Hellenic Journal of Psychology, Vol. 7 (2010), pp. 259-274

THE RELATIONSHIP OF PHYSICAL ACTIVITY AND TELEVISION WATCHING WITH ADOLESCENTS' INTENTIONS AND SELF-EFFICACY TO EAT HEALTHY

Ian J. Wallace, Steven J. Danish, Donna K. McClish, & Kathleen M. Ingram

Virginia Commonwealth University, Richmond, USA

Abstract: Obesity is an increasingly substantial burden on people in the United States and around the world, especially because it contributes to higher rates of chronic disease. Efforts to prevent obesity have focused on identifying and minimizing risk factors that typically begin in early childhood; particularly, television watching (TV) habits, which develop early and are associated with childhood obesity. Other research has targeted intermediary variables in behavior change models-intentions and self-efficacy. To increase youth health behavior intentions and self-efficacy, research has examined the influence of physical activity (PA), particularly learned through sport. The current study examined ninth graders (N = 1,287) and investigated the relationship between PA and TV, and intentions and self-efficacy to eat healthy. Results show that independently, PA and TV were each significantly related to student intentions and self-efficacy. The implications of these findings are discussed for adolescent health behavior, adult health behavior, and the process of health behavior change.

Key words: Obesity; Physical activity; Self-efficacy; Television watching.

Note: Preparation of this manuscript was supported by the National Cancer Institute Grant R01CA102760 awarded to Steven J. Danish.

This article was based on a thesis completed by Ian Wallace under the supervision of Steven Danish. Dr. Elizabeth Fries passed away during the completion of this project. This research would not have been possible without her significant contributions. Her commitment to improving the health of individuals and communities and to enhancing the knowledge of professionals in the field was a source of inspiration to her co-authors.

Address: Ian J. Wallace, Argosy University, San Francisco Bay Area, 1005 Atlantic Ave., Alameda, CA 94501, USA. E-mail: iwallace@argosy.edu

INTRODUCTION

In the United States, chronic disease is becoming an increasingly unmanageable and overwhelming burden. The two most prevalent chronic diseases, cancer and heart disease, account for the largest proportion of morbidity and mortality (51%) among all adult diseases (Jemal et al., 2005), each year killing an estimated 557,000 and 697,000 people respectively (American Cancer Society, 2008). Research suggests chronic diseases are largely due to controllable, and therefore preventable, lifestyle factors (Orlandi & Dalton, 1998; U.S. Department of Health and Human Services [USDHHS], 2002, 2007).

One of the most significant contributing risk factors toward the development of chronic disease is obesity. The Centers for Disease Control and Prevention (CDC) assert that obesity is implicated in the etiology of multiple cancers and is a primary cause of heart disease (United States Preventive Services Task Force [USPSTF], 2007). Fontaine, Redden, Wang, Westfall, and Allison (2003) calculated the years of life lost due to obesity and found that in general, obesity significantly decreases life expectancy, particularly for younger adults. Specifically, they showed that obesity alone can account for up to 13 years of life lost or an approximate 22% reduction of remaining life.

Paralleling the physiological burdens, obesity creates significant economic costs that are increasing at a rate faster than the rate of inflation (Wang & Dietz, 2002). In an investigation of the monetary costs of diseases associated with youth obesity (e.g., diabetes, sleep apnea, gallbladder disease), Wang and Dietz (2002) showed a threefold increase in obesity-related hospital costs between 1981 and 1999, accounting for 0.43% ($35 million) of all costs in 1981 and 1.7% ($127 million) in 1999.

Current statistics indicate that the obesity epidemic is more prevalent than ever before, with particularly marked increases over the past two decades. Among adult Americans, it is estimated that 65% are either overweight or obese, or 30% to 32% are obese (Ogden, Flegal, Carroll, & Johnson, 2002), and 16.5% are extremely obese (Hedley, Ogden, Johnson, Carroll, Curtin, & Flegal, 2004). Among children, an estimated 16% are obese, while 31% are at risk for being obese or overweight (2004). Compared to statistics gathered between 1988 and 1994, in 2000, obesity had increased by approximately three to five percent in children of all ages, most notably among ethnic minority children, who showed increases by upwards of 10 percentage points (Ogden et al., 2002). Perhaps most alarming are the recent data showing a significant increase of obesity across a period of only 4 years (Ogden et al., 2002). Increases were identified in girls (13.8% to 16%), boys (14% to 18.2%), and adult men (27.5% to 31.1%), but not adult women (Ogden et al., 2002).

