

# Theory of Planned Behavior and Multivitamin Supplement Use in Caucasian College Females

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Published online: 2 April 2008  
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**Abstract** The objective of this study was to identify predictors of the use of multivitamin supplements (MVS) among Caucasian college females utilizing the Theory of Planned Behavior (TPB). Variables of the TPB and the self-reported use of multivitamin supplements were measured by two separate surveys within 1 week with a convenience sample of 96 Caucasian college student females. Two attitudinal beliefs and one control belief significantly predicted behavioral intention to use multivitamin. A belief that taking multivitamin supplements helps to feel and look good was the most important predictor of the use of multivitamin supplements. *Editors' Strategic Implications:* Findings from this study, although in need of replication, suggest that prevention campaigns would be more successful if messages used to reach these females were consistent with perceived beliefs regarding benefits of using MVS. More broadly, TPB appears to offer a useful framework for understanding or predicting behavior based on psychological constructs theorized to influence behavior.

## Introduction

In the United States, neural tube defects (NTD) affect approximately 4,000 pregnancies each year (Centers for Disease Control and Prevention 1992; Honein et al. 2001). Substantial evidence links inadequate folic acid status of the mother to

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the occurrence of NTD in offspring (Berry et al. 1999; Czeizel and Dudas 1992; Czeizel et al. 1994; Honein et al. 2001; Kirke et al. 1992; Laurence et al. 1981; Medical Research Council 1991; Milunsky et al. 1989; Mulinare et al. 1980; Shaw et al. 1995). Consequently, in 1992, the Centers for Disease Control and Prevention (CDC) and the American Academy of Pediatrics recommended that all women of child bearing age use supplements containing folic acid and/or consume fortified foods in addition to a varied diet to ensure adequate folic acid intake during this critical period (CDC 1992; Desposito and Cunniff 1999). Subsequent to this recommendation, the Food and Drug Administration (FDA) mandated fortifying flour with 140 mcg of folic acid per 100 grams, effective January 1998 (FDA 1996). Since the implementation of this fortification policy, a 19–26% decline in NTD has been observed (CDC 2004; Honein et al. 2001). However, several investigators have suggested that a 50–100% rate of prevention of NTD could be achieved with widespread use of supplements containing folic acid, such as a multivitamin (Czeizel and Dudas 1992; Kirke et al. 1992; Medical Research Council 1991). The March of Dimes (n.d.-a, n.d.-b) recommends that women eat a balanced diet that includes folic acid-rich foods, but also recommends that more be done to promote the use of multivitamin supplements (MVS) among women capable of giving birth.

Despite these recommendations, awareness that folic acid may prevent NTD and use of folic acid-containing supplements such as MVS showed only a modest increase between 1995 and 2005 (CDC 1998, 1999, 2001, 2004, 2005). Even more troubling, recent data show an actual decline in the rate of folic acid-containing MVS use (CDC 2005). Rates of daily use of MVS range from 9 to 43% (CDC 1998, 1999, 2001, 2004, 2005). Caucasian, well-educated women use MVS most frequently, while ethnic minority women, women 25 years of age and younger, and those with low-incomes have lower rates (CDC 1998, 1999, 2001, 2004, 2005).

