



Assessment of Stage of Change, Decisional Balance, Self-efficacy, and Use of Processes of Change of Low-income Parents for Increasing Servings of Fruits and Vegetables to Preschool-aged Children

Continuing Education Questionnaire available at www.sne.org/ Meets Learning Need Codes for RDs and DTRs 4000, 4020, 4150, and 6010.

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ABSTRACT

Objective: Use the Transtheoretical Model of Behavior Change (TTM) to determine the proportionate stage of change of low-income parents and primary caregivers (PPC) for increasing accessibility, measured as servings served, of fruits and vegetables (FV) to their preschool-aged children and evaluate response differences for theoretical constructs.

Design: Cross-sectional, quantitative survey design consisting of staging algorithm, construct scales, and food frequency questionnaire.

Setting: Rural and urban communities in a southwestern state of the United States.

Participants: 238 low-income PPC enrolled in federal nutrition education programs were recruited from group nutrition education sessions.

Main Outcome Measures: Stage of change using a staging algorithm, TTM constructs of processes of change, decisional balance, and self-efficacy measured by multiple-item scales using Likert response, and fruit and vegetable servings served using a food frequency questionnaire.

Analysis: Descriptive analysis, Pearson's chi-square, analyses of variance with Tukey's Honestly Significant Difference post hoc test, and principal component function analysis.

Results: Of the surveyed PPC, 43% were in precontemplation/contemplation stages, and 29% were in the preparation stage for increasing FV accessibility (measured by servings served) to their preschool-aged children. PPC in the action/maintenance stages evidenced greater use of behavioral processes and had higher self-efficacy scores compared to PPC in precontemplation/contemplation and preparation stages.

Conclusions and Implications: Interventions aimed at increasing FV accessibility for preschool-aged children should be tailored to meet PPCs' stage of change. Interventions targeting PPC in precontemplation/contemplation stages should use methods to share ideas for planning meals and snacks to include FV. Interventions for PPC in the preparation stage should aim to build skills in quick preparation of economical FV, address parental role modeling of FV consumption, and encourage goal setting. Learning formats providing social support may prove effective in prevention of behavior relapse for PPC in action/maintenance stages.

Key Words: children, parents, fruits and vegetables, low-income, Transtheoretical Model (*J Nutr Educ Behav.* 2009;41:110-119.)

INTRODUCTION

Research has established a relationship between diets that are rich in fruits and vegetables (FV) and reduced risk

of chronic diseases, including cardiovascular disease, hypertension, diabetes, obesity, and certain types of cancer.¹⁻⁴ Furthermore, many of these food items are good sources of vita-

mins A and C, which have been shown to enhance immune system function.⁵⁻⁸ Most Americans, including preschool-aged children, are not eating enough FV to provide the protective benefits.⁹ The 2005 Dietary Guidelines for Americans recommend an increase in FV consumption from 3 to 5 servings per day to 4 to 10 servings per day, depending on specified energy levels.¹⁰ The guidelines are designed to outline the nutrient needs of people aged 2 years and older according to their gender, age, and level of activity. The increases were, in part,

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a result of the Institute of Medicine (IOM) establishing Adequate Intake (AI) levels for fiber and potassium,^{11,12} both of which are prevalent in FV.

Analyses of epidemiological data conducted by Dwyer et al. and the IOM indicate that intake of these nutrients may be low enough to be of concern for children, adolescents, and adults.^{13,14} Guenther and colleagues used the National Health and Nutrition Examination Surveys (NHANES) conducted between 1999 and 2000 to determine the proportion of subpopulations by age meeting the 2005 Dietary Guidelines FV recommendations.⁹ They estimated slightly less than half (48%) of children 2 to 3 years old met the FV recommendation. Findings from the Feeding Infants and Toddlers Study (FITS) revealed that 40% to 50% of toddlers had no fruit or fruit juice for breakfast, 50% did not have fruit for lunch, and 60% had no fruit at dinner.¹⁵ The accessibility of vegetables was similar to that of fruit. More than 50% of toddlers had no vegetables for lunch, and more than 30% had no vegetables for dinner.