To understand where obesity comes from it is essential to examine beliefs about healthy eating. Parental behaviors and beliefs related to diet have been shown to predict youth eating habits and subsequent rates of obesity in adulthood. Obese youth between 10 and 14 years of age with at least one obese parent have a 79% chance of being obese adults (Hedley et al., 2004). Furthermore, parental obesity more than doubles the risk of adult obesity among both obese and non-obese children less than 10 years of age (Hedley et al., 2004).

Public health organizations and social science researchers have sought to curtail the obesity epidemic by identifying its antecedents (Rise, 2004; USDHHS, 2000; World Health Organization [WHO], 1998). Research has focused on risk factors for obesity that are personal and controllable, such as high-fat and caloric intake (Lowry, Wechsler, Galuska, Fulton, & Kann, 2002), sedentary behavior (Bauman, 2004; Lowry et al., 2002), and lack of physical activity (Dubbert, 2002). Individual variables do not typically demonstrate an independent main effect on obesity. Insufficient vigorous physical activity, however, appears to be a significant and consistent factor associated with increased obesity (Dubbert, 2002). Conversely, engaging in regular physical activity has been shown to help prevent obesity (Bauman, 2004).

Importance of physical activity

The importance of physical activity (PA) has been outlined by governmental and private organizations for over 40 years (Dubbert, 2002). These recommendations have transformed over time, but have generally conferred that cardiovascular activity, multiple times per week, is beneficial for physiological health. Moreover, an inverse dose-response relationship between physical activity and chronic diseases has been shown (Bauman, 2004; Dubbert, 2002). In Healthy People 2010 the USDHHS (2000) recommends that all able-bodied citizens, young and old, engage in 20 minutes of vigorous PA 3 days per week or 30 minutes of moderate PA five days per week. Those who achieve the national recommendations for PA show approximately a 30% risk reduction for chronic disease (Dubbert, 2002). Moreover, vigorous PA has been shown to be significantly related to healthy eating, lower body mass index (BMI), healthy body image, and less emotional distress (Eisenmann, Bartee, & Qi Wang, 2002; Harrison & Narayan, 2003).

Adolescents are generally not motivated to engage in PA for its disease prevention effects. Rather, adolescents are motivated to participate in PA for personal fulfillment, weight loss/maintenance, as well as peer- and parent-related reasons (Haverly & Davison, 2005). A summary of PA research supports the connection

between PA and sport, noting that 80% of PA occurs outside of school, not in physical education classes (Pender, 1998).

METHOD

Overview and study design

The present study was part of a larger study supported by the National Institutes of Health that tested whether a life skills intervention could promote cancer-risk reduction behaviors among adolescents. The program was based on a model of genealogy, the study of family heritage, and health promotion/disease prevention that included two main components: (a) teaching the use of genealogy to increase adolescents' motivation to understand their family's health history and increase their awareness of cancer risks; and (b) teaching life and health skills (e.g., breast and testicular self-examinations, fruit and vegetable intake, reducing fat intake, and regular physical activity) to increase the knowledge and practice of behaviors designed to prevent or reduce the harmful effects of cancer. Further, this program was designed to empower students to practice additional health behaviors, which may prevent future incidences of other diseases, such as cardiovascular disease and diabetes. The study was a cross-sectional analysis of an experimental design that included a multi-level evaluation at baseline, post-intervention, and three months post-intervention. Six high schools in a large suburban central Virginia county were randomly assigned to intervention (three schools) or wait-list control conditions (three schools). One of the wait-list control schools was dropped due to a response rate of less than 15%, substantially below that of the other schools (42% to 86%).

The county where the participating schools are located has a population of approximately 300,000 (United States Census Bureau, 2008). The median household income is an estimated $58,500 with approximately 4.5% of the county's population below the poverty line. On average, approximately 500 students attend each of the schools in this study. Parental consent and student assent were obtained for each participant and the project was approved by the Virginia Commonwealth University Institutional Review Board.

Participants

All ninth-grade students in health and physical education classes were recruited to participate in the study. Students received parental consent and assented to com-

plete the surveys at baseline. A total of 1,287 students completed surveys at baseline, comprising the sample being investigated in the current study. Demographic data showed that 62% of the participants were female; additionally, 65% were Caucasian, 23% African American, 4% multi-racial, 4% Hispanic/Latino, 3% Asian, and approximately 0.5% of American Indian and Hawaiian native.

