JOURNAL OF ADOLESCENT HEALTH 2002;31:226–233

ORIGINAL ARTICLE

Psychosocial Correlates of Physical Activity in White and African-American Girls

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Purpose: **To evaluate the relative utility of the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB) in explaining intentions and physical activity behavior in white and African-American eighth-grade girls.**

Methods: **One-thousand-thirty white and 1114 African-American eighth-grade girls (mean age 13.6 ± 0.7 years) from 31 middle schools in South Carolina completed a 3-day physical activity recall and a questionnaire assessing attitudes, subjective norms, perceived behavioral control, self-efficacy, and intentions related to regular participation in moderate-to-vigorous physical activity (MVPA).**

Results: **Among Whites, 17% of the variance in intentions was contributed by subjective norms and attitude, with intentions accounting for 8% of the variance in MVPA. The addition of perceived behavioral control and self-efficacy to the TRA significantly improved the prediction of intentions and MVPA accounting for 40% and 10% of the variance, respectively. Among African-Americans, subjective norms and attitude accounted for 13% of the variance in intentions, with intentions accounting for only 3% of the variance in MVPA. The addition of perceived behavioral control and self-efficacy to the TRA significantly improved the prediction of intentions and MVPA accounting for 28% and 5% of the variance, respectively.**

Conclusions: **The results provided limited empirical support for the TPB among white adolescent girls; however, our findings suggest that the planned behavior framework has limited utility among African-American adolescent girls. The relatively weak link between intentions and MVPA observed in both population groups suggest that constructs external to the TPB may be more important mediators of physical activity behavior in adolescent girls.** © *Society for Adolescent Medicine, 2002*

KEY WORDS:
Adolescents
Exercise
Theory of Reasoned Action
Theory of Planned Behavior
Self-efficacy
Determinants

Emerging evidence indicates that physical activity is beneficial to the short- and long-term health of children and adolescents [1]. Among youth, physical activity is inversely associated with a number of adverse health outcomes, including elevated blood lipids, obesity, and cigarette smoking, while positively associated with cardiorespiratory fitness, high-density lipoprotein (HDL) cholesterol, bone mass, and psychological well-being [2,3]. Moreover, because physical activity habits developed early in life may persist into adulthood [4,5], adequate participation in physical activity during childhood and adolescence may be of critical importance in the prevention of chronic disease states later in life.

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Supported by grant NIH HL 57775 from the National Heart, Lung and Blood Institute.

Manuscript accepted March 11, 2002.

1054-139X/02/$–see front matter
PII S1054-139X(02)00375-0

Published by Elsevier Science Inc., 360 Park Avenue South, New York, NY 10010

Despite the health benefits of regular physical activity, sizable percentages of youth fail to meet established guidelines for participation in physical activity [6,7]. Low levels of physical activity appear to be particularly prevalent among adolescent girls. Results from the 1997 Youth Risk Behavior Survey (YRBS) indicate that just over 50% of high school–aged girls compared to over 72% of high school–aged boys report participation in vigorous physical activity 3 or more days per week [8]. Of concern, African-American girls at all ages are less physically active than girls from other population subgroups. Analysis of the 1997 YRBS data reveal that, by the 12th grade, 42.3% of African-American girls, compared to 27.2% of white non-Hispanic girls, report no participation in exercise or sport in the week preceding the survey [8]. Collectively, these findings underscore the need for behaviorally based, culturally appropriate interventions to promote physical activity among adolescent girls [9].

