

Theory of Planned Behavior Explains Gender Difference in
Fruit and Vegetable Consumption

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Abstract

A gender difference in fruit and vegetable intake (FVI) is widely documented, but not well understood. Using data from the National Cancer Institute's Food Attitudes and Behavior Survey, we assessed the extent to which gender differences in FVI are attributable to gender differences in constructs from the Theory of Planned Behavior (TPB). Females reported more favorable attitudes and greater perceived behavior control regarding FVI than males, and these beliefs mediated the observed gender difference. Males reported greater perceived norms for FVI, but norms did not predict FVI. Gender did not moderate the influence of TPB constructs on FVI. Thus, TPB constructs substantially explained the gender difference. Interventions targeted toward adult males may benefit by promoting favorable attitudes and perceived behavioral control over FVI.

Keywords: Gender; fruit and vegetables; intake; theory of planned behavior.

Using the Theory of Planned Behavior to Explain the Gender Difference in Fruit and Vegetable Consumption

Nearly all public health authorities recommend fruit and vegetable intake (FVI) as an important preventive health measure (USDA/USDHHS, 2010; WHO, 2003). People who consume higher amounts of fruits and vegetables are less likely to be overweight (Lin & Morrison, 2002) and have a decreased risk of heart disease (Hu, 2003) and certain types of cancers (Steinmetz & Potter, 1996). FVI is also associated with the prevention of Type 2 diabetes, stroke, chronic obstructive pulmonary disease, cataracts, hypertension, and diverticulosis (see Van Duyn & Pivonka, 2000 for review). Older adults who consume more vegetables also experience slower rates of cognitive decline than peers (Kang, Ascherio, & Grodstein, 2005; Morris, Evans, Tangey, Bienias, & Wilson, 2006).

The U.S. Department of Agriculture and Department of Health and Human Services (2010) recommend adults consume at least 2 cups of fruits and 2 ½ cups of vegetables per day. However, adherence to these guidelines is typically low among Americans (Casagrande, Wang, Anderson, & Gray, 2007; CDC, 2007; Guenther, Dodd, Reedy, & Krebs-Smith, 2006; Serdula et al., 2004), and demographic differences in FVI are thoroughly established in the literature (Giskes, Turrell, Patterson, & Newman, 2002; Irala-Estevez et al., 2000; Thompson, Demark-Wahnefried, et al., 1999).

One robust demographic difference in FVI involves gender (i.e., Friel, Newell, & Kelleher, 2005; Johansson, Becker, Fagt, Thorgeirsdottir, & Valsta, 1999; Liang, Shediach-Rizkallah, Celentano, & Rhode, 1999; Roos, Lahelma, Virtanen, Prattala, & Pietinen, 1998; Thompson, Demark-Wahnefried, et al., 1999; Thompson, Margetts, Speller, & McVey, 1999; but see Casagrande, Wang, Anderson, & Gary, 2007; Stables et al., 2002 for exceptions).

Women are more likely than men to consume fruits and vegetables (Blanck, Gillespie, Kimmons, Seymour, & Serdula, 2008) and to meet recommended guidelines (Thompson, Yaroch, et al., 2011). This gender difference may also be widening. Between 1994 and 2000, both men and women showed either small declines or no change in their consumption of fruits and fruit juices, green salad, carrots, and nonfried potatoes. However, women increased their overall consumption of ‘all other vegetables’, whereas men did not (Serdula et al., 2004).

Very little evidence exists concerning the psychosocial factors that explain this gap. Baker and Wardle (2003) examined the extent to which knowledge, attitudes, and preferences explained gender differences in older British adults’ FVI. They found that knowledge, but not attitudes or preferences, partially explained the relationship between gender and FVI. However, this study did not assess variables from a comprehensive theory of health behavior, limiting the extent to which it could attribute gender to the psychosocial factors that commonly predict adherence to preventive health behaviors.

