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Intention to Consume Fruits and Vegetables Is Not a Proxy for Intake in Low-Income Women from Pennsylvania

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Abstract: Intention as an outcome measure for fruit and vegetable nutrition education interventions in low-income women was assessed through dietary assessment 3 weeks after a fruit and vegetable intervention in a federally funded program. Amount and variety of intake were compared to intentions expressed immediately following intervention. Findings suggested intentions did not approximate self-reported intake. For example, of 85 women indicating little baseline fruit variety, 47 intended to increase variety following the intervention; only two met the anticipated improvement. In all, only 25 participants met one or more intentions to improve intake. Implications for measuring intention and assessing outcomes are discussed.

Background

The theory of planned behavior (TPB) as developed by Ajzen (1991) has driven intervention design for a variety of health-related topics and is widely used to address fruit and vegetable intake in adults (Guillaumie, Godin, & Vézina-Im, 2010). Contento (2007) described and modeled application of the TPB to nutrition education, suggesting that behaviors (e.g., intake) are more likely when intention to do so is evident. Behavioral intention is a function of attitude toward behavior, perceived social norms toward the behavior, and perceived self-efficacy to accomplish the behavior. Theory examination has revolved around measuring theoretical components, (e.g., attitude, perceived behavioral control) that influence intention to act.

However, the role of intention as a proxy for behavior has been questioned (Rothman, 2009). Snack choice intention did not predict snack selection among adult office employees in the Netherlands (Weijzen, de Graaf, & Dijksterhuis, 2008). Eating fruits and vegetables did not follow from intention to do so in a sample of young

Norwegian men and women (Kaavik, Lien, Tell, & Klepp, 2005) or middle-aged Dutch women (Bogers, Brug, van Assema, & Dagnelie, 2004). In fact, despite an interest in healthy eating and fruit and vegetable intake, intention in the Dutch sample did not predict self-rated fruit consumption and was negatively related to self-rated vegetable consumption. A positive association was reported between fruit and vegetable consumption and intention to consume among college students; however, its value was tempered by the fact that all students were recruited from health and fitness classes and interested in fruit and vegetable intake (Blanchard et al., 2009).

The belief that intention equates with behavior is strongly held; intention has substituted for behavioral outcomes in studies informing nutrition intervention development for fruits and vegetables (Pawlak & Malinauskas, 2008), a plant-based diet (Wyker, Kirsten, & Davison, 2010), and a healthful diet (Pawlak, Malinauskas & Rivera, 2009).

Measuring nutrition intake intention is convenient, inexpensive, and encumbers little respondent burden. Thus, validation and promotion of the post/retrospective-pre assessment strategy (Rockwell & Kohn, 1989) marked the use of intention as a sound measure of behavior. Given recent concerns about intention as a substitute measure of behavior, we used a post/retrospective-pre-approach and a delayed measure of behavior to examine both intention and behavior in a federally-funded nutrition education intervention.