Identifying the psychosocial factors that influence physical activity behavior in adolescent girls is an important prerequisite to designing effective intervention programs for this population [10]. Two well-established theoretical models that may be useful for this purpose are the Theory of Reasoned Action (TRA) [11] and the Theory of Planned Behavior (TPB) [12]. TRA states that performance of a given behavior is primarily determined by an individual's intention to perform that behavior. The intent to perform this behavior is, in turn, influenced by the individual's attitude toward the behavior and the influence of the individual's social environment or subjective norm. To accommodate behaviors not fully under volitional control, Ajzen [12] added the concept of perceived behavioral control to the reasoned action model. This model (TPB), specifies that intention to perform a given behavior is not only influenced by attitude and subjective norm, but also perceived behavioral control. Perceived behavioral control is hypothesized to directly influence behavior in parallel with its influence on intention. According to Ajzen [12], perceived behavioral control reflects personal beliefs as to how easy or difficult adoption of the behavior is likely to be. It is an overall assessment of factors internal to the individual such as skills, ability, will power, knowledge, and adequate planning; as well as external factors such social support, opportunity, and time. Perceived behavioral control had been viewed as a construct conceptually related to Bandura's concept of perceived self-efficacy or one's confidence in performing a specific behavior [13]. However, lack of clarity in the definition and measurement of both constructs has led some to question their similarity[14].

To date, a small number of studies have utilized the TRA to investigate the determinants of physical activity in children and adolescents. These studies have consistently reported attitudes toward physical activity to be a significant predictor of intentions, with intentions, in turn, being a significant, yet modest, predictor of exercise behavior [15–17]. However, it is important to note that none of these studies have been conducted with large population-based samples of adolescent girls and none have evaluated the utility of the reasoned action framework among African-American youth.

Compared to the TRA, empirical evidence regarding the applicability of the TPB to youth physical activity behavior is sparse. Craig et al. [18] used constructs from the TPB to examine the determinants of physical activity in fifth- and eighth-grade children. In partial support of the TPB, attitudes toward physical activity and perceived behavioral control were found to be significant predictors of intention. Unfortunately, the investigators did not evaluate the additional variance accounted for by the addition of perceived behavioral control to the reasoned action model, nor did they evaluate the potentially important direct influence of perceived behavioral control on physical activity behavior. Most recently, Mummery et al. [19] evaluated the utility of the TPB in explaining exercise intentions in Canadian children in grades 3 to 11. Constructs from the TPB explained 47% of the variability in physical activity intention; however, like Craig et al., the relationship between intention and physical activity behavior was not assessed. Consequently, the relative importance of control perceptions in the prediction of youth physical activity behavior has yet to be fully evaluated.

The purpose of the present study was to evaluate the relative utility of the TRA and TPB in explaining physical activity behavior in white and African-American eighth-grade girls. To determine if self-efficacy and perceived behavioral control were related constructs, we added self-efficacy perceptions to the planned behavior model, and evaluated its independent contribution to the prediction of intentions and physical activity behavior.

Methods

Subjects

Subjects for this study were 2357 eighth-grade girls from 31 middle schools in South Carolina. Of the

study group, 51.8% was African-American with a mean age of 13.7 ± 0.7 years. After deletions for missing or incomplete data on the physical activity or determinant variables, the final sample consisted of 1030 white and 1114 African-American eighth-grade girls ($n = 2144$). The descriptive statistics for this group (52.0% African-American, mean age 13.6 ± 0.7 years) indicated that the demographic characteristics remained unchanged by the exclusion of the subjects. Prior to participation in the study, written informed consent was obtained from each student and her primary guardian. The study was approved by the University of South Carolina Institutional Review Board.

Measures

The measures of intention, physical activity attitudes, subjective norms, perceived behavioral control, and self-efficacy were modified from previously published instruments [20] or specifically developed for the present study. Prior to data collection, each measure was pilot-tested to ensure that the reading level and response format were appropriate for eighth-grade students. The factorial validity and invariance of these measures among eighth-grade girls has been reported elsewhere [21].