Survey

A questionnaire comprised of demographic variables and multiple measures of health beliefs, knowledge, attitudes and behaviors was created to assess the goals of the intervention. The questionnaire was compiled from portions of the Youth Risk Behavior Surveillance System (YRBSS; USDHHS, 2006) and from the Goals for Health (GFH) survey (Fries et al., 2000). For the purpose of this investigation, only the following questions were used: intentions to eat healthy, self-efficacy to eat healthy, television watching, and physical activity.

Behavioral intentions. Three items assessing intentions related to different aspects of healthy-eating behavior were included (e.g., "I plan to lower the amount of fat in my diet during next month."). Responses were recorded on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). In Ajzen and Fishbein's (1980) proposed methodology a valid item format for behavioral intentions was identified; the present study has adapted this format for an adolescent population.

Self-efficacy. Two self-efficacy items related to different aspects of healthy-eating behavior were included (e.g., "I am sure I can lower the amount of fat in my diet next month."). These items were formatted on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The questions were pre-tested (Harmon et al., 2005) and are based on validated items in the Goals for Health survey (Fries et al., 2000).

Vigorous physical activity. This construct was measured via one question reflecting the USDHHS recommendations for PA, which has previously been used in the Youth Risk Behavior Surveillance Survey (USDHHS, 2006). Students were asked how many days in the past week did they participate in vigorous physical activity where they were sweating and breathing heavy for at least 20 minutes. Example activities were provided, including basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities.

Television watching. This construct was measured by one self-report question, "How many hours of television do you watch per day?" Responses ranged from 0 to 5 or more hours per day. For purposes of statistical analysis, responses were dichotomized into those who watched television one hour or less each day and those

who watched television more than one hour each day. This method is common in studies of PA and based on differential findings of the health behaviors previously associated with each group (Lowry et al., 2002; Utter et al., 2003).

Procedure

The survey used in this analysis was administered to students in classes of health and physical education during the fall or spring semesters. Surveys were given one week prior to a health education and promotion intervention. Students completed the surveys independently. Following data collection, the surveys were transferred from the schools and securely stored throughout the research investigation.

Data analysis

The SPSS version 15.0 was used for data analysis. Descriptive statistics were analyzed for all variables. Diagnostics were conducted on all analyses to ensure that assumptions about the data were not violated. When assumptions were violated, steps were taken to make the necessary corrections. Based on the preliminary data analysis, sufficient power was present for analyses at a level of significance $\alpha = .1$. The intercorrelations between study variables are shown in Table 1.

Study hypotheses were tested by conducting two one-way MANCOVAs.

Table 1. Intercorrelations between the study variables

Variables	1	2	3	4	5	6	7
1. Intention – Reduce fat	--	.31	.27	.41	.17	.10	-.08
2. Intention – fruits and vegetables		--	.42	.30	.51	.13	-.06
3. Intention – increase fiber			--	.24	.25	.12	-.08
4. Self-efficacy – reduce fat				--	.49	.17	-.20
5. Self-efficacy – fruits and vegetables					--	.11	-.15
6. Physical activity						--	-.18
7. Television watching							--

Note: All correlations are statistically significant, $p < .01$. $N = 1{,}287$.

Predictor variables of physical activity (high vs. low), television watching (high vs. low), and an interaction term (physical activity by television watching) were used in each analysis, with school as a covariate. In the first MANCOVA the dependent variables were three items assessing intentions to eat healthy and in the second MANCOVA the dependent variables were two items assessing self-efficacy to eat healthy.

Multiple statistical tests were consolidated into the MANCOVAs, which reduced the chance of a Type I error. These tests were also appropriate because the dependent variables–intentions and self-efficacy for healthy eating–were theoretically similar and significantly correlated. Prior to analyzing the hypotheses, the data were examined for outliers, missing data, normality, and other assumptions of MANCOVA statistical analyses. Based on the forced response format of the survey, the data did not contain outliers. Cases with missing data (n = 217) were compared to cases without missing data using independent samples t-tests and chi-square tests, which revealed no statistically significant group differences. Tests for normality produced conflicting results. According to the Kolmogorov-Smirnov goodness-of-fit test (Hox, 2002) the majority of variables were not normally distributed. However, this statistic was notably influenced by the large sample. Tests of kurtosis revealed that the majority of variables had significant "peakedness," which is partly attributable to the limited responses (5-point Likert scales) of the dependent variables. However, tests of skewness demonstrated that the assumption of normality was generally met across all variables.

Additional statistical assumptions for MANCOVAs were examined prior to data analysis. Equal sample sizes are preferred, yet despite differences between cases in the exercise and television watching categories, the overall sample (N = 1,287) was large enough to support analyses of unequal groups. Additionally, the covariate in each MANCOVA did not significantly interact with the independent variables.

