Social-Cognitive Influences on Students' Physical Activity Behavior across the First College Year

J. P. Barfield and Jasmin Hutchinson

Abstract

Background. *The purpose of this study was to examine the cross-sectional and longitudinal influence of specific social-cognitive variables on students' physical activity behavior across the first college year.* ***Methods.*** *First-year college students (N = 406) from a regional higher education institution participated. Email solicitation was sent to students at the beginning of the fall semester with a link to inventories measuring exercise identity (EI), attitude (AT), subjective norm (SN), perceived behavioral control (PBC), and self-report physical activity. The sample was again solicited at the end of the first semester and the end of the first academic year with Pearson r and r^2 used to examine relationships between each independent variable and physical activity behavior.* ***Results.*** *Cross-sectional, EI demonstrated a positive, moderately strong relationship with activity behavior at each data collection time period. Attitude, subjective norm, and perceived behavioral control also demonstrated positive influences on activity at each time period but the strength of the influence was more moderate than that of EI. Longitudinal, EI, AT, and SN were all positively related to activity behavior, with EI demonstrating the strongest influence.* ***Conclusions.*** *Based on the current findings, it appears that specific social-cognitive variables can provide meaningful psychological bases upon which to promote physical activity behavior. Physical activity intervention ideas for college students are included.*

Dr. J. P. Barfield is on the faculty at Tennessee Tech University, and Dr. Jasmin Hutchinson teaches at Springfield College, Springfield, MA.

Despite the well-known health benefits of regular physical activity, most U.S. adults are not physically active at levels that can promote health; indeed, a quarter of the United States population reports no leisure-time physical activity at all (Centers for Disease Control, 2003; 2005). The transition from adolescence to young adulthood appears to represent a critical juncture for continued participation in physical activity, as physical activity levels decline from middle school to high school with further decreases from high school to college graduation. According to a recent report, only 15% to 30% of college students meet the recommended amount of physical activity for health benefits (Blanchard et al., 2008), and this finding has been reported by others (Blanchard et al., 2007; Irwin, 2007; Suminski, Petosa, Utter, & Zhang, 2002). Bray and Born (2004) explicitly examined patterns of physical activity during this transition period, comparing student self-reports of physical activity during the last two months of high school to the first two months of college. They found significant declines in both frequency and duration of vigorous physical activity, with 50% of students who had been vigorously active (i.e. $\geq$ 20 minutes on $\geq$ three days a week) in high school becoming insufficiently active during their first college year.

Together with this period of declining activity, corresponding increases in the incidence and continuance of obesity from adolescence to adulthood have been reported (Gordon-Larsen, Adair, Nelson, & Popkin, 2004; Hedley et al., 2004). Alarmingly, longitudinal data indicates that those who develop obesity as adolescents rarely lower their body mass index (BMI) out of the obese range (Ogden, Flegal, Carroll, & Johnson, 2002). While exercise alone is not a panacea for the current obesity epidemic, it is well established that physical activity is an important factor for weight management in addition to many other health benefits. Healthy People 2010 documented post-secondary educational institutions as settings where physical activity should be promoted among young adults. In order for such promotions to be successful, an understanding of the factors related to physical activity participation is important. The development of empirically verified, theoretically based models can serve as a guide to the development of interventions to enhance physical activity rates among students (Petosa, Hortz, Cardina, & Suminiski, 2005).

Exercise Identity

Exercise identity (EI) is a model currently being examined in college students relative to intervention effectiveness. As integral parts of one's concept of self, role-identities help individuals give meaning and value to their past behavior as well as provide direction for future behavior (Anderson & Cychosz, 1995). Role-identities motivate or stimulate behaviors that have meanings consistent with the identity. Thus, if exercise is a salient aspect of one's role-identity, then one should be motivated to engage in exercise in the present and future as this action serves to reinforce and validate one's concept of self (Swann, 1985). Cardinal and Cardinal (1997) examined the reciprocal relationship between exercise identity and exercise behavior among college students over a 14-week period in which experimental group participants attended aerobic exercise classes while those in the control group attended non-exercise classes. Over the course of the study, experimental group participants increased both their exercise behavior and exercise identity, whereas those in the control group decreased their exercise behavior and showed no change in exercise identity. These results are consistent with previous examinations reported in the literature and therefore suggest that EI may be a sound model on which to base activity interventions (Anderson & Cychosz, 1995). It is necessary, however, to ensure the relationship between EI and behavior is stable across various student groups (cross-sectional) and time periods (longitudinal) if manipulation of EI is to be recommended for activity intervention.