The Theory of Planned Behavior (TPB) is a useful framework for predicting and explaining people’s engagement in a variety of health behaviors (Ajzen, 1991; Armitage & Conner, 2001). The TPB proposes three primary determinants of people’s intentions and behaviors: attitudes, perceived behavioral control, and perceived norms. Each of these determinants is thought to arise from underlying beliefs held by the individual (Fishbein & Ajzen, 2010). Attitudes reflect the degree to which a person views the behavior as favorable or unfavorable, and results from beliefs about the outcomes of the behavior and the evaluation of those outcomes (Fishbein & Ajzen, 2010). For example, favorable attitudes toward FVI could arise from the belief that FVI provides meaningful health benefits or that fruits and vegetables taste good. Perceived behavioral control refers to perceptions of the relative ease or difficulty of

performing the behavior; these perceptions are informed by beliefs about the relative power of internal and external factors to facilitate or impede performance (Ajzen, 1991; Fishbein & Ajzen, 2010). Perceived norms reflect perceptions of social pressure to engage in the behavior, and they arise from a person's beliefs about whether others want him or her to engage in the behavior, whether others engage in the behavior, and the person's motivation to comply.

The TPB has been applied to healthy eating (e.g., high fiber diet, low fat diet, FVI) with some predictive success (e.g., Conner, Norman, & Bell, 2002; De Bruijn et al., 2007; Kothe, in press; Paisley & Sparks, 1998; Povey, Conner, Sparks, James, & Shepherd, 2000a; Sjoberg, Kim, & Reicks, 2004). In a review of 23 studies examining the predictors of FVI, Guillaumie and colleagues (2010) found the TPB to be a useful model for predicting intentions and behavior in FVI. These prior studies show that attitudes, perceived norms, and perceived behavioral control account for anywhere from 30% to 57% of the variance in intentions (Paisley & Sparks, 1998; Povey et al., 2000a), and between 6% and 32% of variance in behavior (Connor et al., 2002; Povey et al., 2000a). Attitudes and perceived behavioral control typically emerge as the strongest predictors of healthy eating (Povey, Conner, Sparks, James, & Shepherd, 2000b; Sjoberg et al., 2004). In contrast, perceived norms often show little or no relationship to healthy eating (Louis, Chan, & Greenbaum, 2009; Paisley & Sparks, 1998).

Gender and TPB constructs may interact to explain FVI in two ways. First, gender differences in TPB constructs may explain gender differences in FVI; thus, TPB constructs may mediate the association between gender and FVI. No studies, to our knowledge, have examined this question. Second, TPB constructs may differentially predict FVI for males compared to females; that is, gender may moderate the association between TPB constructs and FVI. In two prior studies, Blanchard and colleagues (2009a, 2009b) examined this question but did not find

that gender moderated the influence of attitudes, perceived behavioral control, or perceived norms on FVI.

The aim of the current study was to examine gender differences in FVI through the lens of the Theory of Planned Behavior. Using data from the National Cancer Institute's Food Attitudes and Behaviors (FAB) survey, we tested two models. One model examined whether gender differences exist within TPB constructs, and whether these differences explain observed gender differences in FVI. The second model tested moderation by examining whether TPB constructs were differentially predictive of FVI for men compared to women.

Method

Study Design and Participants

We analyzed cross-sectional data from the National Cancer Institute's Food Attitudes and Behaviors survey. In the Fall of 2007, the survey was mailed to 5,803 potential adult respondents in a Consumer Opinion Panel along with a \$5 incentive. The final sample consisted of 3,397 participants, corresponding to a response rate of 57%. Sixty percent of the sample was female and the majority of the sample self-classified as Non-Hispanic Whites (64.38%). Approximately 30% had a high school degree and another 30% had at least some college. Thirty-nine percent of the sample was between 35 and 54 years of age [Table 1]. The study was approved by the National Cancer Institute's institutional review board.

Measures

The FAB survey asked participants a battery of questions concerning their attitudes, beliefs, and behaviors regarding food, specifically FVI. From these questions, we constructed three variables that assessed beliefs relevant to the TPB constructs of attitudes, perceived behavioral control, and perceived norms.