Due to the noted violations above, steps and corrections were made in order to ensure that the results obtained were valid and reliable. First, establishing an a priori alpha significance level of .01 reduced the possibility of a Type I error. Second, the large sample had a positive effect on the power of the statistical tests. Last, where there are violations of statistical assumptions, caution is suggested when interpreting results.

RESULTS

Physical activity, television watching, and intentions

Hypothesis 1 predicted that students who met national standards for recommended vigorous PA (20 minutes, three or more days a week) intended to engage in healthy eating significantly more than students who did not meet national recommendations. After statistically controlling for differences by school, overall results showed that students who met national recommendations for PA reported having signifi-

cantly greater intentions (M = 3.26, SD = 0.91) to eat healthy than students who did not meet national recommendations (M = 3.04, SD = 0.95), $F(1, 1276) = 5.58$, $p < .001$. Partial $\eta^2 = .013$ indicated that PA accounted for 1.3% of the variance, a relatively marginal (Ajzen & Manstead, 2007) yet significant result.

This multivariate analysis also revealed significant differences across specific types of healthy eating (see Table 2). Students who met national recommendations for PA had significantly greater intentions to increase fruit and vegetable consumption, $F(1, 1276) = 12.66$, $p < .001$, partial $\eta^2 = .010$, and increase fiber consumption, $F(1, 1276) = 9.37$, $p < .01$, partial $\eta^2 = .007$. Differences approaching significance were also demonstrated for intentions to reduce fat intake, $F(1, 1276) = 5.19$, $p = .023$, partial $\eta^2 = .004$.

Table 2. Influence of physical activity on intention and self-efficacy to eat healthy

Variables	*M*	*SD*	*n*	*p*
		Intention		
Reduce fat				
High physical activity	3.36	1.09	742	.023
Low physical activity	3.19	1.15	328	
Eat more fruits and vegetables				
High physical activity	3.26	0.91	742	< .001
Low physical activity	3.04	0.95	328	
Increase fiber				
High physical activity	3.20	0.76	742	< .01
Low physical activity	3.05	0.72	328	
		Self-efficacy		
Reduce fat				
High physical activity	3.79	0.85	741	< .001
Low physical activity	3.55	0.92	329	
Eat more fruits and vegetables				
High physical activity	3.62	0.87	741	.022
Low physical activity	3.48	0.92	329	

Note: High PA is exercising vigorously three or more days per week and low PA is exercising vigorously less than three days per week.

It was also hypothesized (Hypothesis 2) that TV would influence student intentions to eat healthy. That is, student intentions to eat healthy were predicted to be greater among students who watched one hour or less of television per day. The MANCOVA used to test this hypothesis revealed no significant group differences based on TV, $F(3, 1276) = 2.83$, $p = .037$, partial $\eta^2 = .007$. However, the pattern of results resembled the direction of Hypothesis 2.

A test of the interaction between PA and TV (see Hypothesis 3) on student intentions to eat healthy was found to be nonsignificant, $F(3, 1276) = 0.36$, $p = .783$.

That is, TV and PA similarly influenced students' intentions to eat healthy. Specifically, students in both the low (M = 10.0, SD = 1.93) and high (M = 9.65, SD = 2.06) TV groups demonstrated greater intentions to eat healthy when they met government recommendations for PA. Conversely, students in both the low (M = 9.04, SD = 2.08) and high (M = 9.65, SD = 2.06) PA groups demonstrated lower intentions to eat healthy when they belonged to the high TV group.

Physical activity, television watching, and self-efficacy

Hypothesis 1 also predicted that students who met national recommendations for vigorous PA would have significantly greater self-efficacy to eat healthy than students who did not meet national recommendations. A second MANCOVA tested differences in self-efficacy between the two groups. Beyond differences between schools, results showed that students who met national recommendations for PA reported having significantly greater self-efficacy (M = 3.62, SD = 0.87) to eat healthy than students who did not meet national recommendations (M = 3.48, SD = 0.92), $F(1, 1281) = 8.34$, $p < .001$, partial $\eta^2 = .022$. The effect size indicated that PA accounted for 2.2% of the variance, a moderate result relative to comparable investigations (Ajzen & Manstead, 2007). Significant differences across specific types of healthy eating were also revealed (see Table 2). Students who met national recommendations for PA had significantly greater self-efficacy to reduce fat intake than students who did not meet national recommendations, $F(1, 1281) = 16.52$, $p < .001$, partial $\eta^2 = .013$. Although only approaching significance, $F(1, 1281) = 5.29$, $p = .022$, partial $\eta^2 = .004$, a similar pattern was shown for self-efficacy to increase fruit and vegetable consumption.

