

Rural Appalachian Adolescent Self-Efficacy Expectations, BMI and Physical Activity

Original Research

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Abstract

Introduction: Adolescents residing in the Appalachian region are at heightened risk for low levels of physical activity (PA) and high levels of morbidity and mortality. Understanding factors related to physical activity in this population will better inform prevention and risk reduction efforts. This study sought to explore relationships between self-efficacy expectations (SEE) to overcome barriers, body mass index (BMI) and different intensities of physical activity.

Methods: The relationship between self-efficacy expectation (SEE) to overcome barriers, body mass index (BMI), and days of moderate (MPA) and vigorous physical activity (VPA) were explored utilizing valid and reliable self-report instruments for 422, 12th grade, rural, male and female students from 11 different schools in an Appalachian region. The researcher conducted preliminary analyses and linear regressions to determine variables related to MPA and VPA.

Results: Results of a regression analysis for MPA indicated the model predicted 11.5% of the variance in days of MPA. Results of the second regression analysis for VPA indicated the model predicted 6.8% of the variance in days of VPA. Self-efficacy expectations to overcome barriers to physical activity were positively related to days engaging in MPA and VPA. BMI was not a significant predictor in either model.

Conclusions: Higher levels of SEE to overcome barriers to physical activity were related to higher rates of moderate and vigorous physical activity among rural, Appalachian adolescents. Increasing levels of SEE may promote increased physical activity levels for these youths. BMI was not related to physical activity behaviors. Findings from this study may provide hope for prevention and intervention efforts targeting obese populations. Additional research to identify factors related to PA in underserved populations, such as Appalachia, may promote more effective programming.

Key Words: Appalachia, obesity, youth.

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Introduction

Over the past forty years, there has been a steady decline in physical activity among high school adolescents.¹⁻² Low levels of physical activity among adolescents places them at heightened risk for morbidities and mortality.³ There are substantial health benefits for adolescents who meet the recommended physical activity (PA) guidelines of at least 60 minutes of daily moderate physical activity (MPA) and three days of vigorous physical activity (VPA) per week.⁴ Regular physical activity promotes positive health outcomes of improved mental health, weight control, healthy bones, and lean muscle

mass;⁵⁻⁹ while reducing risk for numerous diseases and disorders, including hypertension, several forms of cancer, obesity, diabetes, depression and anxiety.^{4,8,10}

Unfortunately, in the United States many adolescents do not realize the benefits of physical activity. As a nation, only 26% of adolescents in grades 9 to 12 meet the physical activity guidelines.^{11,12} As age and grade level increase, rates of physical activity decline.^{4,13,14} The most recent Youth Risk Behavior Surveillance System (YRBSS) survey found that 12th grade students were significantly less likely to meet physical activity guidelines than 9th grade students at 22.9% and 30.6%, respectively.¹¹ Physical activity behaviors developed during adolescence have been shown to track into adulthood.^{15,16} Physically inactive adolescents could face major health concerns as adults.³

Recent studies suggest that underrepresented and marginalized populations are typically inactive.^{17,18} As one of the poorest regions in the United States, it is not surprising that Appalachia is medically challenged with staggering rates for morbidities and mortality.^{10,19,20} Commonly, rural adolescents residing in Appalachian do not meet national standards for physical activity.^{21,22} Several studies have indicated significantly lower rates of PA among Appalachian adolescents compared to national averages with the lowest rates found in rural areas as opposed to larger metro areas of the Appalachian region.^{17,23,24}

Extensive research has been conducted on factors related to adolescent participation in physical activity, but less is known about those residing in Appalachia.^{22,25-29} Some studies indicate that self-efficacy expectations (SEE), one's belief in his or her ability to achieve a goal or to succeed in a specific situation, and body mass index (BMI), an indicator of body fatness, are related to participation in physical activity among urban adolescents.^{5,30,31}

Recent reviews found strong positive relationships between self-efficacy and physical activity among various groups of adolescents.³¹⁻³⁵ Beets et al. (2007) found that self-efficacy mediated participation in physical activity in high school girls in rural areas.³⁴ Additionally, Manley et al. (2013) found a positive correlation between self-efficacy and physical activity among rural middle school children.³⁵ A more specific type of self-efficacy, SEE to overcome barriers/challenges to physical activity has been recognized as a significant predictor of physical activity engagement among urban adolescents.^{31,36,37}

Body mass index (BMI) has been reported as a negative determinant for physical activity participation.^{5,30} Norman et al. (2005) and Mota et al (2010) found a negative association between BMI and physical activity among males.^{38,39} Other studies suggest that both boys and girls with higher than average BMIs engage in lower levels of physical activity.^{5,30,35,40} Two studies examining relations between BMI and physical activity levels specifically among rural youth demonstrated that children with higher BMIs in rural areas were at heightened risk for lower levels of physical activity compared to their counterparts.^{41,42}