A substantial number of studies have been conducted and they consistently identify similar determinants of FV consumption that can be grouped into 3 general categories. The first is specific to income and environmental restraints, including access, cost, availability, and storage space.¹⁶⁻¹⁹ These factors reinforce the premise that adherence to dietary recommendations for FV is problematic for low-income populations. Availability is especially important in households with preschool-aged children in that frequent exposure to FV is an important factor in helping children accept and prefer these food items.²⁰ The work of Cullen et al revealed that availability, accessibility, and preference are significantly correlated with children's consumption of fruit, 100% juice, and vegetables.²¹ A second category of determinants consists of attitudes and beliefs related to FV, including taste, appearance, convenience, and health benefits.²²⁻²⁴ The third category is social dimensions, including the mother's role as gatekeeper in purchasing, preparing, and serving food, and role modeling of parents in the home.^{25,26} Gallaway et al and Granner et al have recently shown an interaction of these deter-

minants to be strong predictors of FV consumption, especially among adolescents.^{27,28} For example, the interaction of preference and home availability of FV strongly predicted consumption in 11- to 14-year-old boys.²⁷ Likewise, preferences for vegetables and parental modeling were strongly correlated with self-efficacy for snack choices in young adolescents.²⁸ These findings leave little doubt about the need for sustainable interventions that remove barriers and improve accessibility of FV in the households of young children before FV consumption recommendations can be met.

To help address FV deficiencies in low-income families with preschool-aged children, the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) has recently allowed for cash value vouchers for FV in food packages issued to pregnant and postpartum women and to children 1 to 5 years of age.²⁹ The move is not only in keeping with current nutrition research to increase consumption of vital nutrients, but also assists in reducing economic barriers to FV consumption for low-income children at the critical time when taste preferences are being developed and eating behaviors are being formed.²⁰ Supporting the efficacy of reducing financial barriers, a recent longitudinal study found significant, sustained increases in consumption of fresh FV 6 months after targeted subsidies were provided to low-income mothers.³⁰ Although the study illustrated the effectiveness of lowering FV costs, it did not address the participants' level of readiness to make the desired behavior change. For the 2005 Dietary Guidelines for Americans and addition of FV to the WIC food package to be fully effective, nutrition educators need to understand the differences in readiness and motivation of parents and primary caregivers (PPC) to increase accessibility of FV to their preschool-aged children.

Transtheoretical Model of Behavior Change

The Transtheoretical Model of Behavior Change (TTM) is a widely supported model for nutrition and

health interventions,^{26,31,32} allowing researchers to stratify people based on their readiness to change and better understand the psychosocial differences between those who are performing a specified behavior and those who are not.³³ TTM postulates that the process of changing behavior occurs over a period of time and is based on the premise that people can be placed into 1 of 5 stages of readiness to engage in the given behavior. Movement between stages is dependent on the levels of motivation and self-efficacy, which are facilitated by the use of cognitive and behavioral processes.^{33,34} As people make changes, levels of motivation and self-efficacy are dynamic and dependent on their experiences and degree of success in making the change. As such, movement between the stages is not a simple, linear progression but is better described as cyclical in nature. Relapse not only occurs but should be expected and addressed as part of an intervention.

Motivation to change, referred to as decisional balance, is determined by the person's perceptions of the anticipated benefits (or pros) of making the change versus the costs (or cons) of changing. As with the Social Cognitive Theory,³⁵ self-efficacy is the person's degree of confidence that he/she can carry out the behavior in a variety of different situations. The processes of change are cognitive and behavioral strategies in which people engage to bring about a desired change. Cognitive processes are covert in nature and are employed during the early stages; behavioral processes are more overt and are most often used during the later stages of change.³⁴

The aim of the present study was to use the TTM of Behavior Change to assess the proportionate stage of change of low-income PPC of preschool-aged children for increasing FV accessibility to their young children. The authors also aimed to evaluate their response differences for the psychosocial factors of decisional balance, self-efficacy, and use of processes of change. Because young children depend on their PPC to make FV accessible by serving them at meals and snacks when eating at home and when eating out, the authors used FV servings served as a proxy variable for accessibility.

The authors hypothesized low-income PPC of preschool-aged children would present in separate stages of change for increasing FV servings served, and as such they would have differences in decisional balance for making the change, have differences in levels of self-efficacy, and employ different types of processes for making the change. These differences call for the development and delivery of tailored messages aimed at increasing FV servings.

The present study contributes insight into the differences among low-income PPC for increasing the amount of FV served to young children during the developmental period when food preferences are being formed. The findings are significant in that they provide guidance for the development and delivery of tailored interventions aimed at increasing exposure and accessibility to FV, thus increasing the opportunity for the child to develop taste preferences for FV and positively influence lifelong dietary behaviors.