### Purpose and Rationale

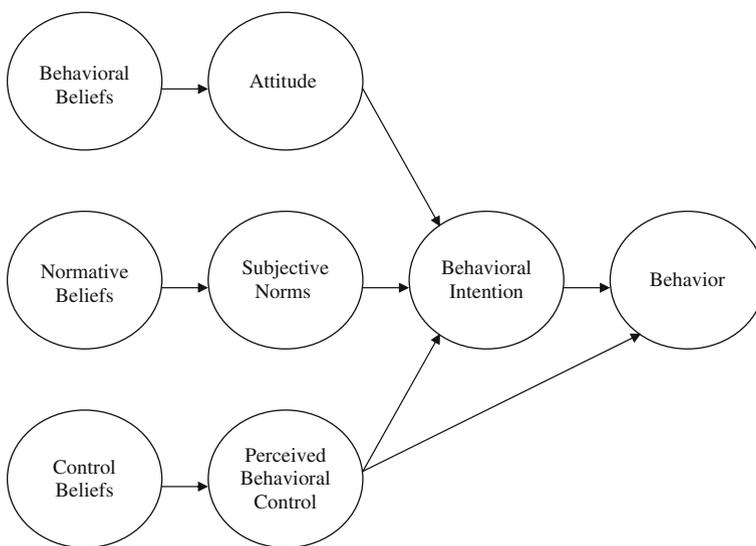
The most effective strategy for lowering the risk of giving birth to an infant with NTD is to use an MVS containing folic acid. Unfortunately, several studies have indicated that college aged women have lower intakes of MVS compared to older females (CDC 1998, 1999, 2001, 2004, 2005). Moreover, while female college students do not typically plan to become pregnant, up to 50% of those who are sexually active use no contraception, placing them at risk of unintended pregnancy (Montgomery and Mayne 2000). Indeed, results based on the National Survey of Family Growth showed that 75% of pregnancies among 18- and 19-year-old women were unintended. The proportion of unintended pregnancies among females 20–24 years old was about 58.5% (Henshaw 1998). Thus, college aged women may be regarded as a high-risk group for having a child with a NTD due to a combination of risk factors including low socioeconomic status, age-related risk, sexual behavior, and low compliance with MVS use.

In the past, educational campaigns targeted at women of childbearing age focused on defining folic acid, identifying foods rich in folic acid, and explaining the importance of the regular use of folic acid-containing supplements to prevent

NTD. Despite these educational efforts, many women of childbearing age, including college aged females, are still not able to recall spontaneously what folic acid is, how to obtain adequate amounts of it from food, or identify the most critical time when adequate intakes of this vitamin are required (CDC 1998, 1999, 2001, 2005). It is essential to identify psychosocial correlates of MVS use among females capable of giving birth, especially those younger than 25. Identification of such correlates would help in designing effective educational interventions targeted at women capable of becoming pregnant to increase their compliance with the folic acid recommendation. To date, however, little is known concerning the characteristics associated with MVS use among women of reproductive age, especially among college-aged women. Therefore, the purpose of this study was to identify specific predictors of MVS use among Caucasian female college students aged 18–25 attending a mid-sized southern university, using the Theory of Planned Behavior (TPB).

### Theoretical Framework

The TPB (Fig. 1) offers a framework for understanding or predicting behavior based on psychological constructs theorized to influence behavior (Ajzen 1991; Ajzen and



**Fig. 1** Theory of planned behavior. *Behavior*—the use of multivitamin supplements. *Behavior intention*—plans to perform a behavior. *Attitude*—a positive or negative evaluation to perform the particular behavior. *Subjective norms*—social pressure implied by important referent individuals' or groups' approval or disapproval of engaging in a given behavior. *Perceived behavioral control*—perceived ease or difficulty of performing the behavior. *Behavioral beliefs*—a person's perceived outcomes of conducting a behavior and the evaluation of those outcomes. *Normative beliefs*—a social pressure implied by important referent individuals or groups weighted by a motivation to comply with such pressure. *Control Beliefs*—beliefs concerning the presence or absence of resources and the impediments to behavioral performance and perceived power or impact of each resource/impediment to facilitate or inhibit the behavior

Fishbein 1980). The intention to perform a behavior, such as the use of MVS, is thought to be influenced by attitudes, subjective norms, and perceived behavioral control toward the behavior, which are in turn determined by salient information, or salient beliefs about that behavior, called behavioral, normative, and control beliefs, respectively. Salient beliefs are a function of an expectancy-value framework. The expectancy-value framework of behavioral beliefs consists of expectancy, defined as a person's perceived outcomes of conducting a behavior, and value, defined as the evaluation of those perceived outcomes.

Attitudes toward a behavior constitute one's evaluation of a behavior. Attitudes are thought to be influenced by behavioral beliefs about the consequences of the behavior and by positive or negative judgments about these consequences. For example, if an individual holds the belief that eating a high fiber diet will reduce the risk of colon cancer, and the individual places a high value on reducing this risk, the TPB would suggest that the individual's attitude toward eating a high fiber diet would be favorable. This in turn would influence that individual's intention to consume, and subsequently to consume, such a diet.