The dramatic health disparities found among children, adolescents and adults within Appalachian regions of the United States is of great concern.^{4,22} Realizing providers are fewer and death rates are higher than other regions of the country, it is critical to find ways to promote health in the rural, Appalachian region.²³ Despite recent attempts to explain physical activity among rural youth, many gaps remain in the literature about Appalachian populations. To the author's knowledge, no study has examined the relationship between self-efficacy expectations (SEE) to overcome barriers/challenges to physical activity, body mass index (BMI) of adolescents and engagement in physical activity at differing levels of intensity among rural, Appalachian adolescents. The intent of the current study was to explore the relationship among SEE, BMI, and days of moderate (MPA) and days of vigorous physical activity (VPA) by rural Appalachian adolescents.

Methods

Participants

Twelfth grade, high school students (N=422) from eleven rural schools spanning seven counties in the Appalachian region participated. Similar to regional data, participants were predominantly Caucasian. Data from the Ohio Department of Education indicated that the majority of students at each school received free or reduced-price lunches and that family income levels for each school were very low.

Protocol

A university based institutional review board approved this study. Parental consent and child assent were required for study participation for those younger than 18 years of age. Students aged 18 and older provided consent and assent to participate. All 12th grade students enrolled in English class or a study hall were eligible for the study. Prior to data collection an oral script was read (and was available for review) containing the purpose and procedures of the study. All students then provided assent for participation. The author administered the questionnaire to individual classes in each school. Participants were allowed to ask clarifying questions before, during and after the survey and could elect to withdraw from the study at any time. Students completed the surveys in approximately 15 to 25 minutes.

Measures

Participant age, self-efficacy expectation to overcome barriers, previous 7 days of moderate physical activity (MPA), previous 7 days of vigorous physical activity (VPA) and body mass index (BMI), were determined via the self-report survey items.

Self-Efficacy to Overcome Barriers Questionnaire

A modified version of the *Strength of Self-Efficacy to Overcome Barriers to Physical Activity* instrument was used in this study.⁴³ This measure was originally developed by Saunders in 1997 in which construct and predictive validity were established. The scale has 7 items which assess an individual's confidence that he or she can exercise when facing barriers to engaging in regular physical activity (e.g. I think I can exercise no matter how busy my day is). This scale has adequate psychometric properties.⁴³ For the current study, the 5- point scale used by Winters et al. (2001) was modified to a 4- point scale, ranging from never (1) to always (4). The coefficient alpha for the total score on this scale was acceptable (alpha = .90).

7-Day Recall of Physical Activity Scale

Total days MPA and VPA were determined using the *7-Day Physical Activity Recall Scale*. This measure was originally developed and validated by Petosa (1993) and was designed to measure MPA and VPA in terms of mode, duration and day, and if the activity was planned or unplanned for seven days prior to administration.⁴⁴ Participants were asked to report MPA by asking participants the following question "During the last 7 days, how much time did you spend doing moderate exercise?" A comparable question, "During the last 7 days, how much time did you spend doing vigorous exercise?" was used to assess VPA. Definitions and examples of activities in each category were given to illustrate the difference between moderate and vigorous physical activities. Validity and reliability of this instrument was piloted in a sample of 9th and 10th grade students. The seven-day recall has demonstrated correlations with the *Previous Day Physical Activity Recall* (PDPAR) questionnaire of .92 and .89 for vigorous and moderate activity, respectively. Test-retest stabilities on the population ranged from .78 to .82 for moderate and vigorous physical activity respectively.

Body Mass Index

Body mass index (BMI) is an indirect measure of body fat used to determine if individual's weight falls into a "healthy range" based upon height. BMI measurement is considered a reliable and valid alternative to direct measures of body fat.⁴ If an individual is carrying too much weight for his/her height then the excess weight is assumed to be unhealthy fat. Higher BMI scores typically indicate higher levels of total body fat. This study calculated BMI based on participant self-reported height and weight. Calculation of BMI using self-reported measures of height and weight have been shown to be a very good indicator for classification of weight status.^{45,46} Utilizing the Centers for Disease Control and Prevention BMI formula, participant self-reported weight in pounds (lbs.) was divided by self-reported height in inches (in) squared and multiplied by a conversion factor of 703 to determine participant BMI score.⁴

Statistical Analyses

The data was analyzed using the IBM Statistical Package for Social Sciences (IBM SPSS). The descriptive statistics were calculated for sex, age, MPA, VPA, SEE, and BMI. Two regression analyses were conducted to determine the relationship among self-efficacy expectations, BMI, and days engaging in MPA and VPA during the past week for 12th grade students using the most recent version of SPSS.