Attitudes. Eleven items in the FAB aligned with the TPB construct of attitudes, assessed indirectly via behavioral beliefs about FVI. Behavioral beliefs represent the extent to which a behavior is perceived to produce an outcome, and, in conjunction with evaluation of these outcomes, determine individuals' attitudes toward the behavior (Fishbein & Ajzen, 2010). Six of these items were prefaced by the stem "Think about yourself, if you were to eat plenty of fruits and vegetables every day, how likely would you be to...". Participants then responded on a scale from 1 ("Not at All Likely") to 5 ("Very Likely") for "have more energy," "live a long life," "control your weight," "look better," "be 'regular,'" and "feel good about yourself." Five other items were reasons that respondents marked for eating fruits and vegetables: "it is important for being as healthy as possible," "I believe it is a good thing for my health," "I believe it is very important for me," "it is an important choice I really want to make," and "it is consistent with my life goals." This 11-item scale had strong reliability, $\alpha = .90$.

Perceived Behavioral Control. Perceived behavioral control represents a personal evaluation of how easy or difficult the behavior is to perform, and can be assessed using items relating to a person's confidence in his or her ability to perform the behavior (Ajzen, 1991; Fishbein & Ajzen, 2010). One set of questions in the FAB survey asked participants, "Assuming that you want to, how confident are you that you could do each of the following starting this week and continuing for at least 1 month?" Respondents answered 7 items related to this stem, on a scale from 1 ("Not at All Confident") to 5 ("Very Confident"). Items included how confident they were that they could eat a healthy snack like a fruit or vegetable "when you're really hungry," "when you are tired," "when there are junk foods in your house," "when your family and friends are eating junk foods," "instead of cake, cookies, candy," and "while

watching TV”; an additional item asked about confidence to “buy or bring fruits and vegetables to eat at work.” Reliability for this scale was also strong, $\alpha = .92$.

Perceived Norms. The TPB construct of perceived norms refers to the perceived social pressure to perform (or not perform) a behavior (Ajzen, 1991). As an indirect measure of perceived norms, we used 8 items from the FAB survey that captured normative beliefs relating to the perception of social pressure to engage in FVI. Because of limitations in the FAB dataset, all items represent injunctive norms, or the perception that other people approve of and want the individual to increase FVI. Three items asked respondents to endorse statements using a 1 (“Strongly Disagree”) to 5 (“Strongly Agree”) scale, including “My friends and family encourage me to eat fruits and vegetables,” “My family and friends remind me not to eat junk food,” “My family or friends would say something to me if they saw I was not eating fruits and vegetables.” Five of the questions asked respondents to indicate the extent to which a reason for FVI was true, on a 1 (“Not True at All”) to 5 (“Very True”) scale. These items included “others would be upset with me if I did not,” “I feel pressure from others to eat fruits and vegetables,” “I want others to approve of me,” “I want others to see I can do it,” and “I don’t want to let others down.” This 8-item scale had good reliability, $\alpha = .81$.

Fruit and Vegetable Intake (FVI). Detailed questions asked participants about their FVI over the past month, including juices, fruits, salads, non-fried potatoes, dried beans, other vegetables, and tomato sauce. An example of phrasing was “During the last month, how often did you eat cooked dried beans, such as refried beans, baked beans, bean soup, and pork and beans?” Participants responded on a scale ranging from “Never” to “Five or more times per day.” Following procedures detailed elsewhere (NCI, 2011), responses were converted to cup equivalent of fruits and vegetables (without fried potatoes) per day.

Results

Gender Differences in Fruit and Vegetable Intake

FVI was positively skewed, ranging from 0 to 50.25 cups per day ($M = 3.14$, $SD = 3.82$). Twenty-eight participants who reported more than 20 cups per day were outliers ($+3$ SD s from mean), and were excluded from all analyses. Among the remaining participants, the average fruit and vegetable intake per day was 2.91 cups ($SD = 2.81$).

Consistent with prior research, women reported greater FVI than men, $t(3198) = -3.38$, $p < .001$. Women reported FVI of over 3 cups per day ($M = 3.04$, $SD = 2.87$), whereas men reported under 3 cups ($M = 2.70$, $SD = 2.67$). This gender difference was also apparent when examining the proportion of women and men reporting FVI greater than the recommended 4.5 cups per day. A significantly larger proportion of women (20.4%) than men (16.7%) met this recommendation, $\chi^2(1) = 7.26$, $p < .01$.