Subjective norms are defined as social pressures to perform or not perform a behavior. They are thought to be driven by normative beliefs, beliefs about how significant others would like an individual to act with regard to a particular behavior, and by outcome evaluations, the value the individual places on those normative beliefs. Following the example presented above, if a person's spouse and children encouraged him or her to eat a high fiber diet and the individual valued the family's concern and opinion, the individual's subjective norm would influence his or her intention to eat a high fiber diet.

Perceived behavioral control is defined as perceived ease of performing the behavior. It is influenced both by situational and internal factors that could inhibit or facilitate performing the behavior. For example, lack of awareness about how to purchase and prepare high fiber foods, or lack of access to these foods, could influence perceived behavioral control. This in turn would impact the intention to perform the behavior, which itself is theorized to be the most important direct predictor of behavior (Ajzen 1991; Ajzen and Fishbein 1980). Each of the constructs of the TPB can be measured using a standardized approach (Ajzen 1991; Ajzen and Fishbein 1980).

The TPB has been used extensively to predict various kinds of behaviors, including health behaviors. Godin and Kok (1996) published a review of the application of the TPB to explain a variety of health related behavioral categories, including addictive behavior, screening, eating, exercising, use of condoms, HIV/AIDS, and oral hygiene. The reviewers considered 56 studies that included 86 applications of the theory. Since then, TPB has been applied numerous times to predict health related behavior such as the use of condoms, the use of complementary medicine, and a number of diet-related behaviors such as following low fat diet, use of dietary supplements, and use of MVS (Albarracin et al. 2001; Backman et al. 2002; Conner et al. 2001; Furham and Lovett 2001; Pawlak et al. 2005). In this study we used TPB to identify and assess factors perceived important to Caucasian female college students regarding the use of MVS.

## Methods

### Study Design

Two survey instruments, the Survey of the Theory of Planned Behavior (STPB) and the Survey of the Use of Multivitamin Supplements (SUMS), were developed by the researchers. These two surveys were administered 1 week apart to measure statements within the variables of the TPB and to assess the use of MVS. A preliminary open-ended survey was used several weeks prior to administration of the STPB to elicit the expectancy components of salient behavioral, normative, and control beliefs relative to the use of MVS in the targeted population.

### Survey Instruments

The researchers used the methods of Ajzen (2002) to develop the STPB questionnaire and to measure the constructs of the TPB related to the use of MVS. Behavioral, normative, and control beliefs regarding MVS were obtained from questionnaires completed by eight female student volunteers, six of whom were Caucasian. The most frequently identified salient beliefs (based on frequency count) were subsequently included in the STPB. In addition, standard-scaled statements adopted from the literature tailored toward the behavior of interest (the use of MVS) were included in the STPB (Ajzen and Fishbein 1980; Conner et al. 2001).

Three female volunteers assisted with cognitive testing of the STPB. These students expressed their cognitive understanding of the statements included in the STPB with regard to all statements. Two statements included in the STPB were rephrased as suggested by these students.

Fifteen female college student volunteers (mean age = 22.4), representing a variety of majors from two undergraduate general education courses, completed a pilot administration to assess reliability of the STPB.

The final STPB questionnaire contained 36 statements, each of which was rated by respondents on a seven point Likert scale, from one (disagree) to seven (agree). Reliability analysis was conducted separately for attitude, subjective norms, perceived behavioral control, and behavioral intention. The Cronbach alpha reliability scores were 0.95 for behavioral intention, 0.93 for attitude, 0.90 for subjective norms, and 0.84 for perceived behavioral control. Statements as grouped by the TPB construct are shown in Table 1. A variable score was calculated for each construct by obtaining the mean score for all questionnaire items included under that construct. For data analysis purposes, a seven-point bipolar scale, ranging from minus three (strongly disagree) to three (strongly agree) was used to measure the value statement of each respective salient belief (Ajzen and Fishbein 1980). The value of salient beliefs was determined by multiplying each statement within behavioral, normative, and control belief by the corresponding value statement of that belief. The summation of scores within behavioral, normative, and control beliefs yielded the actual measurement of the respective constructs. Thus, the estimation of salient beliefs was expressed by the following formula:  $SB = \sum(e \times v)$ , where SB refers to