Results

Physical Characteristics

Females participants comprised of 53% (n=224) of the 422 total participants, while 47% percent (n=198) of participants were male. The average age of participants was 17 years and eight months ($SD = .61$; range 16-22 years of age). In the previous seven days, less than six percent of 12th grade participants met the physical activity guidelines for MPA and less than nine percent met VPA guidelines (see Table 1).

Table 1. Means for Moderate (MPA) and Vigorous (VPA) Physical Activity, Self-Efficacy Expectations (SEE) & Body Mass Index (BMI) by 12th Grade Rural Appalachian Adolescents (n=422).

	MEAN	RANGE
MPA (DAYS)	2.6 ± 2.6	0-7
VPA (DAYS)	0.9 ± 1.8	0-7
SEE	18.3 ± 5.9	7-28
BMI	23.7 ± 4.6	14.2-46.3

Data are Means ± SD

Males had slightly higher rates for days of moderate (M=2.0) and vigorous (M=0.7) physical activity than their female counterparts (M=1.7 and M= 0.5, respectively). Preliminary data analyses revealed differences in moderate and vigorous physical activity levels based on gender were insignificant. Further, gender was not related to MPA or VPA at a 0.05 level of significance. Thus, gender was not included in regression analyses.

Regression Analysis 1: Days Engaging in Moderate Physical Activity

Results of a linear regression analysis indicated that BMI score and SEE predicted 11.5% of the variance in days MPA, $F(2, 419) = 27.34, p < .001$. Table 2 presents data for variables in the model.

Table 2. Regression 1: SEE, BMI and Moderate Physical Activity

VARIABLE	B	SE	BETA	T	SIG.
BMI	.004	.026	.006	.137	.891
SEE	.150	.020	.340	7.385	.000

Self-efficacy expectations were positively related to days engaging in moderate physical activity. BMI was not a significant predictor of days engaging in moderate physical activity. The interaction term was not significant and did not influence the predictive power of the model; therefore, the interaction term was not included in the best fit model.

Regression Analysis 2: Days Engaging in Vigorous Physical Activity

Results of a linear regression analysis indicated that BMI score and self-efficacy expectations predicted 6.8% of the variance in days of VPA, $F(2, 419) = 15.28, p < .001$. Table 3 presents data for variables in the model.

Table 3. Regression 2: SEE, BMI and Vigorous Physical Activity

VARIABLE	B	SE	BETA	T	SIG.
BMI	-.004	.019	-.011	-.238	.812
SEE	.080	.015	.260	5.494	.000

Self-efficacy expectations were positively related to days engaging in vigorous physical activity. BMI was not a significant predictor of days engaging in vigorous physical activity. The interaction term was not significant and was not included in the best fit model.

Discussion

Like past studies conducted in Appalachia, participants in the study exhibited low levels of physical activity compared to the national average.^{5,17,23,24} Adolescents residing in rural Appalachia may be at greater risk

for negative health outcomes related to lack of physical activity and obesity (cardiovascular disease, cancer, diabetes and stroke) compared to peers from other regions of the country.⁵ This study found that self-efficacy expectations to overcome barriers to physical activity (SEE) was a significant predictor of MPA and VPA. On the contrary, BMI was not a significant predictor of physical activity in either analysis. Understanding factor that influence physical activity behaviors is imperative for developing appropriate interventions to reduce health disparities.

To the author's knowledge, this is the first study to investigate SEE and physical activity among rural Appalachian adolescents. Similar to research in other populations, the results for this study support the predictive ability of SEE to overcome barriers in relation to MPA and VPA among rural, Appalachian adolescents.^{32,35} This finding provides a unique contribution to the current literature, as results suggests that both male and female high school adolescents may benefit from improved SEE to overcome barriers for MPA and VPA. Therefore, the belief in one's ability to overcome barriers to physical activity may influence adolescents' decisions to engage in physical activity.

There is a great need for prevention and interventions efforts for physical activity in rural, Appalachian areas. Interventions that have been tested with youth have demonstrated that increases in one's belief in their ability to be physically active have positively influenced youth engagement in physical activity.^{32,47,48} For example, Dishman et al.'s (2004) Lifestyle Education for Activity Program (LEAP) provided experimental evidence showing that increased self-efficacy directly resulted in increased physical activity among adolescent girls.⁴⁷ Self-efficacy is an important factor related to engagement in physical activity. This study found that SEE to overcome barriers to physical activity may influence rural, Appalachian adolescents' decision to engage in PA. Finding ways to boost adolescents' self-efficacy to overcome barriers to physical activity in rural, Appalachian areas is important as it may impact their decision to initiate and maintain a physically active lifestyle. Providing adolescents with an opportunity to engage in fun, non-threatening physical activities that may not require a great deal of initial skill may promote increased SEE and engagement in MPA.