METHODS

Design, Sampling, and Data Collection

The target population for the cross-sectional, quantitative study was low-income PPC of preschool children aged 1 to 5 years. Low-income was defined as being at or below 185% of the federal poverty level in Federal Fiscal Year 2006. The survey population consisted of PPC enrolled in federal assistance nutrition education programs, including WIC, the Expanded Food and Nutrition Education Program (EFNEP), and the Food Stamp Nutrition Education Program (FSNEP). These programs have income eligibility criteria meeting the authors' definition of low income. The convenience sample was recruited from 3 independent WIC clinics and 8 EFNEP/FSNEP units. Two of the WIC clinics were located in urban areas; a third was located in a rural community. Two EFNEP/FSNEP units were in urban counties, and 6 were composed of multiple rural counties. Subjects were enrolled in and attending nutrition education classes offered through these programs. The sample size estimate of 288 was determined

with a formula developed to estimate the proportion of a population for a relevant measure [$n = (p)(1-p)(z/M.E.)^2$].³⁶⁻³⁷ The authors used a 95% confidence interval ($z = 1.96$), 5% margin of error, and predicted proportion (p) of 0.75 to be in pre-action stages.³⁸

Data were collected through distribution of survey instruments in April 2006. The surveys were administered to PPC who were attending regularly scheduled nutrition education classes at selected community sites. All PPC in attendance at the randomly selected sessions were invited to participate. The survey administrators were trained nutrition educators indigenous to the targeted population and available for questions and clarification while the surveys were being completed. Because PPC who chose not to participate did not return a survey, the authors were unable to track the number who declined and the reason for nonresponse. However, educators indicated that very few PPC refused. Duplicate responses were eliminated by excluding those that were marked "yes" to having completed the survey at another location. Informed consent information was provided to the subjects, both verbally and in writing, with passive consent to participate in the study provided by submission of a completed survey.

Instrumentation

The authors used a survey instrument consisting of a stage of change algorithm, construct scales, and an FV frequency questionnaire (FVFQ). The survey was tested in previous research and found to be effective in discriminating between stages of change for FV consumption.³⁸ The construct scales for self-efficacy and decisional balance were developed and validated as part of a multistate research project.³⁹ The Cronbach α internal reliability coefficient for the self-efficacy scale was 0.77, and 0.79 for the decisional balance scale. The FVFQ was previously validated with the consumption frequency (reported on the FVFQ) highly correlated with a 7-item screener ($r = 0.76$).⁴⁰ Minor modifications were made in wording the stage of change survey to better reflect the determinants of FV consumption in

low-income households identified in previous research.^{16-19,21-23,25} An expert panel of 4 WIC registered dietitians, 1 WIC paraprofessional, and a university nutritional sciences faculty member with expertise in the use of TTM reviewed the survey for content validity and low respondent burden. As a result of the expert review, the number of food items in the FVFQ was reduced from 26 to 8 related food items. Items included 100% fruit juice; fresh, canned, frozen, and dried fruit; lettuce salad; starchy vegetables such as potatoes, corn, and peas; dark green vegetables such as broccoli, spinach, kale, or other greens; orange vegetables such as carrots, sweet potatoes, pumpkin, and winter squashes; tomatoes or salsa; and other vegetables such as okra, peppers, cabbage, and summer squash. The resulting survey instrument consisted of 6 parts, including demographics, staging algorithm, pros and cons (decisional balance), confidence (self-efficacy), strategies (processes of change), and the FVFQ. A pilot-test was conducted during July 2005 with low-income parents enrolled in community parenting/nutrition education classes to ascertain the appropriateness and relevance of the survey for the study's targeted population.

Demographics. Collected information included race, ethnic background, age, gender, education, and employment status. Two questions to ensure inclusion criteria were met included (1) being the PPC of a child 1 to 5 years of age; and (2) enrollment in WIC, EFNEP, or FSNEP.

Intention to serve fruits and vegetables. Respondents were stratified into stages of change using a 2-stage algorithm. Subjects were asked to circle the number of servings, ranging from 0 to 9, of FV they usually served each day. One serving of FV was defined as 1 piece of raw fruit; $\frac{1}{2}$ cup cooked or raw, cut-up fruit or vegetable; 1 cup salad; or $\frac{3}{4}$ cup 100% juice. Serving sizes were explained by the trained nutrition educator using visual models that were available for reference as subjects completed the survey. Subjects who reported serving 4 or fewer servings were classified as being in the precontemplation stage

if they were not planning to serve more FV, in the contemplation stage if planning to serve more in the next 6 months, or in the preparation stage if planning to serve more in the next month. Those who reported serving 5 or more servings each day were classified as being in the action stage if they had been serving that amount for less than 6 months, or in the maintenance stage if they reported serving the amount for more than 6 months. For the purpose of statistical analysis, the 5 theoretical stages were collapsed into 3 stages and are summarized in Table 2. The collapsed stages consist of precontemplation/contemplation, preparation, and action/maintenance. This move is supported by work conducted by Ma, Betts, and Horacek,³¹ who examined the appropriateness of the theoretical 5-stages for use in dietary behaviors of FV consumption; their findings suggested a 3-stage pattern may be more representative of the temporal process for changing FV dietary patterns.