Gender Differences in TPB Constructs

Attitude toward FVI was more favorable among females ($M = 3.97$, $SD = .75$) than males, ($M = 3.65$, $SD = .83$), $t(3301) = -11.31$, $p < .001$. Further, on each behavioral belief item comprising the attitudes construct, women reported more favorable beliefs than men, $p < .001$.

Females also reported greater perceived behavioral control over FVI ($M = 3.75$, $SD = .96$) than males ($M = 3.50$, $SD = 1.07$), $t(3291) = -6.91$, $p < .001$. Across all items comprising the construct, women reported higher confidence than males, $p < .001$.

Males reported greater perceived norms regarding FVI ($M = 2.29$, $SD = .83$) than females ($M = 2.13$, $SD = .81$), $t(3305) = -5.66$, $p < .01$. On all items except one ("I want others to see I can do it", $p > .10$), men reported stronger normative beliefs than women.

Do TPB Constructs Mediate Gender Differences in FVI?

To examine whether these gender differences in TPB constructs explain gender differences in FVI, we used methods described by Preacher and Hayes (2008) which estimate path coefficients in multiple mediator models and provide bootstrap confidence intervals for indirect effects. In this mediational model, gender was the independent variable; attitudes, perceived behavioral control, and perceived norms were mediators; and covariates included age, education level, ethnicity/race, and geographic location (see Blanck et al., 2011, and Thompson, Willis et al., 2011, for prior use of these covariates in the FAB survey). We used Hayes and Preacher's (2011) 'INDIRECT SPSS' macro to compute parameter estimates and confidence intervals.

Figure 1 displays results from the mediation analysis. Consistent with the TPB, favorable attitudes predicted greater FVI, $\beta = .14$, $t(3150) = 7.37$, $p < .001$. More importantly, there was a significant indirect effect of gender on FVI through attitudes, $\beta = .20$, $B = .16$, $CI = .11, .22$, $p < .01$. [Figure 1]. Ancillary analyses showed that significant indirect effects of three specific behavioral beliefs drove this effect: "I personally believe it is a good thing for my health" ($CI = .05 - .14$), "it is consistent with my life goals" ($CI = .05, .14$), and "I have carefully thought about it and believe it is very important for me" ($CI = .01 - .12$).

Greater perceived behavioral control also predicted greater FVI, $\beta = .25$, $t(3150) = 13.67$, $p < .001$. There was also a significant indirect effect of gender on FVI through perceived behavioral control, $\beta = .12$, $B = .18$, $CI = .12, .22$, $p < .01$. Ancillary analyses showed that this effect was driven by significant indirect effects of participants' confidence in eating FV in four specific contexts: "bringing fruits and vegetables to eat at work" ($CI = .02 - .10$), "when tired" ($CI = .02 - .09$), "when there are junk foods in your house" ($CI = .01 - .08$), and "while watching TV" ($CI = .00 - .09$).

Perceived norms was not a significant predictor of FVI, $\beta = .03$, $t(3150) = 1.93$, $p > .05$. Thus, there was no significant indirect effect of gender on FVI through perceived norms, $\beta = -.11$, $B = -.02$, $CI = -.05, .002$, $p = .05$.

Importantly, gender did not have a significant direct effect on FVI after accounting for the indirect effects of the TPB constructs, $p > .05$. Attitudes, perceived behavioral control, and perceived norms together accounted for 87% of the relationship between gender and FVI. Thus, gender differences in FVI were adequately explained by the TPB.

Does Gender Moderate Relationships Between TPB Constructs and FVI?

In a second model, we examined whether gender moderated the associations between any of the TPB constructs and FVI. In this model, we included gender, the three TPB constructs, all interaction terms between gender and the TPB constructs, and covariates described earlier. All interactions between gender and TPB constructs were not significant (p 's $> .05$), indicating that gender did not significantly moderate the association between any of the TPB constructs and reported FVI.

Discussion

The present study aimed to understand the psychosocial factors that may underlie observed gender differences in fruit and vegetable intake. Consistent with prior research, women reported more FVI than men. Furthermore, women reported greater perceived behavioral control and more favorable attitudes toward FVI. In contrast, men reported greater perceived norms regarding FVI. Most importantly, we found clear evidence that the gender differences in attitudes and perceived behavioral control significantly mediated the observed gender difference in FVI. Specifically, American men's relatively low FVI was explained by weaker beliefs in the

importance of FVI for health, as well as lesser confidence in the ability to eat FV at work, when tired, when watching television, and when other junk foods are available.