Intention to be physically active was measured by participant selection of one of five sentences indicating intention to be physically active on most days, with responses coded from 1 ("Sure I will not be active") to 5 ("Sure I will be active"). The attitude measure included 7 items that consisted of belief and corresponding value statements. The belief statements were rated also on a 5-point Likert-type scale anchored by 1 ("Disagree a lot")and 5 ("Agree a lot"); value statements were rated on a 5-point Likert-type scale with responses ranging from 1 ("Very bad") to 5 ("Very good"). Attitude scores were computed by multiplying each belief statement with it's corresponding value and averaging the products. The subjective norm measure included 8 items that consisted of normative beliefs and corresponding motivation to comply statements. Normative belief statements and motivation to comply statements were rated on 5-point Likert-type scales anchored by 1 ("Disagree a lot") and 5 ("Agree a lot"). Subjective norms scores were computed by averaging the product of each normative belief and motivation to comply rating. The measure of perceived behavioral control included 4 items rated on a 5-point Likert-type scale. The anchors were 1 ("Agree a lot") and 5 ("Disagree a lot"). The self-efficacy measure consisted of 8 items rated on a 5-point Likert-type scales anchored by 1 ("Disagree a lot") and 5 ("Agree a lot").

Physical activity. Physical activity was assessed using the Three-Day Physical Activity Recall (3DPAR). This instrument, which is an extension of the Previous Day Physical Activity Recall (PDPAR) [22], requires participants to recall their past physical activity behavior from each of the previous 3 days, beginning with the most recent day. Each day is segmented into 30-minute time blocks (7:00 am to midnight), which, in turn, are grouped into broader time periods such as morning, afternoon and evening. The instrument provides a list of 55 commonly performed activities grouped into the following categories: sleep/bathing, eating, work, after-school/spare-time/hobbies, transportation, and physical activities/sports. For each block of each day, a participant entered the main activity in which she participated during each 30-minute period. The main activity was defined as the activity that occupied the majority of the 30-minute period. Participants also rated the relative intensity of the designated activity as very light, light, moderate, and hard. To help participants select the correct intensity level, the instrument provides pictorial representations of the four levels of relative intensity. For example, very light activity was depicted by a girl sitting down, while vigorous physical activity was depicted by a girl running.

All participants completed the 3DPAR instrument on a Wednesday, recalling activities from the immediately preceding Tuesday, Monday, and Sunday. Based on the activity and the level of intensity selected, each 30-minute block was assigned a literature-based metabolic equivalent (MET) value [23]. Data from each day were reduced to the average daily number of 30-minute time blocks in which the main activity was rated at 3 METs or greater—a measure of moderate-to-vigorous physical activity (MVPA). In a preliminary validation study involving 72 eighth- and ninth-grade girls, physical activity participation, as measured by the 3DPAR, was significantly correlated with CSA motion sensor counts ($r = .30$, $p < .05$).

Data Analysis

For both population groups means, standard deviations, and Pearson correlations were calculated for all variables. Race-specific hierarchical regression analyses were then used to evaluate the unique

Table 1. Descriptive Statistics for the Total Sample and White and African-American Girls, Respectively

Variable	Range of Possible Scores	Total Sample (N = 2144)	White (N = 1030)	African-American (N = 1114)
MVPA blocks/day	0 to 34	3.5 ± 2.7	4.1 ± 2.7	3.0 ± 2.5†
Intention	1 to 5	4.1 ± 1.0	4.2 ± 0.9	4.0 ± 1.0†
Attitude	1 to 25	17.5 ± 3.1	18.0 ± 2.9	17.1 ± 3.3†
Subjective norm	1 to 25	11.5 ± 5.0	12.0 ± 4.8	10.9 ± 5.2†
Perceived behavioral control	1 to 5	4.1 ± 0.7	4.2 ± 0.7	4.0 ± 0.7†
Self-efficacy	1 to 5	3.8 ± 0.7	3.9 ± 0.7	3.6 ± 0.7†

† Significantly different from white girls (P < 0.0001).
MPVA = moderate-to-vigorous physical activity.

contribution of the model components to the prediction of intentions and MVPA. To improve the normality and homoscedasticity of the residuals, a log transformation was applied to the physical activity dependent variable [24]. Statistical significance was set at an alpha level of .05.