Theory of Planned Behavior

The Theory of Planned Behavior is also a social-cognitive model being examined in college students relative to intervention effectiveness. Theory of Planned Behavior postulates that intention (to exercise in this case) is influenced by three conceptually independent constructs: attitude toward the behavior, subjective norm, and perceived behavioral control. Attitude (AT) refers to the individual's beliefs about the outcomes of a behavior along with his or her evaluations of those outcomes. Subjective norm (SN) refers to the beliefs held by the individual in relation to significant others' attitudes towards the target behavior, along with their motivation to comply with those significant others. Perceived behavioral control (PBC) refers to the individual's perception of how difficult or easy it is to carry out a given behavior. Thus, attitudes, subjective norms,

and perceived behavioral control jointly contribute to the formation of behavioral intentions, which in turn predicts whether the behavior will or will not occur. As a general rule, the more favorable the attitude and subjective norm with respect to a behavior, and the greater the perceived behavioral control, the stronger should be an individual's intention to perform the behavior under consideration (Cardinal & Cardinal, 1997).

Meta-analytic reviews of Theory of Planned Behavior factors and exercise literature support the utility of these variables for predicting and explaining exercise intention and behavior (Hagger, Chatzisarantis, & Biddle, 2002; Hausenblas, Carron, & Mack, 1997, Symons Downs & Hausenblas, 2005). However, its use for explaining exercise behavior in college students has received only scant research attention. Two recent studies conducted by Blanchard and colleagues (2007; 2008) examined whether planned behavior variables could explain significant variation in physical activity intentions and behavior among college students. Findings by these authors support the hypothesis that attitudes are a significant unique predictor of intention for various ethnic groups. These data were collected over one to two weeks so, again, it is necessary to examine this relationship across student groups (cross-sectional) and time periods (longitudinal). Since manipulation of EI, AT, SN, and PBC may result in effective exercise interventions for college-aged students, the primary purpose of this study was to examine the influence of each variable on students' physical activity behavior from both a cross-sectional and longitudinal perspective. Based on these findings, the secondary purpose of this study was to recommend specific programming interventions that may be most effective in increasing physical activity in college-aged students.

Methods

Participants

First-year college students (N = 406) from a regional higher education institution in the southeast United States were recruited to participate. Email requests were sent to students enrolled in first-year experience courses at three time periods during the first college year. Demographic data for participants at each time period are reported in Table 1. In general, prior high school sport participation and self-reported physical activity level (often, sometimes, rarely) were similar across all three samples. Informed consent was required for

Table 1

Demographic Characteristics of the Cross-Sectional Samples

	N	High School Sport	Often	Sometimes	Rarely	Not Reported
T1	259	151 (58%)	94 (36%)	100 (38%)	31 (12%)	34 (13%)
T2	142	92 (65%)	49 (34%)	66 (47%)	18 (13%)	9 (6%)
T3	105	65 (62%)	39 (37%)	42 (40%)	12 (11%)	12 (11%)

Note. Self-reported sport and activity levels at baseline (T1), end of the first semester (T2), and end of the academic year (T3).

participants to access the survey and human subjects IRB approval was obtained prior to survey distribution. Participants were notified that the survey was not part of any academic or course requirement and that they were not obligated to participate and/or could withdraw at any time without consequence.