**Table 1** Statements included in the STPB by TPB constructs

Item
<i>Behavioral intention</i>
I intend to take a multivitamin supplement each day next week
I will try to take a multivitamin supplement each day next week
I plan to take a multivitamin supplement each day next week
I want to take a multivitamin supplement each day next week
It is very likely that I will take a multivitamin supplement each day next week
<i>Attitude</i>
I think that my taking a multivitamin supplement each day next week would be healthy
I think that my taking a multivitamin supplement each day next week would be beneficial
I think that my taking a multivitamin supplement each day next week would be smart
I think that my taking a multivitamin supplement each day next week would be pleasant
I think that my taking a multivitamin supplement each day next week would be favorable
<i>Subjective norms</i>
People who are important to me would think I should take a multivitamin supplement each day next week
People whose opinion I value would think I should take a multivitamin supplement each day next week
My family (e.g. parents, siblings) thinks I should take a multivitamin supplement each day next week
My peers would approve of my taking a multivitamin supplement each day next week
<i>Perceived behavioral control</i>
It would be easy for me to take a multivitamin supplement each day next week
I will have the opportunity to take a multivitamin supplement each day next week
I am very confident I could take a multivitamin supplement each day next week
I can afford buying multivitamin supplements
<i>Behavioral beliefs</i>
Taking a multivitamin supplement each day next week would improve my health
Being healthy is important to me
Taking a multivitamin supplement each day next week would help me to get nutrients I do not get in my diet
Getting all nutrients I need is important to me
Taking a multivitamin supplement each day next week would give me extra energy
Getting extra energy from multivitamin supplements is important to me
Taking a multivitamin supplement each day next week would help me look and feel better
Looking and feeling good is important to me
<i>Normative beliefs</i>
My family (e.g. parents, siblings) thinks I should take a multivitamin supplement each day next week
It is important to me what my family thinks about my taking multivitamin supplements
My peers approve of my taking a multivitamin supplement each day next week
It is important to me what my peers think about my taking multivitamin supplements
My doctor wants me to take a multivitamin supplement each day next week
It is important to me what my doctor thinks about my taking multivitamin supplements
<i>Control beliefs</i>
It would be difficult for me to remember to take a multivitamin supplement each day next week
Remembering to take multivitamin supplements would make taking them more difficult
I can afford buying multivitamin supplements
The cost of multivitamin supplements would prevent me from taking them

a salient belief,  $\sum$  is the sum of,  $e$  stands for expectancy component, and  $v$  is a symbol for value statement of salient beliefs.

### Subjects and Recruitment

The research protocol was approved by the Human Subjects Protection Review Committee at the University of Southern Mississippi. Study questionnaires were distributed and completed by 96 Caucasian female students, mean age of 21.45 (SD = 1.6), in classrooms during regularly scheduled classes. One week following the administration of STPB, 74 (77%) participants completed a one-question survey on the frequency of MVS use during the previous week.

### Data Analysis

SPSS for Windows software was used for data analyses. Multiple linear regression was performed to evaluate how well the combination of attitude, subjective norms and perceived behavioral control predicted behavioral intention to take MVS. Logistic regression determined the extent to which the TPB predicted self-reported use of MVS. A one-way analysis of variance was conducted to assess any differences in the mean score of behavioral intention between MVS users and nonusers, and between those who did and did not receive a federal student loan.