Pros and cons. Decisional balance was measured using 6 items (3 pros and 3 cons) with a 5-point Likert response, where 1 = not important in deciding to serve more FV and 5 = extremely important in deciding to serve more FV. Pro items measured health benefits including protection from chronic diseases, minimizing infections and colds, and maintaining healthful weight.¹⁻⁸ Con items addressed expense of buying, time to shop, and time to prepare FV.^{16-19,22}

Confidence. Self-efficacy was assessed with 5 items measured with a 4-point Likert response, where 1 = not at all confident and 4 = very confident. The items addressed confidence in being able to serve FV when preparing meals at home, eating meals away from home, preparing tasty recipes, having limited money to buy food, and having limited time to prepare FV.

Strategies for serving more fruits and vegetables. Processes of change were measured using a 5-point Likert response, from 1 = not at all to 5 = all of the time. Cognitive processes included looking for tips to add FV to meals (consciousness raising), notic-

ing more ready-to-eat FV in the grocery store, and noticing more FV where the family eats out (social liberation), role-modeling eating of FV (self-reevaluation), thinking that the family would be healthier if they ate more FV (emotional arousal), and deciding to serve more FV (commitment). Behavioral processes included serving FV instead of junk food and serving fruit instead of sweets for dessert (countering), having easy access to fruit for snacks and reminders to serve 2 vegetables with main meals (stimulus control), talking to other people about eating more FV (helping relations), and feeling pleased when others provided praise for serving FV (rewards).

FVFQ. Fruits and vegetables were divided into 8 groups, including 100% fruit juice, fruit, lettuce salad, starchy vegetables, dark green vegetables, orange vegetables, tomatoes or salsa, and other vegetables. Seven response options for frequency of serving the fruits or vegetables ranged from never to 2 or more times a day; and response options for serving size included small (less than $\frac{1}{2}$ cup or equivalent), medium ($\frac{1}{2}$ cup or equivalent), and large (more than $\frac{1}{2}$ cup or equivalent). Visual aids reflecting $\frac{1}{4}$, $\frac{1}{2}$, and 1 cup servings were available as references to assist subjects with determining serving sizes.

The Oklahoma State University Institutional Review Board reviewed and approved the protocol.

Statistical Analysis

Analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 14.0 (SPSS Inc, Chicago IL, 2006). Descriptive analysis defined the survey population's demographic characteristics. Pearson's chi-square analyses were used to assess differences in the distribution of PPC in the separate stages of change, as well as stage of change (SOC) distribution by demographic characteristic. Daily accessibility of FV was calculated by summing the product of frequency of serving and serving size across all the food items listed. A paired-sample *t* test was used to compare FV servings served reported in the staging algorithm, with FV servings reported in the FVFQ. To achieve a normal distribution of the positively skewed FV servings served, raw data

were transformed using natural logarithm [$\ln(x + 1)$, where x is the total FV servings served computed from the FVFQ]. One-way analyses of variance (ANOVA) were used to test for differences in the number of FV servings served by SOC. Cronbach α was used to measure the internal reliability of the items measuring decisional balance, self-efficacy, and use of cognitive and behavioral processes. The decisional balance items were standardized by conversion to T-scores. Analyses of variance were used to identify differences among stages for scales measuring con and pro decisional balance, self-efficacy, cognitive processes, and behavioral processes, as well as the scores for the items composing the scales. When appropriate, Tukey's Honestly Significant Difference (HSD) post hoc tests were used to identify pairwise significance between stages. Function analysis using principal component extraction was conducted on the self-efficacy scale items to clarify interpretation. The significance level for all analyses was set at $P < 0.05$.

RESULTS

A total of 274 of 330 (83%) surveys were returned, of which 238 (87%) were complete and eligible for analysis. Nineteen (7%) of the returned surveys did not meet inclusion criteria, 15 (6%) were incomplete responses, and 2 (0.1%) indicated they were duplicate responses. As summarized in Table 1, the majority of the respondents were female (97%), white (55%), and averaged 27 years (± 7.7 years) of age. Fifty percent of the respondents had a high school education, 27% had some college or were college graduates, and 21% had less than a high school education. Slightly more than half (56%) did not work outside the home.