Instruments

The Exercise Identity Scale (EIS) was used to assess exercise identity (Anderson & Cychosz, 1995). The instrument consisted of nine questions scored on a seven-point Likert scale from "strongly disagree" to "strongly agree." Example questions included, "I consider myself an exerciser," and "I have numerous goals related to exercising." A Theory of Planned Behavior instrument (TPB) was developed from the guidelines of Ajzen (2006) to assess attitude toward exercise behavior (AT), normative beliefs that influence exercise behavior (i.e., subjective norm, SN), and perceived behavioral control (PBC) to influence exercise behavior. All TPB subscales consisted of questions scored on a seven-point Likert scale but the descriptors varied. Within the AT subscale, seven responses were elicited for the single statement, "engaging in moderate-intensity exercise on most, if not all days of the week would be," and were scored from lowest (e.g., useless, harmful, bad) to highest (e.g., useful, beneficial, good). Four questions, such as "most people who are important to me engage in moderate-intensity exercise most, if

not all, days of the week" addressed the SN subscale and were scored from lowest (strongly disagree, not at all) to highest (strongly agree, very much). Perceived behavioral control questions, such as, "for me to engage in moderate exercise on most, if not all, days of the week would be," were also scored from lowest (extremely difficult, very little control) to highest (extremely easy, complete control). No reverse scoring was used in any of the TPB subscales. Internal consistency and test-retest reliability of the EIS and TPB subscales were collected to ensure scales were consistent and therefore could be used across a school year to assess exercise influences.

The Godin Leisure-Time Exercise Questionnaire (GLTEQ) was used to assess physical activity behavior (Godin & Shephard, 1985). The instrument assessed light, moderate, and vigorous exercise and yielded a continuous score of weekly leisure activity.

Procedures

Initial participant recruitment occurred during the first two weeks of the fall academic semester. Email solicitation was sent to students enrolled in first-year experience courses with a link to the online survey consisting of the EI inventory, TPB subscales, informed consent, and demographic questions. Participants had 10 days from the initial solicitation to access and submit the survey and an email reminder was distributed one week following the initial recruitment effort. At the conclusion of the first administration (T1), approximately 40 first-year college students were recruited from university classes and asked to complete hard copy surveys for internal consistency analysis of EI, AT SN, and PBC. Retest data were collected one to two weeks later for test-retest reliability analysis.

First-year students were again solicited at the end of the first college semester (T2; four months following initial data collection), enabling collection of both cross-sectional and longitudinal data. A final sample group was solicited at the end of the first academic year (T3; eight months following initial collection). The same recruitment procedures were used for all three time periods, with participants having 10 days from the initial solicitation to access and submit the survey. An email reminder was distributed one week following each initial recruitment effort.

Analyses

To ensure integrity of surveys, Cronbach's alpha and intraclass correlation coefficients (ICC) were used to examine internal consistency of scale items and the test-retest reliability of scale scores, respectively. To examine the cross-sectional influence of each independent variable on students' physical activity behavior, r and r^2 were determined between each variable and activity behavior score (GLTEQ) at T1, T2, and T3. To examine the longitudinal influence of social-cognitive variables on students' physical activity behavior, data from a subsample of students who participated in survey completion at two time periods (T1 and T2 or T1 and T3) were extracted. Pearson r and r^2 were determined between each independent variable and behavior score at the post-time period. SPSS (Version 14.0) was used for all analyses.

Results

Internal consistency reliability was strong for each scale ($\alpha >$ .90 for EI, AT, SN, and PBC) and test-retest reliability was also acceptable ($ICC >$ .90 for each variable across two trials and >.80 when adjusted for one trial). Descriptive statistics for each time period are reported in Table 2. In general, social-cognitive and behavior scores were similar for each cross-sectional sample (T1, T2, and T3).