To our knowledge, the only other study to examine psychosocial factors underlying the gender difference in FVI (Baker and Wardle, 2003) found that females' greater knowledge—but not attitudes—partially explained the gender difference in FVI. This study, however, focused on older adults attending a population-based cancer screening in the United Kingdom prior to 2000. Thus, the discrepancy between our findings and Baker and Wardle's (2003) findings may be due to differences in the age, cultural context, or health motivations of the two samples. For example, attitudes may better explain disparities in FVI among a population-based sample such as the FAB respondents, rather than among a sample pre-selected for adherence to recommended health behaviors, as was Baker and Wardle's (2003) sample.

Interestingly, males reported greater perceived norms regarding FVI compared to females. Our measure of norms assessed injunctive norms, or the perception that other people approve of and want the individual to increase FVI. Injunctive norms contrast with descriptive norms, which represent the perception of the extent to which others practice the behavior. The unexpected finding regarding perceived norms may make sense considering the injunctive nature of our measure. To the extent that other people perceive men's FVI as inadequate, men may indeed experience greater pressure from others to increase FVI. However, this pressure may not necessarily influence men's intentions and behavior if they misperceive their own FVI as adequate. Thus, increasing men's knowledge of FVI recommendations may be an important step in addressing gender differences in FVI (cf., Baker & Wardle, 2003).

Perceived norms did not significantly predict FVI in our sample, a finding corroborated in another review (Shaikh et al., 2008). Perceived norms, particularly descriptive norms, tend to

be weaker predictors of health-promoting behaviors compared to health-risk behaviors, and for older samples compared to younger samples (Rivis & Sheeran, 2003). Thus, our findings confirm the limited role of perceived norms in predicting the health-promoting behavior of FVI among adults.

Consistent with prior research, gender did not moderate the influence of any TPB construct on FVI. Thus, there is no reason to expect that a particular TPB construct will be more motivating for men than for women. Rather, interventions that aim to increase men's FVI consumption should emphasize the TPB constructs on which males tend to report low levels.

The FAB data is cross-sectional, so causality cannot be inferred. Furthermore, as the study was cross-sectional, it did not include questions about respondents' intentions to consume fruits and vegetables. According to the Theory of Planned Behavior, intention is the most proximal predictor of behavior, with attitudes, perceived behavioral control and perceived norms influencing behavior via intentions. Thus, we were unable to test the complete TPB model with the available data. Despite this theoretical limitation, our results have practical significance, as interventions more often seek to promote favorable attitudes, perceived behavioral control, and social norms, rather than directly increase intentions. Thus, of the components of the TPB, this study included the beliefs and constructs most often targeted in interventions. Lastly, although the FAB survey utilized a population-based sample, it did not use probability sampling so the results may not be generalizable to the American population as a whole.

Despite these limitations, our findings demonstrate that among a large sample of American adults, males reported less favorable attitudes and less perceived behavioral control for FVI, and these beliefs significantly predicted self-reported FVI. In contrast, perceived norms did not explain gender differences. Thus, our findings do not support the use of social normative

interventions for promoting FVI among adult American men. Rather, interventions that aim to increase FVI among adult males may do well to promote favorable attitudes toward fruits and vegetables and enhance men's perceptions of control over increasing FVI.