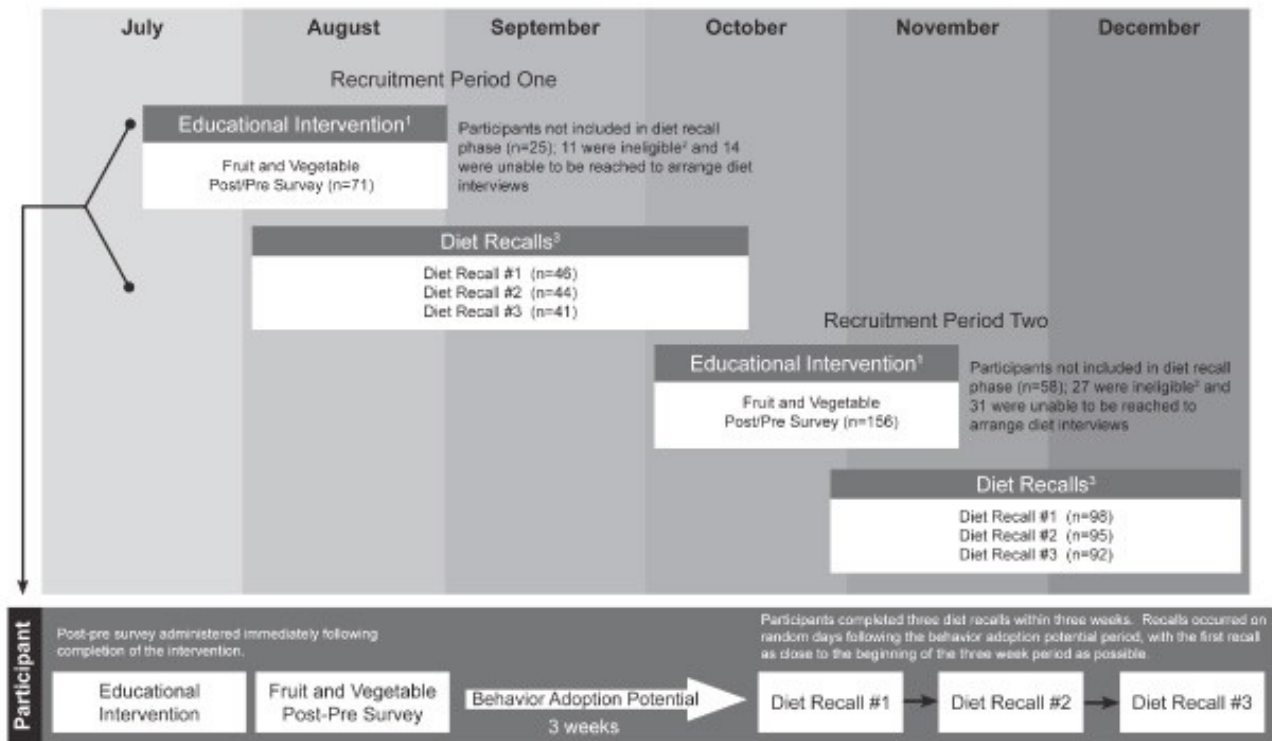
Methods

Research Design

Association of dietary behavior with intention was assessed in a two-stage, post-education design. Assessment included survey administration immediately following a nutrition education session and three-telephone dietary recalls. As shown in Figure 1, each participant experienced one educational session focused on either 1) vegetables or 2) vegetables and fruit. Educational formats followed each agency's standard protocol. Common educational elements included a learner-centered, experiential approach, discussion, and focus on skill development. The educational experience served as a point of recruitment, with educators informing learners of the study before the educational session and inviting participation at its conclusion.

Program educators received training on the study protocol and were instructed to recruit persons 18 through 50 years of age from households in which food purchase and selection decisions were made by household members. Participants were recruited from 63 separate small group classes or one-on-one education sessions conducted by 18 educators as part of Supplemental Nutrition Assistance Program Education (28.6%) and Expanded Food and Nutrition Education Program (71.4%) programming. The Office of Research Protections at The Pennsylvania State University approved this study.

Figure 1.
Data Collection Protocol



¹ Educational Intervention was one of the following:
 • Intervention was conducted in small group format (8-10 participants) by Expanded Food and Nutrition Education Program (EFNEP) educators during recruitment periods one and two. A lesson based on materials from the Eating Right Is Basic (<http://www.fcs.msue.msu.edu/EFNEP/catalog/index.htm>) curriculum was presented. (n=168)
 • Intervention was conducted in group format (5-15 participants) by a Supplemental Nutrition Assistance Program Education (SNAP-Ed) educator during recruitment period one. A lesson based on materials from the Simply Good Eating (<http://www.extension.umn.edu/distribution/nutrition/DJ8020.html>) curriculum was presented. (n=16)
 • A ten-minute intervention using MyPyramid (www.mypyramid.gov) handouts was delivered in a one-on-one format by SNAP-Ed educators during recruitment period two. (n=43)

² Ineligible participants did not meet inclusion criteria (i.e. participants aged 51 and over, not able to make food purchasing and/or preparation decisions, or non-Pennsylvania residents) or protocol was not followed during recruitment or diet recalls.