Staging of Subjects and FV Servings Served

Results of the stratification of subjects into the 5 SOC and the 3 collapsed stages are summarized in Table 2. Based on the staging algorithm results, 43% of the subjects staged as precontemplation/contemplation ($n = 102$), 29% staged as preparation ($n = 69$), and 28% staged as action/maintenance

Table 1. Demographic Characteristics of Low-income Parents/caregivers (n = 238)

Demographic Characteristic	n	%
<i>Gender</i>		
Female	231	97
Male	7	3
<i>Residential locale</i>		
Rural	133	56
Urban	105	44
<i>Race/ethnicity</i>		
White	130	55
Black or African American	51	21
American/Alaskan Indian	30	13
Hispanic	24	10
Asian or Pacific Islander	3	1
<i>Education</i>		
High school or GED	119	50
Some college or college graduate	65	27
Less than high school	51	21
Nonresponse for item	3	1
<i>Employment</i>		
Do not work outside the home	132	56
Full-time (32 hours or more/week)	65	27
Part-time (less than 32 hours/week)	37	16
Nonresponse for item	4	2

GED indicates General Education Development.

(n = 67). Pearson's chi-square test indicated a significant difference in the number of low-income PPC in each stage of change for increasing FV servings served to their preschool-aged children ($P = .008$). Paired t test of FV servings served reported in the staging algorithm and FVFQ resulted in no significant difference in the 2 amounts ($P = .725$). Table 3 presents data from the FVFQ for each stage of change and ANOVA results. The PPC in the preparation and action/maintenance stages served similar amounts of FV to their children (4.1 and 4.2 servings, respectively), and significantly more ($P < .001$) than reported by PPC in the precontemplation/contemplation stage (2.9 servings). Pearson's chi-square analysis indicated PPC did not differ by residential locale ($P = .43$), race/ethnicity ($P = .197$), educational level ($P = .424$), or employment status ($P = .083$) when compared by SOC (data not reported in table).

Processes of Change

Data reporting the use of the cognitive and behavioral processes of change by SOC are reported in Table 3. The

Cronbach α internal reliability coefficient for use of cognitive processes (consciousness raising, social liberation, reevaluation, emotional arousal, and commitment) was 0.78. The ANOVA indicated a significant difference ($P < .001$) in use of cognitive processes. Tukey's HSD post hoc test revealed PPC in preparation and action/maintenance stages used cognitive processes with similar frequency, and significantly more often than PPC in the precontemplation/contemplation stage ($P \leq .006$). Review of the items on the cognitive processes scale revealed self-reevaluation (role-model eating FV), consciousness raising (look for tips to add FV to meals and snacks), and commitment (decide to serve more FV) were used significantly more often by PPC in preparation and action/maintenance stages when compared to PPC in the precontemplation/contemplation stage. The PPC in the action/maintenance stage also used the cognitive processes of social liberation (notice more healthful vegetables where family eats out) and emotional arousal (think if family ate more FV they would be healthier) significantly

more often than PPC in the precontemplation/contemplation stages.

The Cronbach α internal reliability coefficient for the behavioral processes of change (countering, stimulus control, helping relations, rewards) was 0.82. The ANOVA resulted in a significant difference ($P < .001$) in the frequency of use of behavioral processes by PPC in separate SOC. Tukey's HSD post hoc test identified differences increased significantly as stage of change advanced ($P \leq .038$), with PPC in the action/maintenance stage using behavioral processes most often. The specific behavioral processes used significantly more often by PPC in the preparation and action/maintenance stages compared to PPC in the precontemplation/contemplation stage were countering (serving FV instead of less healthful snacks), stimulus control (planning to serve vegetables at meals), and rewards (feeling pleased when praised for serving FV). Helping relations (social support and talking to others about serving family FV) was used significantly more often ($P = .002$) by PPC in the action/maintenance stage compared to PPC in the precontemplation/contemplation stage.

Decisional Balance

The data summarizing decisional balance by SOC are presented in Table 3. The Cronbach α internal reliability coefficient for the con decisional balance scale items was 0.69, and 0.86 for the pro decisional balance scale items. The PPC in the precontemplation/contemplation stage had a higher T-score for the con scale when compared to the pro decisional balance scale, whereas the reverse was true for PPC in the preparation and action/maintenance stages. The point at which the pro decisional balance scale score surpassed the con decisional balance scale score occurred prior to the preparation stage. Using SOC as the fixed variable and the con and pro decisional balance scale T-scores as dependent variables, an analysis of variance resulted in a small but significant difference between stages for the con decisional balance scale ($P = .037$), but not for the pro decisional balance scale ($P = .061$). Tukey's HSD post hoc test resulted in