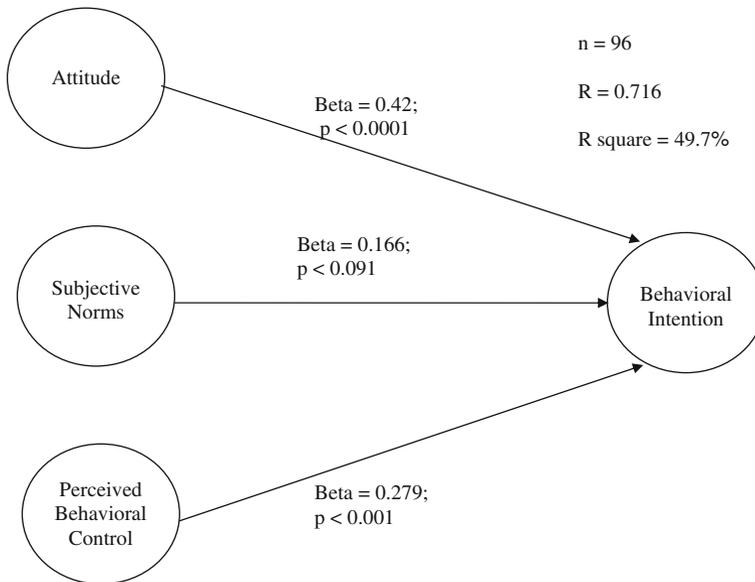
## Results

### Demographic Characteristics

The mean age of the 96 STPB participants was 21.4 years (SD = 1.6). The second survey, on MVS use, was completed by 74 of the 96 original students (77.1%). All participants were Caucasian females enrolled in undergraduate general education courses in the summer semester of 2003. Forty-eight participants (50%) received at least one of four governmental loans based on financial need. The four loans included Pell Grant, Federal Supplemental Educational Opportunity Grant, Federal Work Study, or Federal Perkins Loan. Eligibility to receive these loans was used as a proxy for low-income status.

### Findings

All variables of the TPB significantly correlated with each other, exhibiting moderate to high correlations. Figure 2 shows the results of multiple linear regression analysis. The multiple correlation of attitude, subjective norms, and perceived behavioral control significantly correlated with measures of behavioral intention ( $R = .716$ ). The linear combination of attitude, subjective norms, and perceived behavioral control together accounted for 49.7% (adjusted R square) of the variance in behavioral intention ( $F[3, 92] = 32.29, P < .001$ ). Attitude had the greatest influence ( $\beta = .42, P < .0001$ ), followed by perceived behavioral control ( $\beta = .279, P < .001$ ), and subjective norms ( $\beta = .166, P < .091$ ).



**Fig. 2** Beta coefficients and correlations between attitude, subjective norms, and perceived behavioral control and behavioral intention based on results of multiple linear regression analysis

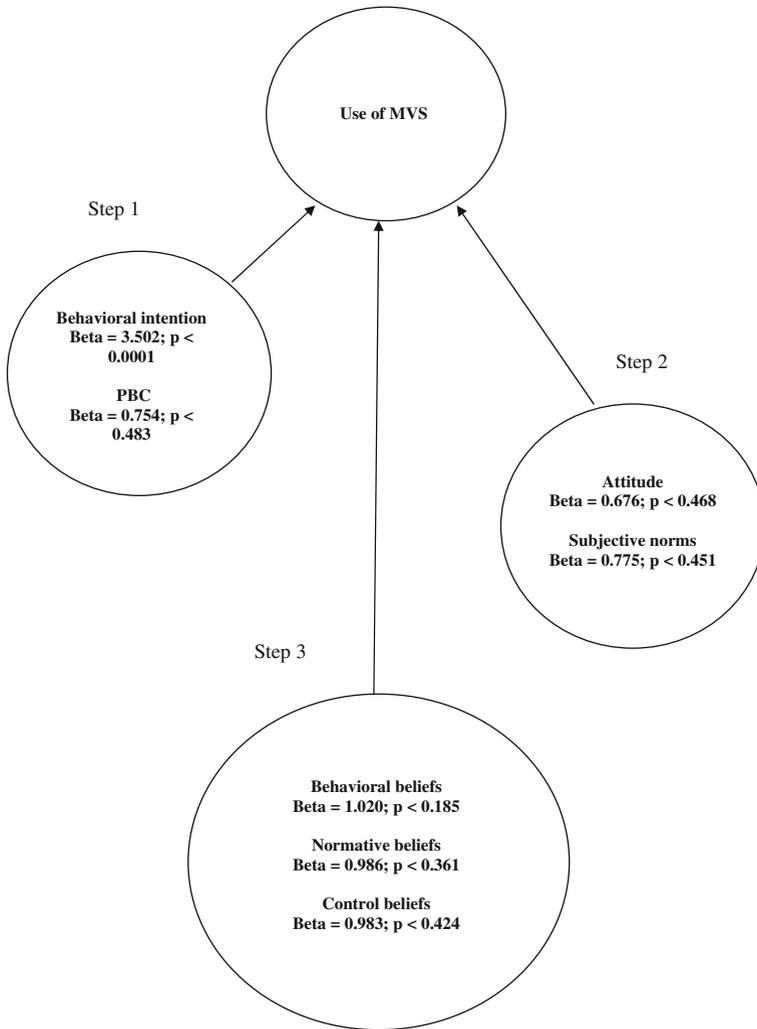
A one-way analysis of variance was conducted to assess whether socioeconomic status had an effect on the scores of behavioral intention. No significant difference was detected in the mean scores of behavioral intention between students who received governmental loans and those who did not ( $F[1, 94] = .276, P < .601$ ).