It was further hypothesized (Hypothesis 2) that TV would influence student self-efficacy to eat healthy. That is, student self-efficacy to eat healthy was predicted to be greater among students who watched less than one hour or less of television per day. The MANCOVA used to test this hypothesis showed that students who watch one hour or less of television per day report significantly more self-efficacy (M = 7.58, SD = 1.43) to eat healthy than those who watch more than one hour (M = 7.00, SD = 1.56), $F(1, 1281) = 29.1$, $p < .001$, partial $\eta^2 = .022$.

A test of the interaction between PA and TV (see Hypothesis 3) on student self-efficacy to eat healthy was found to be nonsignificant, $F(2, 1281) = 0.23$, $p = .795$. That is, TV and PA similarly influenced students' self-efficacy to eat healthy. Specifically, students in both the low (M = 7.67, SD = 1.37) and high (M = 7.14, SD = 1.52) TV groups demonstrated greater self-efficacy to eat healthy when they met government recommendations for physical activity. Conversely, students in both the

low ($M = 6.74$, $SD = 1.62$) and high ($M = 7.14$, $SD = 1.52$) PA groups demonstrated lower self-efficacy to eat healthy when they belonged to the high television watching group.

DISCUSSION

Students who participated in vigorous PA three or more days per week reported significantly greater intentions to increase fiber and eat more fruits and vegetables; however, results of intentions to reduce fat were marginal. Although these findings show mixed support for Hypothesis 1, they indicate that physically active students aspire to improve their dietary behaviors, which also affect obesity rates and subsequent complications of obesity. The different intentions between PA groups may be explained by influential factors within the PA environment. Adolescent PA typically occurs in the social context of school-based team sports (USDHHS, 2000) where students interact with coaches and peers with the goal of improving performance, including maximizing physiological readiness (Utter et al., 2003). Thus, as a means to achieving optimal athletic performance, students in these environments are likely informed about healthy dietary habits and encouraged to follow them. Further research showing that adolescents often practice multiple healthy or unhealthy behaviors simultaneously (Dubbert, 2002), known as a clustering effect, which supports the conclusion that students' intentions to eat more fruits and vegetables and increase fiber may be influenced by engaging in vigorous PA more frequently.

Results demonstrated partial support for Hypothesis 2. Students who met recommendations for PA reported significantly greater self-efficacy to reduce fat consumption (but not to eat more fruits and vegetables), which contrasts the nonsignificant results for intentions to reduce fat consumption. This inconsistency may be due to differences in knowledge about consuming fat. As previously noted, adolescent PA occurs primarily in sport, which is where information about eating healthy (i.e., problems of excessive fat consumption) is frequently communicated. Knowing that fatty foods can hinder athletic performance may provide students with greater self-efficacy to reduce fat consumption, but knowledge in and of itself does not appear to motivate students to change their fat consuming behavior. Moreover, self-efficacy and intentions are inherently different and therefore should not be assumed to follow the same pattern. Self-efficacy is a personal assessment of capability (Bandura, 1986) that is less susceptible to the practical and sometimes uncontrollable real-world obstacles that intention attempts to assess (Ajzen, 1985).

Results support the conclusion that ninth graders who engage in more PA and

watch less TV have greater intentions and self-efficacy to eat healthy. Ninth graders with the next strongest intentions and self-efficacy to eat healthy fall into two groups: (a) high in PA, high in TV and (b) low in PA, low in TV. Last, ninth graders low in PA, high in TV had the lowest intentions and self-efficacy. These findings invalidate the prediction of Hypothesis 3 that there would be a significant interaction between PA and TV. Multiple interpretations of the data may explain differences between the groups.

First, PA has inherent and unique psychosocial qualities that may account for the differences. As previously mentioned, ninth graders receive the bulk of their PA through organized sport, which provides a structured environment that has the possibility to teach life skills. Life skills are transferable lessons and abilities that can be applied to other life domains (Danish et al., 1993; Hodge & Danish, 1999; Papacharisis, Goudas, Danish, & Theodorakis, 2005). The life skills learned through sport/PA may provide adolescents with a foundation of self-efficacy and intentions that may be demonstrated in the current results. However, students may have entered sport/PA because of a preexisting sense of self-efficacy and intention that helps them excel. The direction of this relationship cannot be determined by the cross-sectional nature of results from the current study.