Table 3 depicts the cross-sectional relationships between EI, AT, SN, PBC and GLTEQ at each time period. Positive, moderately strong relationships existed between EI and physical activity at

Table 2

Cross-sectional Means (SD) at T1, T2, and T3

	Age	*EI*	*AT*	*SN*	*PBC*	*GLTEQ*
T1	18.01 (.35)	34 (14)	40 (8)	17 (5)	21 (5)	59 (27)
T2	18.25 (.48)	38 (14)	40 (7)	17 (5)	19 (5)	57 (27)
T3	18.48 (1.8)	38 (14)	40 (7)	19 (4)	20 (5)	58 (24)

Note. Highest possible scores are 63 for EI, 49 for AT, 28 for SN, 28 for PBC, 119 for GLTEQ.

each time period with EI explaining approximately 40% of activity behavior variation across samples. Theory of Planned Behavior variables (AT, SN, PBC) were also positively and moderately related to activity behavior, explaining between 6 and 20% of the variation in activity behavior depending on the sample. Table 3 also documents the longitudinal relationships between the social-cognitive variables and physical activity behavior. Exercise identity demonstrated a strong influence on activity behavior across time. The influence of AT and SN on activity was also positive but their independent influence was weaker across time than EI, explaining between 8 and 18% of the variability in activity behavior scores.

Table 3

Relationships between Social-Cognitive Variables and Physical Activity Score (GLTEQ) across the First College Year

		Cross-Sectional			Longitudinal		
		n	***r***	***r²***	***n***	***r***	***r²***
EI	T1	208	.53*	.28			
	T2	130	.63*	.40	49	.34*	.12
	T3	92	.66*	.44	49	.69*	.48
AT	T1	208	.42*	.17			
	T2	130	.45*	.20	49	.42*	.18
	T3	92	.27*	.07	49	.29*	.08
SN	T1	208	.40*	.16			
	T2	130	.44*	.19	49	.30*	.09
	T3	92	.24*	.06	49	.33*	.11
PBC	T1	205	.31*	.10			
	T2	130	.44*	.19	49	.20	.04
	T3	92	.33*	.11	49	.26	.07

** Significant ($p < .01$).*
Note. EI = exercise identity; AT = attitude; SN = subjective norm; PBC = perceived behavioral control

Discussion

The primary purpose of this study was to examine the influence of specific social-cognitive variables on students' physical activity behavior across multiple time periods during the first college year. Findings from the current study indicate that EI demonstrated a strong influence on physical activity behavior from both a cross-sectional and longitudinal perspective. Additionally, AT and SN were moderately related to behavior across samples (cross-sectional) and time (longitudinal). Since the majority of college students are not physically active (Kasparek, Corwin, Valois, Sargent, & Moris, 2008), there is a need to identify which exercise psychology factors are most likely to influence behavior and therefore increase likelihood of behavior change. The current study documents the influence of EI, AT, and SN on activity behavior and therefore inclusion of these variables may be useful in physical activity interventions for college students.

Exercise Identity

In the current study, EI explained approximately 40% of variability in physical activity behavior across different samples. This influence is consistent with the minimal empirical evidence reported in the literature. Specifically, Anderson & Cychoz (1995) reported that amount and type of exercise explained a significant amount of EI (r^2 = .34). Although not the same direction of explanation, the similar findings appear to confirm that EI and physical activity behavior are related. More importantly, the relationship between EI and activity behavior was stable over time, explaining almost 50% of the variability in activity scores across the entire academic year. Therefore, it seems reasonable that efforts to increase EI are likely to increase physical activity behavior.

Theory of Planned Behavior

The Theory of Planned Behavior (TPB) is a social-cognitive model of expectancy value that postulates behavioral intention as the proximal determinant of behavior (Ajzen, 1991). The decision to be physically active is the behavioral intention in the current study and, despite its usage in adolescent populations, few researchers have examined the influence of planned behavior variables on activity levels in college students. Blanchard and colleagues (2007;

2008) have devoted the most attention to TPB influence with this population. These authors noted that attitudes are a significant unique predictor of intention for various ethnic groups. Consistent with the work of Blanchard and colleagues, AT in the current study explained 7 to 20% of cross-sectional activity variability and 8 to 18% of longitudinal variability. Our results indicate that a person's belief in the benefit of exercise is related to the amount of exercise in which he/she engages. It is therefore important that health promotion interventions for college students emphasize the importance of physical activity to a positive, healthy lifestyle.