Results

Descriptive Statistics

Descriptive statistics for the physical activity and psychosocial determinant variables are shown in Table 1. On average, study participants were low-active, reporting less than four blocks of MVPA per day. Relative to their white counterparts, African-American girls were significantly less active and exhibited significantly lower scores on the psychosocial predictor variables. Inter-relationships among the study variables for the white and African-American girls are shown in Tables 2 and 3, respectively. Among Whites, correlations ranged from .14 to .61 and all were significant below the .0001 level. Among African-Americans, correlations were consistently lower, ranging from .05 to .50. With the exception of the association between attitudes and MVPA, all of the correlations were statistically significant at the .05 level or less. Among both racial/ethnic groups, self-efficacy perceptions were strongly associated with perceived behavioral control (r = .40–.60) and intentions to be active (r= .50–.61).

Table 2. Pearson Correlation Matrix for the Study Variables Among White Girls (N = 1030)

Variable	1	2	3	4	5	6
1. MVPA block	1.00					
2. Intentions	.28	1.00				
3. Attitude	.19	.40	1.00			
4. Subjective norm	.14	.28	.39	1.00		
5. Perceived behavioral control	.17	.43	.41	.21	1.00	
6. Self-efficacy	.29	.61	.45	.31	.60	1.00

Log transformed.
All correlation coefficients are significant at the .0001 level.
MVPA = moderate-to-vigorous physical activity.

Prediction of Intention

Tables 4 and 5 show the results of the hierarchical regression analyses for the prediction of intention among white and African-American girls, respectively. In accordance with theory, attitudes towards physical activity and subjective norms were entered on Step 1; perceived behavioral control on Step 2, and physical activity self-efficacy on Step 3.

Table 3. Pearson Correlation Matrix for the Study Variables Among African-American Girls (N = 1114)

Variable	1	2	3	4	5	6
1. MVPA blocks	1.00					
2. Intentions	.18	1.00				
3. Attitude	.05*	.32	1.00			
4. Subjective norm	.07†	.25	.34	1.00		
5. Perceived behavioral control	.14	.31	.27	.15	1.00	
6. Self-efficacy	.18	.50	.39	.31	.40	1.00

Log transformed; * not significant (p = .09); † significant (p = .03). All of the remaining correlations are significant (p < .0001).

Table 4. Hierarchical Regression Analyses for the Prediction of Intention Among Whites (N = 1030)

Variables	b	B	p-value	Adj. R^2
Step 1				
Attitude	.11	.34	<.0001	
Subjective norm	.03	.15	<.0001	.17
Step 2				
Attitude	.07	.22	<.0001	
Subjective norm	.02	.13	<.0001	
Perceived behavioral control	.42	.31	<.0001	.25
Step 3				
Attitude	.04	.12	<.0001	
Subjective norm	.01	.06	.02	
Perceived behavioral control	.12	.09	.002	
Self-efficacy	.68	.49	<.0001	.40

Table 5. Hierarchical Regression Analyses for the Prediction of Intention Among African-American Girls (N = 1114)

Variables	b	B	*p*-value	Adj. R^2
Step 1				
Attitude	.08	.27	<.0001	
Subjective norm	.03	.15	<.0001	.13
Step 2				
Attitude	.07	.21	<.0001	
Subjective norm	.03	.14	<.0001	
Perceived behavioral control	.35	.23	<.0001	.17
Step 3				
Attitude	.04	.12	<.0001	
Subjective norm	.01	.07	.007	
Perceived behavioral control	.18	.11	.002	
Self-efficacy	.55	.39	<.0001	.28

Whites. On Step 1, both attitudes and subjective norm significantly contributed to the prediction of intention (R^2 = .17, F (2,1027) = 109.1, $p < .0001$). When perceived behavioral control was entered into the analysis on Step 2, it significantly increased the predictive power of the model, accounting for an additional 8% of the variance in intention (R^2 = .25, F (3,1026) = 118.2, $p < .0001$). The addition of physical activity self-efficacy on Step 3 significantly enhanced the prediction of the intention, accounting for an additional 15% of the variance (R^2=.40, F (4,1025) = 170.2, $p < .0001$).