Health professionals, school professionals, personal trainers, youth advocates, physical educators/coaches, parents, and prevention specialists should provide opportunities for engagement in behaviors to promote self-efficacy expectations for physical activity. Furthermore, adolescents should be provided with opportunities to explore and master a wide variety of physical activities. Providing properly developed practice opportunities, appropriate feedback, and encouragement may support mastery experiences that may lead to increased SEE. Verbal encouragement from teachers, coaches/trainers, parents and peers may help adolescents overcome self-doubt and bolster their beliefs (self-efficacy) that they have the skills and ability to succeed. Social modeling, witnessing of peers successfully completing and overcoming barriers to similar tasks, may also increase one's SEE because vicarious learning from observing the sustained effort and success of peers may raise one's expectation in his or her own ability to succeed.⁴⁹

In contrast to past studies, BMI was not related to moderate or vigorous physical activity for participants in this study.^{30,35,38-40} BMI was not a significant factor influencing adolescent decisions to engage in physical activity. This may be a promising discovery since obesity rates have climbed dramatically in the last 40 years with overweight/obesity being more prevalent in rural adolescents than urban adolescents.^{4,50} Recognizing higher than "normal" BMI was not related to physical activity behaviors in this population may provide hope for prevention and intervention efforts, as physical activity is a major strategy for reducing overweight/obesity.

Several factors limit the generalizability of the findings. The sample was limited to adolescents from one Midwest state within a rural, Appalachian region of the United States. Therefore, the results may not be generalizable to the entire Appalachian region. Although the findings of this study were significant, only a small portion of physical activity variance was accounted for by the model, 11.5% of the variance for days of MPA and 6.8% of days of VPA. This study represents only two variables that may influence physical activity, several other factors may impact one's decision to engage in physical activity. For example, Beets et al. (2007) found that support from family and friends may provide added incentive and motivation to increase participation in physical activity.³⁴ Future studies should examine the impact of other factors, such as student perceptions about outcomes of physical activity, social support for physical

activity and the type of physical activity in which students participate. This study was cross-sectional in nature. Longitudinal research would provide additional insight regarding the impact of self-efficacy expectations on engagement in physical activity as high school students become young adults. This study utilized self-report measures to calculate BMI. Although, objective measures of height and weight are ideal, studies conducted with adolescents suggest that despite the reporter bias commonly found in overweight/obese individuals, self-reported weight and height are valid proxy measures for objectively measured values.^{45,46,51} Fonseca et al., (2010) found high correlations between self-reported and measured weight, height.⁴⁵ Further in 2000, Goodman found use of self-reported height and weight measures resulted in successful classification for BMI status (underweight, normal/healthy weight, overweight or obese) 96% of the time.⁴⁶

Identifying predictors of MPA and VPA behaviors is important to the promotion of physical activity behavior. Based on the results of this study, building self-efficacy expectation to overcome barriers may encourage physical activity behavior among rural, Appalachian adolescents. Further, positively changing one's belief in his or her ability to overcome barriers to physical activity may increase physical activity behaviors regardless of BMI. Future research should examine additional factors related to PA. Increasing rates of physical activity among rural Appalachian adolescents may potentially reduce the risk for morbidities and mortality. Health and school professionals are essential advocates to deter health problems related to low levels of physical activity among adolescents.⁵² Policies supporting physical activity, physical education and after school programs, may be beneficial to adolescents residing in the rural Appalachian region. Community based efforts incorporating creative approaches to reach rural Appalachian families will also be important to increase physical activity and reduce sedentary behavior.

MEDIA FRIENDLY SUMMARY

Overwhelming health disparities exist in the Appalachian region. Finding ways to reduce morbidities and mortality rates is imperative. Physical activity (PA) is a modifiable behavior that promotes healthy outcomes, yet reports consistently indicate lower than average rates of physical activity among those residing in Appalachia. It is vitally important to promote PA in this population at a young age in hopes of carrying on PA behaviors into adulthood. This study found that self-efficacy expectations (SEE), belief in one's ability to overcome barriers to physical activity, predicted PA behavior among rural, Appalachian adolescents. Advocates for health should provide opportunities for exploration, social modeling, time management and mastery of physical activities while providing feedback and encouragement to enhance self-efficacy. This study also found body mass index (BMI) did not influence the decision to engage in physical activity. Since BMI was not related to physical activity behaviors in this population, there is hope for successful prevention and intervention efforts for reducing overweight/obesity utilizing PA, despite BMI status.

CONFLICT OF INTEREST

No conflict of interest.

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