³ Diet recalls were not completed linearly for the sample, i.e. some participants completed their first diet recall at the same time other participants completed their second diet recall.

Data Collection and Measures

Figure 1 shows the data collection protocol for the overall study and highlights the individual participant data collection experience. Intention data were collected with a six-item survey, in a retrospective pre/post format (Rockwell & Kohn, 1989). Items addressed current (also termed *retrospective-pre*) and intended (also known as *post*) behaviors for fruits and vegetables regarding variety, snack intake, and overall daily amounts. Variety and snack item response sets included four choices: *Almost always, usually, sometimes, and hardly ever*. For example, participants were asked, "How often do you eat more than one kind of fruit each day?" and were instructed to answer for *Before Today* and to indicate their intentions *After Today*. Categorical responses for intake (in cups) were > 2.5, 1.5 to 2.5, .5 to 1.5, < .5, and "not sure" for fruits and > 3.0, 2.0 to 3.0, 1.0 to 2.0, < 1.0, and "not sure" for vegetables.

Experts confirmed content validity and cognitive interviews with a representative sample (n=20) revealed face validity and format fidelity. Field-testing with 815 SNAP-Ed participants showed that data collection and analysis was feasible. Cronbach's $\alpha \geq .81$, a statistical test to assess uniformity of responses, was acceptable for both the retrospective-pre (Cronbach's $\alpha \geq .82$) and post (Cronbach's $\alpha \geq .81$) survey components. Socio-demographic data included age, ethnicity, race, education, and Supplemental Nutrition Assistance Program participation status. Program educators bulk-mailed completed surveys to researchers in addressed, stamped envelopes; class, location, nutrition program, and instructor identifiers were included.

Dietary intake was assessed from three 24-hour dietary recalls collected during telephone interviews performed by trained staff at The Pennsylvania State University Diet Assessment Center. All interviewers completed 40

hours of intensive training (Smiciklas-Wright, JADA 1991). Dietary recalls occurred on random days over a 3-week period with the calls beginning 3 weeks after the educational experience. Average call length was 20 minutes. Recall data were collected and analyzed using the Nutrition Data System for Research (NDS-R) software version 2006, developed by the Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN. NDS-R provides structured prompts that standardize data entry using a multiple pass system of interview methodology.

Food security was measured with the six-item Short Form of the USDA Household Food Security Scale, administered at time of second dietary recall. The Short Form consists of statements about household food availability or affordability; households listing more than one item were scored as food insecure (Bickel, Nord, Price, Hamilton, & Cook, 2000).

Data Analysis

Six dietary intake variables were constructed from 24-hour recall data: daily fruit, daily vegetables, fruit variety, vegetable variety, fruit snacks, and vegetable snacks. Daily fruit and vegetable variables were computed as mean cup equivalents, averaged from three 24-hour recalls. Average daily intake was recoded into a categorical variable with values that reflected a response range as denoted on the retrospective pre/post survey, (e.g., 1 to 2 cups was a category, and more than 2 to 3 cups was another category). Variety was assessed independently by two expert reviewers; a third expert reconciled differences. Daily variety was defined as consuming more than one kind of vegetable (fruit) in any amount as a meal, snack, or ingredient. For example, consuming potato salad that included onions would denote variety for that day. Number of days in which variety was observed could range from 0 to 3. A vegetable (fruit) snack was denoted by the presence of vegetables (fruit) in any amount consumed daily as a snack. Thus, variable values ranged from 0 (no vegetable/fruit snack consumption on any day) to 3 (vegetable/fruit snack consumption on all 3 recall days).

