruit juice servings (serv). PC indicates Precontemplation Stage; C, Contemplation Stage; PR, Preparation Stage; A, Action Stage; M, Maintenance Stage. Behavioral criterion for the FV stage was to provide your child with 5 servings of fruits and vegetables every day; PA, to help your child get 1 hour of moderate intensity physical activity. SD, to limit your child to 1 serving per week of sugary drinks. FJ, to limit your child's juice intake to no more than 6 ounces of 100% fruit pure juice each day. PC and C were collapsed for FV and PA. SE indicates self-efficacy. The SE sum score is the sum of the 4 items for the scale (range 4-20).

Another limitation to consider is that the study took place over 2 years in varying seasons, which may have influenced diet and PA patterns. Finally, a possible limitation was the inclusion of parents with children aged 4–10 years, a range that includes varying parent–child relationships and diet and PA levels. Nonetheless, the stage measure used a criterion consistent with the health recommendations for all 4- to 10-year-olds. Although the parent of a 4-year-old may have issues different from those of the parent of a 10-year-old, the purpose of the stage measure is to assess parental readiness to meet the specified recommendation.

> These SOC measures may be used to provide stage-appropriate advice when counseling parents.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Health promotion advocates, including dietitians, nutrition educators, and researchers, may use these measures in efforts to assist families. The measures in this study may have a broader appeal for use in that they do not assume a focus on weight management, but rather assess healthful lifestyle behaviors. Dietitians and other health care providers may find the measures useful because they assess issues that providers are encouraged to address regularly.[7,37] The measures may help them provide stage-appropriate advice when they are working with parents. Health program planners and researchers should consider using these measures when designing tailored interventions for families with children aged 4–10 years. Although future validation of the measures is needed, the readiness ladder may be a good alternative to SOC measures with the caveat that face-to-face as opposed to paper-based administration may lead to overestimation of readiness. Future research should consider examining the validity of the readiness ladder to provide

an additional, and perhaps easier, tool to use.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.jneb.2014.11.003.

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CONFLICT OF INTEREST

The authors have not stated any conflicts of interest.