Twenty-six students in our sample used MVS. A one-way analysis of variance was conducted to determine whether there was a difference in the mean scores of behavioral intention between MVS users and nonusers. There was a significant difference in the mean scores of behavioral intention between these two groups ( $F[1, 74] = 50.54, P < .000$ ).

We conducted a separate multiple regression analysis with only those participants who did not use MVS. For this sub-sample, the multiple correlation of attitude, subjective norms, and perceived behavioral control significantly correlated with measures of behavioral intention ( $R = .497$ ). The linear combination of attitude, subjective norms, and perceived behavioral control together accounted for 35.6% of the variance in behavioral intention ( $F[3, 46] = 8.48, P < .000$ ). Attitude was the only significant predictor of intention ( $\beta = .402, P < .01$ ). Beta coefficients for subjective norms and perceived behavioral control were .142,  $P < .332$  and .169,  $P < .218$ , respectively.

There were no significant departures from the normality, linearity, and homoscedasticity assumptions for either multiple regression analysis. No multicollinearity, outliers, or influential cases were detected.

Figure 3 shows the results of logistic regression. Behavioral intention and perceived behavioral control were simultaneously entered in the first step of the analysis. Attitude and subjective norms were entered in the second step, and



**Fig. 3** Beta coefficients of variables of the TPB as measures of the impact of variables of the TPB on behavior based on results of logistic regression analysis

behavioral, normative, and control beliefs were entered in the third step of the analysis. The order of entering these variables into the regression analysis is consistent with both the assumptions of the TPB and what has been reported in the literature (Conner et al. 2001). Overall, 85.1% of subjects were correctly classified as MVS users or nonusers. The Hosmer and Lemeshow test of model fit showed that the model adequately fits the data (Hosmer and Lemeshow Chi-square = 10.68 (df = 8)  $P < .221$ ). The odds of using MVS more than tripled (3.502, see Table 2) for every increase of one unit of behavioral intention. The model accounted for 53.4% of the variance in the use of MVS (Nagelkerke R-square = 0.534).

**Table 2** Impact of variables of the TPB on behavior based on results of logistic regression analysis

Variables	Odds ratio	95% CI	Significance
<i>Step 1</i>			
Behavioral intention	3.502	1.799–6.819	0.0001
Perceived behavioral control	0.754	0.343–1.659	0.483
<i>Step 2</i>			
Attitude	0.676	0.235–1.946	0.468
Subjective norms	0.775	0.399–1.054	0.451
<i>Step 3</i>			
Behavioral beliefs	1.02	0.990–1.051	0.185
Normative beliefs	0.986	0.955–1.017	0.361
Control beliefs	0.983	0.943–1.025	0.424

Percent correctly classified: Step 1, 85.1%; Step 2, 85.1%; Step 3, 87.8%

## Discussion

This is the first known application of the TPB to the use of MVS in a population of Caucasian female college students. The findings extend previous applications of the TPB.