Intention to consume a specific amount of vegetables and fruits each day (as reported on the post/pre survey) was compared to diet recall responses using a schema shown in Table 1. Another schema interpreted diet recall variety and snack intake in the context of intention to consume vegetables and fruits (Table 1). Findings about intention and behavior were analyzed only for participants with 3 completed diet recalls (completers). Data were analyzed using descriptive statistics, Chi Square, and t-tests as appropriate. (SPSS, version 14.0, 2005, SPSS Inc, Chicago, IL). Statistical significance was indicated by $p < .05$.

Table 1.
Met Intention Schemata¹

Amount of Vegetables (Fruit) Consumed				
Daily mean³ intake in cup equivalents	Reported Dietary Intention on Post/Pre Survey			
	≥3 cups (≥2.5 cups)	2 - 3 cups (1.5 - 2.5 cups)	1 to 2 cups (0.5 - 1.5 cups)	< 1 cup (< 0.5 cup)
≥ 3 cups vegetables (≥ 2.5 cups)	Met	Met	Met	Met
Between 2 and 3 cups vegetables (Between 1.5 and 2.5 cups)		Met	Met	Met

1 to 2 cups vegetables (0.5 to 1.5 cups)			Met	Met
Less than 1 cup vegetables (Less than 0.5 cup)				Met
Dietary Intake Behaviors of (1) Variety and (2) Consumption as Snacks				
Number of diet recalls indicating presence of vegetable/fruit	Reported Dietary Intention on Post/Pre Survey			
	Almost Always	Usually	Sometimes	Hardly Ever
All three recall days	Met	Met	Met	
Two recall days		Met	Met	
One recall day			Met	Met
Zero recall days				Met
¹ "Met" indicates that intention reported on Post/Pre survey was met by the corresponding behavior reported through dietary recall. ² Amounts for fruit shown in parentheses. ³ Mean of three days				

Findings

The 133 participants who provided three diet recalls were more likely than the 56 participants who completed fewer than three diet recalls (non-completers) to have received education or training beyond high school ($X^2 = 3.973, p = 0.046$). Completers and non-completers did not differ in age, race, gender, food assistance program participation during the past year, recruitment period, and receipt of a high school diploma or GED. Completers who provided demographic information were primarily non-Hispanic (96.1%), white (61.8%), female (93.2%), and high school or GED graduates (75.2%); 59.5% received education or training beyond high school. The 18-30 year old age group comprised 53.8% of the sample, and 46.2% were aged 31-50. Most were Supplemental Nutrition Assistance Program participants within the past year (68.5%) and food secure (60.9%).

Post/retrospective-pre survey responses indicated that 33.8% of completers were (almost always/usually) consuming a variety of fruit at baseline; 66.2% were not (hardly ever/sometimes). Snacks that included fruit were eaten by 27.8% and 30.2% consumed more than 1.5 cups of fruit each day. Baseline perceptions of participants included consuming a variety of vegetables (59.4%), vegetable-inclusive snacks (15.0%), and more than 2 cups of vegetables each day (23.3%).

Intentions to Consume as Predictors of Dietary Behavior

More participants met intentions related to vegetable variety, quantity, and use as a snack than intentions for these behaviors related to fruits. As shown in Table 2, no more than two-thirds of participants met *any* fruit or vegetable intake intention; in fact, with the exception of vegetable variety, intake intentions were met by fewer than half of the participants. Of note is the inclusion of *static inaction* in this count. *Static inaction* refers to not practicing recommended dietary behaviors and denoting no intention to change dietary behaviors. *Static inaction* was identified for 27 (20.3%) participants, i.e. change was not intended and indeed they didn't change intake behavior. This phenomenon of *static inaction* did not apply to any specific fruit or vegetable response.

Table 2.
Intention Transformed to Behavior¹

Dietary Intake Variables	Met Intention (% , n)
Vegetable Variety (N=131)	66.4, 87
Vegetable Daily Amount (N=124)	44.4, 55
Vegetable Snack (N=131)	29.8, 39
Fruit Variety (N=129)	20.2, 26
Fruit Daily Amount (N=117)	24.8, 29
Fruit Snack (N=130)	19.2, 25
¹ Sample sizes vary due to missing responses.	