An alternative interpretation is that these results may be due to TV. The negative main effect of TV on intentions and self-efficacy to eat healthy may be primarily responsible for these disparate results. The high correlation between TV and the consumption of high caloric foods is a possible underlying explanation for the significant findings (Feldman et al., 2003). Yet, there may be an a priori explanation that suggests having low intentions and self-efficacy for healthy eating in ninth grade leads to watching greater than 1 hour of television per day. Again, however, the non-experimental nature of the current study does not indicate the causal direction of this relationship.

Overall, similar findings across multiple analyses demonstrate the strong relationship in ninth graders between PA, TV, and the intentions and self-efficacy to eat healthy. The national recommendations for PA as denoted in Healthy People 2010 (USDHHS, 2000), which were incorporated into the current study, are supported by these findings–vigorous PA at least three times per week is associated with greater intentions and self-efficacy to eat healthy. Although the Healthy People 2010 demarcation for PA was primarily based on its healthy physiological effects, the results of this study demonstrate secondary benefits of increasing the intentions and self-efficacy of other health-enhancing behaviors, for a ninth-grade population receiving a life skills intervention as part of a health promotion program. In view of recent statistics that show a continuing trend of increased incidence and prevalence

of obesity, these findings are promising contributions toward greater understanding of healthy behavior and disease prevention within the context of community-based programs incorporating life skills interventions.

Strengths

The large sample size that composed each analysis provided ample power to support the findings. Power was also maintained despite divisions within the analyses based on the levels of physical activity and television watching. This sample was further strengthened by data collection from six schools, which adds generalizability to the findings. Based on the recommendations from the Healthy People 2010 initiative (USDHHS, 2000), the distinction between low and high physically active ninth graders allowed for relevant interpretation of differences between these groups. This method was also employed with the TV variable so that the results would be compatible with those of previous research (Feldman et al., 2003).

Limitations

Statistical tests of normality revealed the need for cautionary interpretation of some results. The non-normal distribution for intentions to increase fiber, and the self-efficacy variable of decreased fat consumption, warrant reserved conclusions regarding the significance of the findings. However, the skewed distribution of scores or significant kurtosis within these variables may be indicative of a normal adolescent population's distribution among these variables. It is important to consider both the statistical implications of non-normal data and the realistic representation of the data. Perhaps an alternative method of data collection other than a self-report survey would have captured a more normal distribution of the current variables.

The 217 cases dropped from the original sample due to missing data (constituting 17% of the sample) is a limitation to the current study. This limitation exists despite tests indicating minor, but not statistically significant differences between groups. Although the remaining sample size was still more than adequate for analyses, the reasons why so many cases had missing data may be detrimental to the results. Due to the high number of dependent variables used in the larger study of which the current investigation was a part, there is an increased likelihood of missing data, which was represented by a generally even distribution of missing data across the variables. It may be possible that survey questions were misunderstood, skipped, or omitted in a systematic fashion. Although differences between the

investigated sample and missing cases did not indicate such differences, caution should be employed when interpreting the results of the investigation.

One of the most significant limitations of this study was the lack of causal inference. Although the current cross-sectional investigation of differences between physically active ninth graders does support findings from previous research (Bauman, 2004; Dubbert, 2002), we cannot make causal predictions that increased physical activity will lead to healthy eating. The findings from this study are limited to conclusions based on a "snapshot" within the process of adolescent health behavior change.

Finally, the percentage of students in the current study's sample who met national recommendations for PA was greater than previously reported averages. Over 69% of the ninth graders surveyed, reported participating in vigorous PA for 20 minutes, three or more times per week. Previous data suggests that 63% is a robust estimate for a youth population (Grunbaum et al., 2004). The current sample appears to represent a population with greater PA participation and thus findings many not fully generalize to the general population of ninth graders.

Future directions

Further inquiry is needed to examine the processes and variables responsible for the transformation of intentions and self-efficacy into actual behavior change. Although these results support Prochaska and DiClimente's (1983) transtheoretical model of behavior change, the current study examined only a small piece of the health behavior puzzle.

Another potential direction within this area of study involves distinctions within PA. It was noted that PA for ninth graders predominantly occurs through sport, yet specific differences within type of PA were not investigated. Intentions and self-efficacy to eat healthy may differentially exist among participants in team versus individual sports, weight contingent sports (e.g., wrestling, boxing) versus non-weight contingent sports, or judged athletic competitions versus objectively scored sports. Differences such as these may influence the self-efficacy and intentions of adolescents to engage in health-enhancing behaviors.