As stated previously, attitude, subjective norms, and perceived behavioral control predicted behavioral intention to use MVS. However, only two of these variables, attitude and perceived behavioral control, had a statistically significant impact. These results support the application of the TPB to predict behavioral intention and the use of MVS. Attitude, subjective norms, and perceived behavioral control together significantly predicted behavioral intention. Therefore, having a positive attitude toward MVS and having greater perceived control over taking MVS were each significantly positively associated with stronger behavioral intention to take MVS. In addition, having stronger perceived social pressure to take MVS may also help young female students to decide to take them. These results differed from previous findings among African American students (Pawlak et al. 2005). In that study, subjective norms had the highest impact on behavioral intention of African American students to use MVS. Attitude, on the other hand, had the lowest impact.

Consistent with the assumption of the TPB, behavioral intention was the only predictor of behavior (the use of MVS). The odds of taking MVS more than tripled (3.502, see Table 2) for every increase of one unit of behavioral intention. Analysis of beta coefficients of behavioral and control beliefs that are the underlying constructs of attitude and perceived behavioral control, respectively, showed that only two behavioral beliefs, *taking a multivitamin supplement each day next week would help me look and feel better* and *taking a multivitamin supplement each day next week would help me to get nutrients I do not get in my diet*, and one control belief, *I can afford buying multivitamin supplements*, had statistically significant impact on behavioral intention. A belief that MVS would make students feel and look better had the biggest impact ( $\beta = .323, P < .019$ ).

As stated earlier, primary prevention of NTD with adequate use of folic acid has been limited to educating women capable of becoming pregnant about foods that are good sources of folic acid, what folic acid is, and that they should be taking a MVS

(CDC 1998, 1999, 2001, 2005). Interestingly, not one of the eight students who completed the preliminary open-ended questionnaire listed prevention of NTD as a reason to take MVS. Instead, they perceived factors such as increase in energy, feeling well, and looking good. Health care professionals would unlikely think of these factors as benefits of using MVS. Even after several years of educating women capable of becoming pregnant about using MVS to prevent NTD college-aged adults do not spontaneously think of using MVS for this reason. This supports the conclusion that the educational campaigns conducted in the past have been ineffective.

The results of our research, and the results of at least one other study based on a sample of college aged adults, consistently showed that prevention of NTD is not a reason why females in this age group use MVS (Dorfman 2004). Rather, intention to use MVS is influenced by factors not related to prevention of NTD. For example, a belief that MVS will help them feel and look good has the strongest impact on behavioral intention. Consequently, utilizing messages such as “MVS will help you feel and look good” and “MVS will help you to obtain nutrients you may not get in your diet” may have a considerable impact in NTD prevention if such messages are incorporated in educational campaigns targeting Caucasian female adults. Health care professionals may be willing to convey a message that taking a daily MVS will help to obtain nutrients people may not be getting enough from a diet. However, more than likely, many health care professionals will consider a belief that taking MVS will help people to feel and look better to be a misconception. Thus, it may be very difficult to convince those who market the use of MVS for the primary prevention of NTD to actually use such messages in educational campaigns. These health care professionals must understand that regardless of the accuracy of a claim that MVS will help someone to feel and look good, college aged adults perceive it as a true benefit of taking MVS.

Our findings are consistent with those of Dorfman (2004) who reported the findings of focus groups conducted by a social marketing committee of the North Carolina Chapter of the March of Dimes. In that study, body image and a concern for good looks were among the most important factors identified by young adults age 17–25 from eastern North Carolina who were asked about what health issues mattered most for women of their age. Young adults consider body image and size and looking good to be very important. Young people are not satisfied with their perception of how they look (Miller et al. 1980; Sarwer et al. 2005). Many try to improve their looks in a variety of ways including cosmetic surgery, exercise, and dieting (Miller et al. 1980). In comparison to these measures to improve their looks and image, taking MVS may be perceived as an easy and inexpensive way to accomplish the desired objectives. Thus, the findings of this research may have very practical implications in MVS promotion and ultimately in prevention of NTD.