Participant characteristics unrelated to meeting dietary intentions included education/ training beyond high school, and Hispanic ethnicity. Significant relationships among participant characteristics and achievement of dietary intentions did not follow a pattern (as shown in Table 3). Only age was associated with meeting intentions for more than one of the intake behaviors, i.e. fruit amount and fruit variety.

Table 3.
Characteristics Significantly Associated with Meeting Fruit and Vegetable Dietary Intentions

Intended Fruit and Vegetable Intake Behaviors	Participant Characteristics					
	SNAP Participation¹	Age²	High School Diploma or GED³	Program Type⁴	Race⁵	Food Security Status⁶
Vegetable Variety	X ² = 4.159, p=.041		X ² = 4.389, p=.036			
Vegetable Snacks						
Vegetable Daily Amount				X ² = 3.914, p=.048		
Fruit Variety		X ² = 4.813, p=.028				X ² = 6.595, p=.010
Fruit Snack						
Fruit Daily Amount		X ² = 5.260, p=.022			X ² = 4.468, p=.035	

¹ Participants who had not participated in the Supplemental Nutrition Assistance Program (SNAP) over the past year were more likely to meet their vegetable variety intention.

² Participants who had completed high school or received a GED were more likely to meet their vegetable variety intention.

³ Participants who were recruited from EFNEP classes were more likely to meet their daily amount of vegetables intention.

⁴ Participants in the "18-30" age category were more likely to meet their fruit variety intention and intention for fruit cups.

⁵ Participants who were food insecure were more likely to meet their fruit variety intention.

⁶ Non-white participants were more likely to meet their intention for fruit cups.

Of the eighty-five participants who reported not including a variety of fruit in their diet at baseline, 47 (55.3%) indicated intending to increase the variety of fruit following educational intervention. However, only two of these 47 actually met the intended behavior; i.e., rather than a success rate of 55.3%, the educational intervention was successful for only 2.4%. Comparing intervention effectiveness using intention versus behavior for the five remaining fruit and vegetable dietary behaviors revealed similar findings. Of 52 not consuming fruit as a snack, but intending to do so, only 9.6% met their intention. Two of the 36 participants (5.6%) who were not consuming greater than 1.5 cups of fruit daily but intended to do so met their stated intention. Of 25 who did not consume more than one kind of vegetable daily, but intended to do so, 16 (64%) met their goal. Only two of the 39 (5.1%) who didn't eat vegetables as snacks but reported an intention to begin the practice, actually did. Six of the 32 participants (18.8%) who were not consuming greater than 2 cups of vegetables daily but intended to do so met their stated intention.

In all, meeting at least one intention to improve dietary intake of fruits and/or vegetables represented only 25 participants. These 25 participants were mostly food secure (72%), white (64%), high school graduates (92%), with 60% having education beyond high school.

Discussion

In this sample of 133 adults participating in an educational experience typical of a federally funded nutrition education program, few (25 or 18.8%) achieved an intended change in fruit or vegetable intake behavior, in amount, variety, or function. This finding is of interest because measurement of intention is a recommended nutrition education outcome measure, owing to use of the TPB in nutrition intervention development (Guillaumie, Godin & Vézina-Im, 2010) and reported advantages of the post/retrospective-pre assessment strategy (Rockwell & Kohn, 1989; Jayaratne, 2010).

Our findings are surprising because we were not measuring results of a specific intervention, but results from nutrition education following a field agency's typical practice of education delivery. Participants were recruited only from locations providing a lesson on fruits and vegetables or only vegetables. In addition, two separate recruitment periods were designed to account for seasonality of fruits and vegetables; the first recruitment period was held from July through August, and the second recruitment period was held from October through November. Intake of only two types (for fruits or vegetables) was liberally labeled as showing "variety." Fruit or vegetable snacking was defined by intake of "any amount" of fruit or vegetable.