Table 2. Results of Staging Algorithm

Stage of Change	n	%	Collapsed Stage of Change ($P = .008$)*		
				n	%
Precontemplation	24	10	Precontemplation/contemplation	102	43
Contemplation	78	33	Preparation	69	29
Preparation	69	29	Action/maintenance	67	28
Action	8	3			
Maintenance	59	25			
Total	238	100	Total	238	100

*Pearson's Chi-Square. Significance level set at $\alpha = 0.05$

no significant differences between any 2 stages for the con scale. The ANOVA of the con decisional balance items indicated stages differed significantly on "FV take too much time to prepare" ($P = .004$). The negative item was significantly more important to PPC in the precontemplation/contemplation stage ($P = .036$) compared to PPC in the preparation and action/maintenance stages.

Self-efficacy

Data reporting level of self-efficacy by SOC are summarized in Table 3. The Cronbach α internal reliability coefficient for the 5 self-efficacy items was measured at 0.80. ANOVA of mean scale scores revealed significant differences ($P < .001$). Tukey's HSD post hoc identified self-efficacy was lowest for the PPC in the precontemplation/contemplation stage and increased significantly with each stage. Analyses of variance of the self-efficacy items resulted in significant differences in 4 of the 5 items ($P < .001$). Of these 4 items (preparing meals at home, preparing tasty FV, limited time, and limited money to buy food), PPC in the precontemplation/contemplation stage were significantly less confident in their ability to serve FV than PPC in the preparation ($P \leq .035$) and action/maintenance stages ($P < .001$) with one exception, when money to buy food was low. In times of insufficient money, PPC in the preparation stage reported self-efficacy for serving FV similar to PPC in the precontemplation/contemplation stage, both of which were significantly lower than levels reported by PPC in the action/maintenance stage ($P \leq .005$). A factor analysis using principal component

extraction of the items resulted in 2 extracted functions, with the first accounting for 90.8% of the variance between groups. The item with the highest function correlation ($r = 0.841$) was confidence in preparing tasty, easy recipes using FV.

DISCUSSION

The findings provide evidence that low-income PPC of preschool-aged children are in separate stages of change for increasing daily FV servings to their preschool-aged children, with almost half (43%) being in precontemplation/contemplation stages. Although none of the average number of FV servings served to children met the recommendation, the servings served by PPC in the precontemplation/contemplation stage were significantly fewer than the servings served by PPC in the preparation and action/maintenance stages. More importantly, the psychosocial attributes of PPC who were serving less FV compared to PPC who were serving more FV were in keeping with TTM theoretical constructs. For example, PPC in the precontemplation/contemplation stages used fewer processes of change less frequently to serve FV to their children, placed more importance in the negative aspects of the behavior compared to the positive, and had lower self-efficacy for performing the behavior under various situations when compared to PPC in preparation and action/maintenance stages. These differences were not a manifestation of demographic characteristics, but rather related to differences in psychosocial factors as measured by TTM constructs. As such, nutrition education efforts aimed at increasing FV

servings should address the characteristics of PPC in separate stages of change.

The authors found that PPC in preparation and action/maintenance stages were using both cognitive and behavioral processes more often than PPC in the precontemplation/contemplation stage. The finding is consistent with previous research positively associating use of a variety of processes with higher stages of change.^{38,41,42} It is logical that PPC in the higher stages would have greater awareness of ideas for adding FV to meals and be role modeling the desired behavior for their children. These behaviors demonstrate their commitment to serving more FV to their children that the authors found to be less prevalent in PPC in the precontemplation/contemplation stage. As such, helping PPC in early stages of change increase awareness of easy and economical ways to add FV to meals and snacks has potential to build self-efficacy and subsequently, commitment to performing the behavior.

Within the behavioral processes of change scale items, countering healthful behaviors for less healthful behaviors was used significantly more often by PPC in the action/maintenance stages. In the present study, this behavior was measured by choosing to serve FV, rather than less nutritious food, to children for snacks. Helping parents change the dietary quality of children's snacks to include FV is essential and recommended by the American Academy of Pediatrics as a strategy for improving nutrition in young children.⁴³ In the last 2 decades, the prevalence of snacks consumed throughout the day has almost doubled from less than once per day to 1.6 snacks per day.⁴⁴ Thus, snacks have become increasingly important in the overall nutritional quality of children's diets. However, the nutrient contribution of snacks is frequently high in salt, saturated and trans fats, and added sugars.^{15,45} For this reason, assisting PPC in the preparation stage shift the type of food served at snacks to include more FV can contribute to increased accessibility of FV to young children.