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Table 1

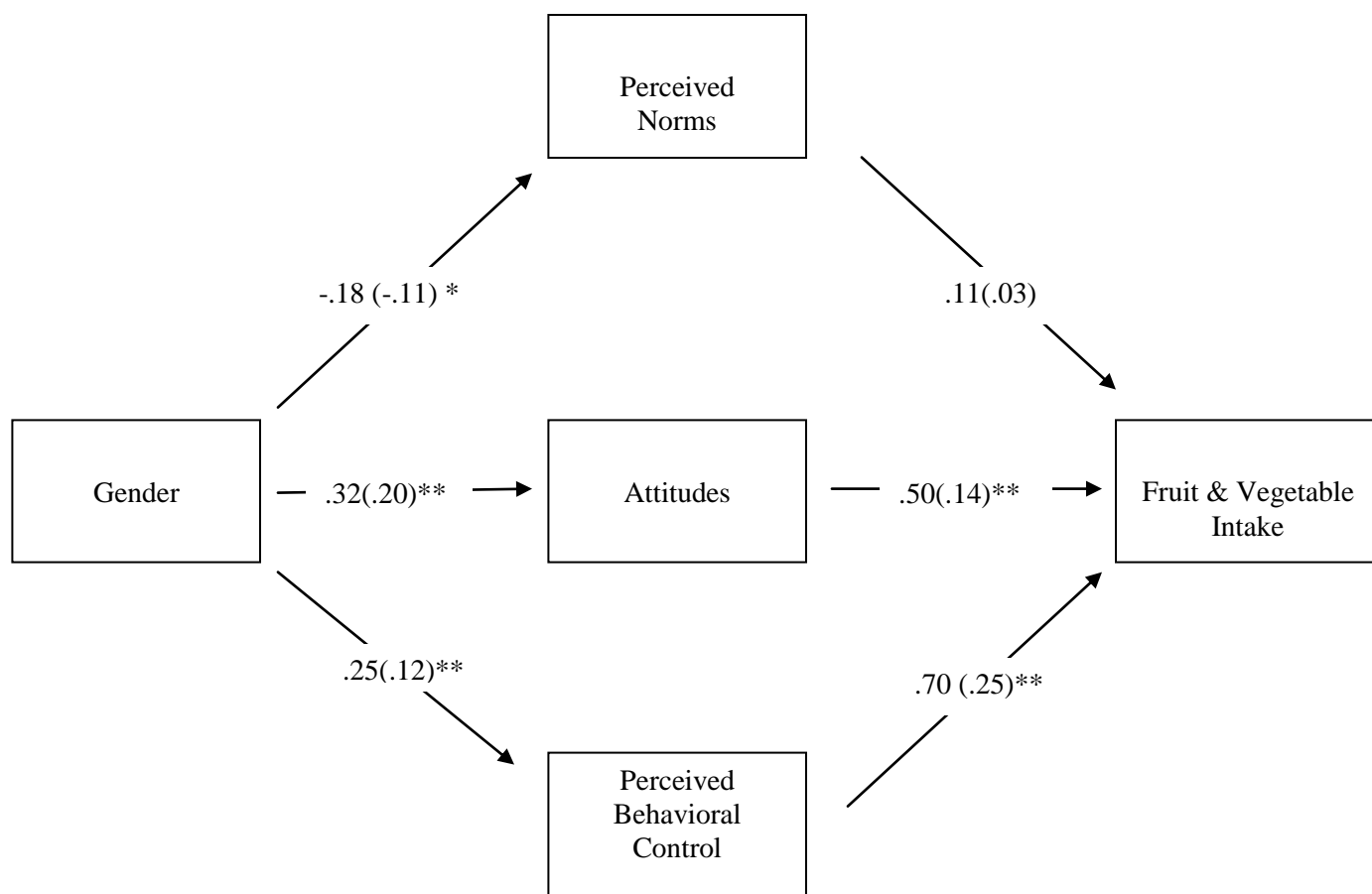
Demographic Composition of Sample

Characteristic	<i>N</i>
Sex	
Male	1300
Female	2009
Age Range	
18-34	949
35-54	1312
>55	1053
Education	
Less than HS	408
HS	1008
Some College	993
College or more	901
Race	
White	2187
Black	834
Hispanic	133
Asian	49
American Indian	19
Native Hawaiian	4
Mix non-Hispanic	88
Unknown	85
Geographic Region	
New England	167
Middle Atlantic	498
E. North Central	528

W. North Central	205
South Atlantic	738
E. South Central	252
W. South Central	382
Mountain	195
Pacific	432

Note. HS = high school.

Figure 1. Mediation model examining the TPB constructs in FVI. Values represent unstandardized path coefficients; values in parenthesis represent standardized path coefficients.



Note: $*$ $p < .05$. $**$ $p < .01$. Gender coded as 0 = male, 1 = female.