Subjective norm reflects the importance an individual places on exercise based on perceived approval for exercise demonstrated by others. The current study documented that SN was an important influence on exercise behavior, explaining approximately 15% of activity variability across samples and approximately 10% across time. This outcome supports findings by Parrott and colleagues (2008). These authors examined the effectiveness of email-based persuasive messaging on exercise behavior and TPB constructs in sedentary college students and reported that positively framed persuasive messages sent via email improved exercise behavior, attitude and intentions. The sample in the Parrott study was delimited to sedentary individuals so perhaps it is not surprising that our findings do not demonstrate the same strength of influence. We examined the relationship between TPB variables and activity across diverse samples (Table 1) and therefore have a more conservative estimate about the influence of each independent variable on behavior. Regardless, the effort made by Parrott and colleagues was intended to increase behavioral intention through personal contact and we feel this addition is warranted for college-based health promotion efforts. The influence of subjective norm, although modest, was important to the current study population and dissemination of messages and reminders may be better received from personal contacts (e.g., faculty, residential life personnel) than anonymous administrative email distributions.

Perceived behavioral control reflects an individual's thoughts relative to the difficulty or ease of exercise behavior. Although PBC was related to exercise behavior in each sample (cross-sectional), this variable explained minimal variation in activity behavior across time. Therefore, its usage in health promotion programs may be more beneficial to participant recruitment than actual program intervention. That is, it would be helpful to identify students who

are receptive to an exercise intervention during the recruitment process to maximize program adherence. Simultaneously, it would be equally important to identify students who perceive barriers to exercise participation (low PBC score) and therefore not be likely candidates to complete a program. Therefore, PBC is worth assessing on potential exercise intervention candidates but probably should not be a focus point of the intervention itself.

Role of Gender on Variable Influence

The purpose of the current study was to examine the influence of social-cognitive variables on college students' physical activity behavior from both a cross-sectional and longitudinal perspective. Although the impact of gender on these relationships was not a priority, we did examine the same research questions in both males and females to ensure gender, itself, was not a confounding variable. Overall, our evaluations indicated that the influence of social-cognitive variables on physical activity was weaker in men. This leads us to query why women might be more heavily influenced by social factors when it comes to physical activity participation. One fruitful avenue of research might be to consider the influence of gender role on physical activity. Social scientists make a distinction between "sex" and "gender." Sex refers to biological differences (chromosomes, hormonal profiles, internal and external sex organs) that define males and females while gender describes the characteristics that a society or culture demarcate as masculine or feminine. Therefore gender role refers to the socially prescribed roles deemed appropriate for each sex based upon the views of a particular society or culture.

Within adulthood, early gender roles are reinforced through social and environmental influences such as peers, the media, and other life experiences. As adults, some women report that they feel social pressure not to participate in physical activity (Berg, Cromwell, & Arnett, 2002; Sanderson, Littleton, & Pulley, 2002) or that they are discouraged from being physically active (King, Castro, Wilcox, et al., 2000). Reasons given for this perception include pressure to conform to their roles as mothers and primary caregivers, the need to put family obligations before their own needs, feelings of guilt or selfishness for taking personal time to exercise, and the lack of value given to physical activity within their own communities. However, participation in a comprehensive physical activity intervention, tailored to address women's distinct constraints and pressures due

to female gender roles and socialization experiences, can facilitate increased physical activity among women (Segar, Eccles, Peck, & Richardson, 2007; Segar, Jayaratne, Hanlon, & Richardson, 2002).

Gender roles are not static. Indeed, by their very definition they change as the needs, attitudes, and ideologies of a particular society changes. Thus, the role of females (and males) in sport and society is continuing to evolve. Despite this flux, the current literature suggests that females are subject to significant socialization factors that have the potential to influence their exercise identity and participation in physical activity. This may be one reason why the women in our study were apparently more sensitive to social-cognitive influences than the men in the study. Females with a well-developed exercise identity were more likely to be physically active (with EI explaining close to 50% of variation in behavior). Thus, components of exercise identity can and should be incorporated into intervention goals for females (e.g., sports-skill building to increase perceived competence). Likewise, SN was moderately related to physical activity, specific to women, in this study. This finding indicates that females are influenced to a greater degree by significant others' attitudes towards physical activity, along with their own motivation to comply with those significant others. Given the research previously discussed pertaining to differential value of and encouragement for physical activity among women, this distinction is a potentially important finding.