Relapse for PPC in the action/maintenance stages is to be expected and should be planned for. In the

Table 3. Mean of FV Servings Served (cups) and Mean Scores for Scales Measuring Use of Processes of Change, Decisional Balance, and Self-efficacy of PPC for Serving FV

FV Servings Served (cups) and TTM Constructs	Stage of Change			
	Precontemplation/Contemplation (n = 102) Mean ± SD	Preparation (n = 69) Mean ± SD	Action/ Maintenance (n = 67) Mean ± SD	Total (n = 238) Mean ± SD
Mean FV servings served (cups); <i>P</i> < .001*	2.9 ± 1.9 ^a (1.5 ± 1.0) ^a	4.1 ± 2.7 ^b (2.0 ± 1.3) ^b	4.2 ± 2.2 ^b (2.1 ± 1.1) ^b	3.6 ± 2.3 (1.8 ± 1.5)
Cognitive processes scale ¹ <i>P</i> < .001*	3.3 ± 0.64 ^a	3.6 ± 0.76 ^b	3.8 ± 0.66 ^b	3.5 ± 0.71
Behavioral processes scale ¹ <i>P</i> < .001*	3.0 ± 0.80 ^a	3.3 ± 0.70 ^b	3.7 ± 0.70 ^c	3.3 ± 0.80
Con decisional balance scale ² <i>P</i> = .037*	51.9 ± 9.7	48.8 ± 9.7	48.3 ± 10.4	50.0 ± 10.0
Pro decisional balance scale ² <i>P</i> = .061	8.2 ± 9.8	51.3 ± 9.3	51.3 ± 10.1	50.0 ± 10.0
Self-efficacy scale ³ <i>P</i> < .001*	2.6 ± 0.6 ^a	2.8 ± 0.6 ^b	3.1 ± 0.6 ^c	2.8 ± 0.6

FV indicates fruits and vegetables; PPC, parents and primary caregivers; SD, standard deviation; TTM, Transtheoretical Model of Behavior Change.
 Values with different superscript letters (a, b, and c) were significantly different at *P* < 0.05.
 *Mean difference significant at $\alpha = 0.05$; ¹Cognitive and behavioral processes scale: 1 = not at all; 2 = hardly ever; 3 = sometimes; 4 = often; 5 = all the time; ²Con and pro decisional balance scale: raw data transformed to T-scores where mean = 50.; ³Self-efficacy balance scale: 1 = not at all confident; 2 = somewhat confident; 3 = confident; 4 = very confident

present study 28% of PPC staged as action/maintenance and had construct scores reflective of the stages; however, the calculated servings of FV served was slightly less than 5 servings daily. Therefore, it is plausible they experience relapse and depend on use of reward and helping relations significantly more often than PPC in early stages. The use of social support can be used in planning for and responding to relapse, especially when other adults in the household are supportive of serving more FV. The finding is substantiated by recent studies reporting the importance of social support in developing and maintaining health-promoting behaviors. Paisley et al examined the responses and roles of significant others related to dietary change and found emotional responses varied from negative to supportive, with supportive responses resulting in more positive outcomes.⁴⁶ Specific to FV, Baranowski et al found social support to be an important and consistent predictor of vegetable availability in the home.⁴⁷

The TTM theory posits the negative aspects of performing a given behavior outweigh the positive aspects for people in early TTM stages of change and reverse in later TTM stages,⁴⁸ with crossover occurring as subjects move from the contemplation to the preparation stage.³³ This decisional balance phenomenon held true in the present study. The health benefits of serving FV were important to PPC in all stages, but only enough to outweigh the negative aspects for PPC in the preparation and action/maintenance stages. The negative decisional balance item accounting for the significant difference between stages was time related to preparing FV. In addition, the self-efficacy item measuring time revealed PPC in the precontemplation/contemplation stage was significantly lower than for PPC in preparation and action/maintenance stages. A recent study evaluated the influence of family resources on food preparation and revealed a negative relationship between time spent preparing food and the amount of time working out-

side the home, regardless of income.⁴⁹ Although employment in this study was not related to FV servings, employment does limit time for food preparation; and time does appear to have a relationship with decisional balance and self-efficacy in serving FV. Perhaps time is important to this study's population in that almost half (43%) of the respondents worked outside the home, and time pressures may limit FV servings in meals and snacks.