African-Americans. On Step 1, both attitudes and subjective norm significantly contributed to the prediction of intention (R^2 =.13, F (2,1111) = 80.5, $p < .0001$). The addition of perceived behavioral control on Step 2, significantly increased the predictive power of the model, accounting for an additional 4% of the variance in intention (R^2=.17, F (3,1110) = 79.2, $p < .0001$). The addition of physical activity self-efficacy on Step 3 significantly enhanced the prediction of the intention, accounting for an additional 11% of the variance (R^2=.28, F (4,1109) = 109.9, $p < .0001$).

Prediction of MVPA

Tables 6 and 7 show the results of the hierarchical regression analyses for the prediction of MVPA for white and African-American girls, respectively. Intention was entered on the first step, perceived behavioral control on the second step, and self-efficacy on the third step.

Whites. On Step 1, intention was significantly related to physical activity level, accounting for 8% of the variance (R^2 = .08, F (1,1028) = 88.9, $p < .0001$). Despite a marginally significant beta weight, the addition of perceived behavioral control on Step 2 resulted in no meaningful increase in variance explained (R^2 = .08, F (2,1027) = 46.5, $p < .0001$). The addition of physical activity self-efficacy on Step 3 significantly increased the predictability of the model, accounting for an additional 3% of the variance in MVPA (R^2=.10, F (3,1026) = 38.3, $p < .0001$).

Table 6. Hierarchical Regression Analyses for the Prediction of Log MVPA Among White Girls (N = 1030)

Variables	b	B	*p*-value	Adj. R^2
Step 1				
Intention	.17	.28	<.0001	.08
Step 2				
Intention	.15	.25	<.0001	
Perceived behavioral control	.05	.06	.05	.08
Step 3				
Intention	.10	.17	<.0001	
Perceived behavioral control	.004	.005	.88	
Self-efficacy	.16	.19	<.0001	.10

MVPA = moderate-to-vigorous physical activity.

African-Americans. On Step 1, intention was significantly related to physical activity level, accounting for 3% of the variance (R^2=.03, F (1,1112) = 39.1, $p < .0001$). The addition of perceived behavioral control on Step 2 resulted in a small but statistically significant increase in variance explained (R^2=.04, F (2,1111) = 23.9, $p <.0001$). The addition of physical activity self-efficacy on Step 3 accounted for an additional 1% of the variance in MVPA (R^2=.05, F (3,1110) = 18.4, $p < .0001$).

Discussion

This study evaluated the relative utility of the TRA, and its extension, the TPB, in explaining physical

Table 7. Hierarchical Regression Analyses for the Prediction of Log MVPA Among African-American Girls (N = 1114)

Variables	b	B	*p*-value	Adj. R^2
Step 1				
Intention	.11	.18	<.0001	.03
Step 2				
Intention	.10	.16	<.0001	
Perceived behavioral control	.08	.09	.004	.04
Step 3				
Intention	.07	.17	<.0001	
Perceived behavioral control	.06	.06	.04	
Self-efficacy	.08	.09	<.008	.05

MVPA = moderate-to-vigorous physical activity.

activity behavior in white and African-American adolescent girls. Among both racial/ethnic groups, the addition of perceived behavioral control and self-efficacy to the reasoned action model significantly improved the prediction of intention and behavior. Thus, from a theoretical perspective, our findings lend support to the utility of the TPB over the TRA. There were, however, notable racial/ethnic differences in the explanatory power of both theoretical models. Among white adolescent girls, the TPB accounted for 40% of the variance in intention and 10% of the variance in MVPA. In contrast, among African-American girls, the TPB accounted for 28% of the variance in intention and only 5% of the variance in MVPA. Moreover, with the exception of perceived behavioral control, the standardized beta weights for each construct were consistently lower in African-American girls than in white girls. Therefore, it appears reasonable to conclude that the planned behavior framework has limited utility among African-American adolescent girls.