### Practical Implications

A number of folate rich foods such as pinto beans, garbanzo beans, kidney beans, tortilla flour, corn flakes, and a variety of fruits and vegetables, are available in most grocery stores. However, it is important to emphasize that Americans in general, especially teens and young adults, fail to meet the recommendation for intake of

these important sources of essential nutrients. In addition, previous studies showed that attempts to increase intake of folic acid through dietary manipulations were ineffective (Elkin and Higham 2000; Kloeblen 1999). This was especially evident in women of child bearing age and lower socioeconomic status who lacked knowledge about selecting foods rich in dietary folate (Elkin and Higham 2000; Kloeblen 1999). Thus, practically, using folic acid containing supplements, such as MVS, may be the only means to achieve the desirable folic acid intake. Thus, the critical role of folic acid obtained from supplements cannot be overemphasized.

Consistent with the results of the present study, educational campaigns targeting Caucasian college female students to take MVS should include messages that taking MVS could help them to feel and look better and that MVS use would help them to get nutrients they do not get from their diet. Further studies with college students should evaluate whether inclusion of these factors in educational campaigns will contribute to the actual use of MVS.

The findings from this study could be implemented in a variety of ways. For example, posters and brochures could be exhibited at student health centers, student recreation centers, grocery and health food stores, and restaurants heavily patronized by college students. Such posters should include information that MVS may help them to feel and look good and may help in obtaining adequate amounts of nutrients. Indeed, posters were successfully implemented in campaigns to increase the intake of fruits and vegetables and similar results may be produced with folic acid (Cox et al. 1998).

The results of this study suggest that the variables included in the model accounted for about 53% of the variance in behavior. This suggests that other factors not considered in this study must be important to Caucasian female college aged students in regard to taking MVS. For example, Conner et al. (2001) suggested that health value may need to be added to the TPB model as a separate variable that may predict health related behavior. Susceptibility to illness is another reason often given for the use of supplements. However, Conner et al. (2001) found no effect of susceptibility to illness on the use of dietary supplements among females. Perceived health status of participants may be an independent predictor of the use of MVS. In the National Health Examination Survey, the National Health and Nutrition Examination Surveys, and the Hispanic Health and Nutrition Examination Survey, adults 20 years and older who reported their health status as excellent or very good had higher rates of dietary supplements use compared to those who classified their health as good, fair or poor (Ervin et al. 1999). In addition, past behavior (or habit) has been found to be a predictor of current or future health related behavior such as smoking, consumption of fat, and physical activity (Staats 2003; Umeh 2003). Past behavior (e.g. previous supplement use) may be another important factor to predict MVS use. Future studies should determine whether these factors may further predict the use of MVS.

### Study Limitations

Several limitations must be considered when interpreting our results. The study used a convenience sample of Caucasian students that may not be representative of all undergraduate students. In addition, this research used self-reported data. Thus, data

may have been subject to self-presentation bias. Even though Frances et al. (2004) stated that a sample size of 80 is acceptable for studies using TPB when data is analyzed with multiple regression analysis, the sample of 96 students included in this analysis may still be considered small. In addition, our sample was limited to Caucasian students attending one university in the southern United States. Thus, our findings may not be generalized to female college students until further studies confirm or dispute our results.

## Conclusion

For more than a decade, women capable of becoming pregnant have been targeted with messages about what folic acid is, what foods are rich in folic acid, and that regular use of folic acid-containing supplements can prevent NTD. In spite of all the marketing efforts, the use of MVS has increased only modestly (CDC 1998, 1999, 2001, 2004, 2005). New approaches are needed to increase compliance with the MVS recommendation. Findings of this study suggest that campaigns targeting Caucasian female college students would be more successful if messages used to reach these females were consistent with perceived beliefs regarding benefits of using MVS. These perceived benefits include feeling and looking better and providing nutrients from MVS students do not get in their diet.

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