In addition to time being a limiting determinant of FV servings, the authors also found self-efficacy to serve FV when money was low to be significantly lower in PPC in both the precontemplation/contemplation and preparation stages compared to PPC in the action/maintenance stage. The finding supports the current literature indicating cost as a barrier to increasing FV servings in low-income populations.^{50,51} A study evaluating the impact of providing supplemental financial support to WIC households specifically for the purpose of purchasing fresh FV provided evidence

that financial subsidy increased FV intake in the study participants.⁵¹ As such, the forthcoming addition of FV to the WIC supplemental food benefit package should help to reduce cost barriers and improve self-efficacy of low-income PPC for increasing servings of FV to young children.

Several limitations of the present study should be addressed. First, the self-administration of the survey may have resulted in incongruent stage stratification when compared to self-reported servings of FV to children. However, PPC in each of the TTM stages had psychosocial characteristics consistent with the theoretical constructs. The use of a convenience sample of respondents enrolled in nutrition education classes limits the generalization of the findings to a population enrolled in federal food assistance and nutrition education programs. Motivation to self-enroll in food assistance and nutrition education may be reflective of the person's higher stage of change to improve dietary quality for their family when compared to the general population. Additionally, FV servings were examined as 1 behavior rather than 2. A previous study has shown individuals to be in different stages of change for increasing consumption of fruit compared to vegetables.³¹ These differences have been related primarily to taste preferences.

IMPLICATIONS FOR PRACTICE

As with previous research, time and cost emerged as the major determinants of FV servings influencing decisional balance and self-efficacy, both of which inhibit movement to higher TTM stages. Nutrition educators can use knowledge of the population's SOC to deliver appropriate messages and levels of intervention and use the processes of change found to facilitate greater accessibility of FV to preschool-aged children. To assist movement of PPC in precontemplation/contemplation stages to the preparation stage, nutrition educators should consider using the cognitive process of consciousness raising to share ideas for adding fresh seasonal FV to meals and snacks. Serving seasonal FV increases the likelihood that

the food items will have better flavor and greater acceptability by family members,³⁰ thus decreasing the waste frequently associated with the cost of fresh produce.¹⁶ In addition, highlighting the economy and quick preparation of frozen and canned FV, especially those with minimal added salt, fat, and sugar, should be emphasized to positively influence decisional balance for increasing FV servings.⁴⁸ Lastly, PPC in higher TTM stages reported role modeling as an important process for serving more FV to children. As such, helping PPC in early TTM stages overcome barriers and improve self-efficacy for increasing their own FV intake may increase the frequency in which they engage in behaviors to increase FV accessibility to their young children.

To help PPC in the preparation stage move into action, experiential learning formats such as cooking classes or demonstrations and tasting events should prove effective in increasing self-efficacy for preparing FV. To be of value, recipes should be quick and economical to prepare. In addition, the activities should engage other household members to create support for increasing servings of FV. The family unit can be encouraged to use behavioral processes to commit to setting small, achievable goals. Examples of behavioral processes found to be useful in this study and appropriate for small goals include planning meals to include 2 vegetables, substituting junk food with fruit at snack, and keeping fruit in a bowl on the counter.

Sharing of successes by PPC in action and maintenance stages will provide the group with the opportunity for reward and time to talk with others about ways to serve FV to children. The behavioral processes of reward and social support are important in keeping the group motivated during a time when the probability of relapse is high.

IMPLICATIONS FOR RESEARCH

The addition of FV to the WIC food benefit package should contribute to lowering the economic barrier of increasing FV servings to young children when food preferences are being formed. After policy implemen-

tation in 2009, this study should be replicated to determine if the FV benefits do in fact reduce the economic burden and facilitate movement into higher stages. As indicated in previous literature citing fruit and vegetable consumption as 2 distinct behaviors, it is recommended that research be conducted to determine if low-income PPC of preschool-aged children differ in their intent to increase servings of fruit as compared to vegetables. An additional question of interest for future study is the relationship between household size and accessibility of FV to household members.

Nutrition education for low-income adult populations is increasingly being conducted in group sessions.⁵² Use of a learner-centered approach based on the principles of TTM has the potential to result in a nutrition education intervention that meets the needs of multiple stages.^{53,54} Learner-centered methodology encourages educators to identify the learners' needs and to match messages to the recognized needs. The TTM provides a mechanism to carry out the assessment. Further research is needed to determine if TTM-based group interventions to increase FV servings to children results in movement across the stages and if movement across the stages is related to increased consumption of FV in young children. There is also the need to better understand the relationship between the extent of nutrition education intervention dosage and movement to higher stages of change for increasing FV servings to children. The latter information would prove useful to federally funded food assistance and nutrition education programs in allocating resources in a manner that best supports desired FV related behaviors.

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