Previous studies involving youth have shown the TPB to be useful for predicting exercise intention [18,19]. None of these studies, however, examined the prediction of actual physical activity behavior. Within our sample of approximately 2100 white and African-American adolescent girls, constructs from the TPB accounted for 40% and 28% of the variance in intentions, respectively. Notably, these figures are comparable to the 47% variance reported by Mummery et al. [19] in Canadian youth and the 37% variance reported by Craig et al [18] in middle school students from the northeastern United States. Yet, despite our ability to predict exercise intention, the association between intention and behavior was weak, accounting for 3% to 8% of the variance in MVPA. While random measurement error and reduced variance in physical activity behavior may have contributed, in part, to this lack of explanatory power, our findings raise the possibility that intentions and behavior may not be closely aligned in adolescent girls. Accordingly, future studies evaluating the TPB and/or the TRA in children and adolescents should assess *both* exercise intentions and physical activity behavior.

Perceived behavioral control has long been viewed as a construct conceptually similar to perceived self-efficacy [12,25]. Few empirical studies, however, have tested this assertion. Therefore, a secondary aim of the present study was to compare the predictive ability of perceived behavioral control and physical activity self-efficacy. Our findings suggest that perceived behavioral control and self-efficacy, as operationalized in this study, are correlated but not equivalent constructs. In the hierarchical regression analyses, the addition of self-efficacy perceptions to the TPB model significantly added to the prediction of intentions and MVPA. Moreover, the standardized beta weights for self-efficacy were substantially greater than that observed for perceived behavioral control, indicating that self-efficacy perceptions were far more important than control perceptions in the prediction of intentions and behavior. Our findings are consistent with those of Dwezaltowski et al [26], who compared the predictive strengths of perceived behavioral control and physical activity self-efficacy in undergraduate college students. In that study, the addition of perceived behavioral control to a regression model containing self-efficacy and intentions did not significantly add to the prediction of MVPA, leading the authors to conclude that perceived behavioral control and self-efficacy were not related constructs. Therefore, the results of this study reinforce the conclusions of previous adult studies and indicate that, within the physical activity domain, perceptions of control are not synonymous with perceptions of self-efficacy.

In agreement with previous investigations [15,16,27], attitudes toward physical activity were found to be a stronger predictor of intentions than subjective norm. The consistency of this finding across studies is somewhat surprising given that previous studies have shown parental physical activity [28,29], social influences related to physical activity [20,30] and adult support for physical activity [31,32] to be significant determinants of youth physical activity behavior. It is possible that, within our study population, the construct of subjective norm, as operationalized by Ajzen and Fishbein, may be unduly influenced by social desirability. That is, because most adolescents perceive regular physical activity as an health enhancing behavior, they may be reluctant to believe that important adult role models such as parents and teachers would not want them to participate in physical activity. Alternatively, subjective norms regarding physical activity may differ conceptually from social support. In support of this assertion, Courneya et al [33] observed social support to be superior to subjective norms in predicting exercise intention and stage of change in a community-based sample of adults. Future studies involving adolescent girls should examine the explanatory power of social support for physical activity relative to other constructs in the reasoned action and planned behavior models. In particular, it would be interesting to examine whether the hypothesized link between intentions and physical activity is me-

diated by social support or encouragement from family and/or peers in adolescent girls.

The results of this study are limited by the cross-sectional study design and the use of self-reported physical activity behavior. Nevertheless, our findings may have important implications for health professionals devising programs to increase physical activity levels in adolescent girls. Our observation that participation in MVPA was strongly related to self-efficacy perceptions (directly or indirectly via intention) in *both* population groups suggests that physical activity intervention programs for adolescent girls should endeavor to increase efficacy beliefs related to physical activity. Furthermore, our findings related to attitude towards physical activity suggest that intervention programs should try to cultivate positive behavioral beliefs by educating girls about the proximal benefits associated with physical activity participation (spending time with friends, weight control) and provide physical activity experiences that meet the needs and interests of adolescent girls.

In summary, the TPB appears to be a viable framework on which to base physical activity interventions for white adolescent girls. However, neither the planned behavior nor reasoned action framework appears to work well for African-American adolescent girls. For both racial/ethnic groups, the relatively modest explanatory power of either theoretical model suggests that constructs external to the reasoned action or planned behavior models may be more important determinants of physical activity. Such constructs might include environmental influences such as access to physical activity programs and facilities, perceived neighborhood safety, and time constraints owing to school and family commitments.

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