Intervention Ideas

It was clear from the current study that EI should be a staple of any health promotion effort for college students. Intervention strategies that can promote and develop EI should increase the likelihood of participation in exercise and physical activity; specifically, an individual will adopt changes in lifestyle that are congruent with the identity of an exerciser. Anderson, Cychosz and Franke reported that behavior is an important antecedent to the establishment of role identity:

"As people perform rituals associated with their role identities or act out some aspect of the role of exerciser, they may, through social interaction, have their identity as an exerciser reinforced and validated. Simultaneously, this validation of the role identity increases the likelihood of exercise-related behaviors in the future" (2001, p. 2).

Potential activity intervention programs that emphasize EI and are already in place at many colleges include activity clubs, intramural sports programs, and curricular physical education classes. A solid intramural sports program with diverse offerings that appeal to the widest possible range of student abilities and interests is desirable (Petosa, Suminski, & Hortz, 2003). Offering non-competitive fitness activities and/or participation based incentives is especially likely to appeal to sedentary students. That is, offering a women-only hour at the fitness center may encourage less confident exercisers to participate. Also recommended are curricular physical education requirements. Empirical data has indicated that required physical education courses enhance the health-related knowledge, attitudes, and behaviors of college alumni (Roberts, Evans, & Ormond, 2006; Slava, Laurie, & Corbin, 1984). However, a college should be careful with placing graduate students without sufficient knowledge into physical education teaching positions. Evidence supports the idea that source expertise enhances the impact of interventions on behavior (Gollwitzer, 1993), thus interventions delivered by recognized 'experts' on a college campus (professors, health educators, etc.) are likely to have a greater impact than those delivered by peers, for example.

As noted by Petosa et al. (2003), many individuals intend to be physically active, but there are numerous features of modern life that serve as barriers to acting on health intentions. Novel intervention ideas include the integration of self-regulation skills, such as behavioral goal setting and self-monitoring to aid students in realizing their physical activity goals. For instance, a first-year experience course for undergraduates may require students to keep an activity journal and report progress to an instructor, health promotion office, or social club. Additionally, Gollwitzer's concept of implementation intentions is also relevant to promoting activity change (1993; 1999). Implementation intentions link anticipated critical situations to goal-directed responses (e.g., "Whenever situation X arises, I will initiate the goal-directed response Y"). For example, a behavioral intention might state "I intend to exercise this week," but an implementation intention might state "When I get home from work on Monday, then I will jog round the park for 20 minutes" (Webb & Sheeran, 2006). To investigate whether college students' participation in vigorous exercise could be increased by forming implementation intentions, Milne, Orbell, and Sheeran (2002) compared an intervention based on protection motivation theory (PMT) with the same motivational

intervention augmented by implementation intentions. The PMT intervention alone raised compliance from 29% to 39%, but when this motivational intervention was complemented by the formation of implementation intentions, the compliance rate rose to 91%.

Limitations

The high physical activity rates reported in this study may not accurately represent the health habits of all college freshmen. It is likely that a selection bias may have occurred in the sample (i.e., physically active students, and those with strong health beliefs, were more likely to respond to the survey than sedentary students). This is a limitation of the study, and future researchers are advised to select a more representative sample. Additionally, Levy and Cardinal (2006) reported that cross-sectional designs used to assess longitudinal changes in physical activity can be limiting. Multiple regression analyses with EI, AT, SN, and PBC as predictors would be an appropriate alternative design to study the research question but sample size prevented its use in the current study. Finally, although common in college studies, the use of self-reported physical activity is inferior to objective physical activity assessment. If possible, future researchers should correct for this assessment choice.

In conclusion, exercise identity was related to activity behavior of college students and should be included in activity interventions for this population, especially for women. Attitudes toward exercise should also be included in intervention programming for college students. In general, EI was a stronger and more stable influence on physical activity level than AT, SN, or PBC variables at various points during the academic year and therefore should be an initial consideration in the design of intervention programs for college students.

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