Increasingly, the effects of obesity are impinging on people's lives at an alarming rate that must be slowed, if not stopped. This is why continued research into preventive measures, especially for youth and adolescents, is increasingly necessary. Among adolescents, behavioral intention and self-efficacy to eat healthy appear to be malleable components of health behavior change. Researchers should continue to map the relationships between psychosocial factors, health behaviors, and health

outcomes, particularly as they exist contextually in stage theories of behavior change. Generally speaking, in order to attenuate the chronic disease pandemics currently afflicting the United States, it is essential that we gain a more nuanced, sophisticated and, simply better, understanding of the health behavior change process.

REFERENCES

Ajzen, I. (1985). *From intentions to actions: A theory of planned behavior.* Heidelberg, Germany: Springer.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior.* Englewood Cliffs, NJ: Prentice Hall.

Ajzen, I., & Manstead, A. S. R. (2007). Changing health-related behaviors: An approach based on the theory of planned behavior. In K. van den Bos, M. Hewstone, J. de Wit, H. Schut, & M. Stroebe (Eds.), *The scope of social psychology: Theory and applications* (pp. 43-63). New York: Psychology Press.

American Cancer Society. (2008). *Statistics*. Retrieved September 26, 2008 from http://www.cancer.org/docroot/stt/stt_0.asp?from=fast

Anderson, R. E., Crespo, C. J., Bartlett, S. J., Cheskin, L. J., & Pratt, M. (1998). Relationship of physical activity and television watching with body weight and level of fatness among children. *Journal of the American Medical Association, 279*, 938-942.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education and Behavior, 31*, 143-164.

Bauman, A. E. (2004). Updating the evidence that physical activity is good for health: An epidemiological review 2000-2003. *Journal of Science and Medicine in Sport, 7*, 6-19.

Danish, S. J., Petitpas, A. J., & Hale, B. D. (1993). Life development intervention for athletes: Life skills through sports. *The Counseling Psychologist, 21*, 352-385.

Dubbert, P. M. (2002). Physical activity and exercise: Recent advances and current challenges. *Journal of Consulting and Clinical Psychology, 70*, 526-536.

Eisenmann, J. C., Bartee, R. T., & Qi Wang, M. (2002). Physical activity, TV viewing, and weight in U.S. Youth: 1999 youth risk behavior survey. *Obesity Research, 10*, 379-385.

Feldman, D. E., Barnett, T., Shrier, I., Rossignol, M., & Abenhaim, L. (2003). Is physical activity differentially associated with different types of sedentary pursuits? *Archives of Pediatrics & Adolescent Medicine, 157*, 797-802.

Fontaine, K. R., Redden, D. T., Wang, C., Westfall, A. O., & Allison, D. B. (2003). Years of life lost due to obesity. *Journal of the American Medical Association, 289*, 187-193.

Fries, E., Meyer, A., Danish, S., Stanton, C., Figueiredo, M., Green, S., Brunelle, J., Townsend, C., & Buzzard, M. (2001). Cancer prevention in rural youth: Teaching goals for health: The pilot experience. *Journal of Cancer Education, 16*, 99-104.

Gortmaker, S. L., Peterson, K., Wiecha, J., Sobol, A. M., Dixit, S., Fox, M. K., & Laird, N. (1999). Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Archives of Pediatrics & Adolescent Medicine, 153*, 409-418.

Grunbaum, J., Kann, L., Kinchen, S., Ross, J., Hawkins, J., Lowry, R., Harris, W. A., McManus, T., Chyen, D., & Collins, J. (2004). Youth Risk Behavior Surveillance-United States, 2003 (Surveillance Summaries, May 21, 2004. MMWR 2004, 53, No. SS-2, pp. 23-31). Atlanta, GA: Centers for Disease Control and Prevention.

Harmon, A. L., Westerberg, A. L., Bond, D. S., Hoy, K. N., Fries, E. A., & Danish, S. J. (2005). Cancer prevention among rural youth: Building a 'Bridge' to better health with genealogy. *Journal of Cancer Education, 20(2)*, 103-107.

Harrison, P. A., & Narayan, G. (2003). Differences in behavior, psychological factors, and environmental factors associated with participation in school sports and other activities in adolescence. *Journal of School Health, 73*, 113-120.

Haverly, K., & Davison, K. K. (2005). Personal fulfillment motivates adolescents to be physically active. *Archives of Pediatrics and Adolescent Medicine, 159*, 1115-1120.