Our snack and variety variables were constructed from our previous formative research with the target audience that examined what the response options *almost always*, *usually*, *sometimes*, and *hardly ever* represented to them. (Responses indicated that *almost always* meant approximately 6-7 times a week, *usually* meant 4-5 times

a week, *sometimes* was 2-3 times a week, and *hardly ever* represented 0-1 times/week.) Finally, dietary data were collected via telephone by professionally trained, experienced, and unbiased assessment staff utilizing three 24-hour recalls.

Interpretation of our findings was limited because association to a specific lesson, instructor, or protocol was not possible. In addition, we knew that nutrition education interventions typical of these federally funded programs routinely incorporate knowledge, motivation, personalization, self-efficacy, and taste testing, but specific lesson content and process information were not available.

Guillaumie, Godin, & Vézina-Im (2010) note that intervention components or variables predictive of behavior may not be predictive of intention. Intention is a complex phenomenon; temporal stability, implementation intentions, and context mediate the impact of intention on behavior so that merely capturing the presence of intention (as is common in many nutrition education programs) may be an inadequate and misleading outcome measure (Webb & Sheeran, 2006). Implementation intentions detail when, where, and how one will perform the intended behavior and have been shown to be useful to increase fruit intake (de Nooijer, de Vet, Brug, & de Vries, 2006). Our intention measure assessed only behavioral intention; including implementation intentions in our assessment may have improved the behavioral predictions from intention.

Self-determination theory posits that self-determined motivation, which is a more sophisticated form of intention, is a better predictor of behavior, including dietary behavior (Pelletier, Dion, Slovinec-D'Angelo, & Reid, 2004) and that intrinsic goals motivate behavior (Deci & Ryan, 2008). Our measure of intention did not differentiate goals or motivation source.

Contextual impact of intention on behavior is an important consideration (Shaikh, Yaroch, Nebeling, Yeh, & Resinow, 2008). Relational culture is the emphasis on interdependence and interconnectedness among individuals and groups and prioritization of these connections (Pasick & Burke, et al., 2009). Pasick & Barker, et al. (2009) in their examination of mammography screening and health care utilization by Latina and Filipina women argued that behavioral intention is not a universal construct, but subject to relational culture. Stewart, Rakowski, & Pasick (2009) noted that intention was a predictor of behavior for white women to have mammography, but not for non-whites. Mediation analyses of contextual factors related to fruit and vegetable behavior (e.g., gender, age, socioeconomic status, social support) will better predict fruit and vegetable intake. Higher quality psychosocial and behavioral measures and use of affective measures (e.g. taste or pleasure) have been suggested to better predict fruit and vegetable intake (Guillaumie, Godin, & Vézina-Im, 2010).

Sutton (2008) diagrams a less direct route between intention and behavior than the theory of planned behavior. In one path, intention directly leads to planning, which in turn leads to behavior. Another path bypasses intention altogether, suggesting that conviction to re-adopt a behavior directly affects either planning or behavior. Thus, a measure of intention in an intervention that affects this recovery may be a poor indicator of behavior.

Implications for Practice

The study of low-income participants in federally funded nutrition education programs in Pennsylvania reported here demonstrated that a measure of behavioral intention alone was not a valid measure of nutrition behavior. As a result, to correctly identify outcomes, we urge that our limited evaluation resources support 1) development and application of direct behavior assessments and 2) the design of nutrition education programs more likely to effect behavior change by addressing motivation, goal setting, implementation intention, skill building, learner readiness, social support, and interconnectedness.

For example, standard nutrition education practice has been to develop and release a comprehensive nutrition education program for low-income mothers, tested only for face validity and usability and including an intention-based survey. Our findings support social, technical, and fiscal capital allocation to program development that accommodates experience, learner readiness, goals, implementation intention, and social support of low-income women as well as robust evaluation using valid and reliable behavioral assessments. Accurately aimed nutrition education programs with multi-modal, intensive behavioral assessments may better cultivate nutrition education efficacy than current broadly defined, population-based approaches that require assumptions about low-income women's interests, skills, needs, experience, and food practices.

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