Hedley, A. A., Ogden, C. L., Johnson, C. L., Carroll, M. D., Curtin, L. R., & Flegal, K. M. (2004). Prevalence of overweight and obesity among US children, adolescents, and adults, 1999-2002. *Journal of the American Medical Association, 291*, 2847-2850.

Hodge, K., & Danish, S. (1999). Promoting life skills for adolescent males through sport. In A. M. Horne & M. S. Kiselica (Eds.), *Handbook of counseling boys and adolescent males: A practitioner's guide* (pp. 55-71). Thousand Oaks, CA: Sage.

Hox, J. J. (2002). *Multilevel analysis: Techniques and applications*. Mahwah, NJ: Erlbaum.

Jemal, A., Murray, T., Ward, E., Samuels, A., Tiwari, R. C., Ghafoor, A., Feuer, E. J., & Thun, M. J. (2005). Cancer statistics, 2005. *CA: A Cancer Journal for Clinicians, 55*, 10-30.

Lowry, R., Wechsler, H., Galuska, D. A., Fulton, J. E., & Kann, L. (2002). Television viewing and its associations with overweight, sedentary lifestyle, and insufficient consumption of fruits and vegetables among US high school students: Differences by race, ethnicity, and gender. *Journal of School Health, 72*, 413-421.

Ogden, C. L., Flegal, K. M., Carroll, M. D., & Johnson, C. L. (2002). Prevalence and trends in overweight among US children and adolescents, 1999-2000. *Journal of the American Medical Association, 288*, 1728-1732.

Orlandi, M. A., & Dalton, L. T. (1998). Lifestyle interventions for the young. In S. S. Shumaker, E. B. Schron, J. K. Ockene, & W. L. McBee (Eds.), *Health behavior change* (2nd ed., pp. 59-84). New York: Springer.

Papacharisis, V., Goudas, M., Danish, S., & Theodorakis, Y. (2005). The effectiveness of teaching a life skills program in a sport context. *Journal of Applied Sport Psychology, 17*, 247-254.

Pender, N. J. (1998). Motivation for physical activity among children and adolescents. *Annual Review of Nursing Research, 16*, 139-172.

Prochaska, J. O., & DiClimente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51*, 390-393.

Rice, J. (2004). Modifying adolescent health behaviors. *Current Opinion in Psychiatry, 17*, 129-132.

Smalley, S. E., Wittler, R. R., & Oliverson, R. H. (2004). Adolescent assessment of cardiovascular heart disease risk factor attitudes and habits. *Journal of Adolescent Health, 35*, 374-379.

Strauss, R. S., Rodzilsky, D., Burack, G., & Colin, M. (2001). Psychosocial correlates of physical activity in healthy children. *Archives of Pediatrics and Adolescent Medicine, 155*, 897-902.

United States Census Bureau: State and County Quick Facts. (2008). *Chesterfield County, Virginia*. Retrieved September 26, 2008 from http://quickfacts.census.gov/qfd/states/51/51041.html

United States Department of Health and Human Services. (2000). *Healthy people 2010: Understanding and improving health* (2nd ed.). Washington, DC: US Government Printing Office.

United States Department of Health and Human Services. (2002). *Health Services Technology/Assessment Texts (HSTAT): Guide to clinical preventive services (3rd ed). Recommendations and systematic evidence reviews, guide to community preventive services*. Rockville, MD: Agency for Healthcare Research and Quality.

United States Department of Health and Human Services. (2006). *Youth Risk Behavior Surveillance – United States, 2005*. Atlanta, GA: Centers for Disease Control.

United States Department of Health and Human Services. (2007). *Preventing and controlling cancer: The nation's second leading cause of death*. Atlanta, GA: Centers for Disease Control.

United States Preventive Services Task Force. (2007). *Guide to clinical preventive services*. Retrieved July 1, 2007 from http://www.ahrq.gov/clinic/pocketgd07/index.html

Utter, J., Neumark-Sztainer, D., Jeffery, R., & Story, M. (2003). Couch potatoes or french fries: Are sedentary behaviors associated with body mass index, physical activity, and dietary behaviors among adolescents? *Journal of the American Dietetic Association, 103*, 1298-1305.

Wang, G., & Dietz, W. H. (2002). Economic burden of obesity in youths aged 6 to 17 years: 1979-1999. *Pediatrics, 109*, e81.

World Health Organization. (1998). *Obesity: Preventing and managing the global epidemic*. Geneva, Switzerland: Author.