Continuing Education

Assessment of Physical Activity, Exercise Self-Efficacy, and Stages of Change in College Students Using a Street-Based Survey Method

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ABSTRACT

This study assessed the level of physical activity, exercise self-efficacy, and stages of change for exercise behavior among college students at a large midwestern university using a street-based survey method. The 50% response rate produced 925 student responses comprising 95% as young (≤24 years of age), 53% female, and 79% Caucasian. One-third of the students did not participate in vigorous physical activity (≤3 days/week). Based on the stages of change questionnaire, 41% of the women and 35% of the men reported they were in the precontemplation or contemplation stages, as they were not active or were not exercising on a regular basis (≤3 times per week for 20 min or longer). Exercise-self efficacy scores were significantly different as a function of exercise stage as predicted by the stages of change theory (R^2=0.26, P<.0001). These results are consistent with earlier reports on college students and their level of physical activity. Therefore, the low cost, ease of data collection, and the short turnaround for availability of results support the usefulness of a street-based survey of young adults on a college campus to evaluate physical activity.

Regular physical activity plays an important role in health and in the quality of life across the life span. Thus, assessing and understanding the levels of physical activity behaviors within different populations and age groups are important (Caspersen, Merritt, & Stephens, 1994).

In the United States approximately 14 million students attend either 2- or 4-year colleges or universities (U.S. Department of Education, 1999). These students are at risk for engaging in or extending their involvement in unhealthy behaviors such as smoking, drinking alcohol, and irregular physical activity (Wechsler, Rigotti, Gledhill-Hoyt & Lee, 1998). The university setting, however, is an environment that provides students with skills and knowledge about healthy lifestyles. Further, the university setting provides ample opportunities to participate in regular physical activity or exercise through sport and fitness programs, physical education classes, and/or intramural sports programs. This is especially important because health beliefs and practices are still developing during these formative years (U.S. Department of Health and Human Services, 1991).

Attempts have been made to describe levels of physical activity and other health-related behavior characteristics of college

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students regionally or nationwide (Calfas, Sallis, Lovato, & Campbell, 1994; Douglas, Collins, & Warren, 1997; Pinto & Marcus, 1995; Silver, Buckworth, Kirby & Sherman, 2000). In general, levels of physical activity have been assessed using questionnaires with either a single item or a combination of questions about physical activity (Calfas et al., 1994; Douglas et al., 1997, Pinto & Marcus, 1995, Paffenbarger, Wing, & Hyde, 1978; Washburn, Adams, & Haile, 1987). Additionally, theoretical models such as the social cognitive theory (SCT) (Bandura, 1977; Pinto & Marcus, 1995; Silver et al., 2000) and the transtheoretical model of behavior change (TTM) (Prochaska & DiClemente, 1983; Silver et al., 2000) have been used to explain and predict exercise behaviors of college-aged students (Calfas et al., 1994; Pinto & Marcus, 1995). Knowing students' exercise stage of change could be used to develop interventions to promote exercise adoption and maintenance while in college and/or prior to transition from college to the workplace. Few studies have utilized both the TTM and SCT to examine exercise behavior changes in college students (Silver et al., 2000). Although data can be found on physical activity levels among college students, only two studies used a random sampling method for surveying their undergraduate students (Pinto & Marcus, 1995; Silver et al., 2000). One of the limitations of these studies was the low response rates (i.e., 27% for Pinto & Marcus, 1995; and 28% for Silver et al., 2000) that make generalizations of the results from the sample to the population problematic. Although many techniques and steps were undertaken to increase the response rate in one study (Silver et al., 2000), less than one-third of the students returned the mail survey. This finding reiterates the difficulty of undertaking mail survey research in an undergraduate student population (Lam, Malaney, & Oteri, 1990).

An alternative to a mail survey that may provide a higher response rate at a lower cost is the street-based survey method. This method involves gathering data through a short written question or interview administered on the street to individuals as they pass by the interviewer. The researchers stand on the street and approach pedestrians either randomly or at a certain interval (e.g., every 10th person; every 5 minutes) (Guydish, Clark, Garcia, & Bucardo, 1995). This method has been used in marketing research to evaluate marketing programs, but to our knowledge, this method has not been used to assess levels of physical activity in undergraduate students.

The current study was implemented to expand our knowledge of physical activity and exercise behaviors of college students utilizing a street-based survey. Via this method, we assessed the levels of physical activity, stages of change for exercise behaviors, and exercise self-efficacy among college students at a large midwestern university.

METHODS

A street-based survey method was used at a large midwestern university. Because of limited contact time with individuals, the survey was limited to a two-page instrument. The project was approved by the Human Subjects Institutional Review Board.

Data Collection

The method of data collection utilized a street-based survey and was conducted during the spring quarter. Eight undergraduate students in the sport and exercise sciences undergraduate major volunteered to help. During the third, fourth, and fifth weeks of the 10-wk quarter, the volunteers were positioned at several locations at a university's main campus for several days of each week at specific time periods. The days, time of the day, and locations were chosen to increase the probability of obtaining a representative sample of the undergraduate population. The times and locations were chosen based on the times of the day that classes were offered, the places that off-campus housing students entered the main campus area, the places students usually socialized, and the locations of several libraries. Evening hours were selected to gather information from students who were more likely to be part-time students taking evening classes.

Individuals passing by the volunteers were verbally approached continuously and asked if they were willing to complete a written survey that took approximately 2 minutes to complete. After an individual finished the survey new individuals passing by were approached. To determine the response rate, the volunteers kept track of how many individuals were verbally approached and how many actually completed the surveys. Data collection occurred approximately 30 hours per week, during 3 weeks in 1 month. There were 925 usable questionnaires, and the response rate was 50% (Figure 1).

Instrumentation

Demographic characteristics surveyed included age, sex, race, class standing, enrollment status, and place of residence. Additional questions identified self-reported levels of regular physical activity, self-efficacy for exercise, and exercise stage of change.

Self-reported levels of regular physical activity were assessed with selected Harvard Alumni Activity Survey questions (Paffenbarger et al., 1978). Specifically, individuals were asked: "At least once a week do you engage in any regular activity like brisk walking, jogging, bicycling, etc., long enough to work up a sweat? If yes, how many days a week?" (Paffenbarger et al., 1978; Washburn et al., 1987). These questions were selected because number of days of sweat induced physical activity correlates with VO_{2max} (0.46) (Siconolfi, Lasater, Snow & Carleton, 1985) and treadmill time to exhaustion (0.51) (Kohl, Blair, Paffenbarger, Macera, & Kronenfeld, 1988) and because of the practicality of assessing levels of physical activity in a large group of people using this question.

Self-efficacy for exercise was assessed to measure confidence in the respondent's ability to overcome obstacles to participation in exercise (Marcus, Selby, Niaura, & Rossi, 1992). The self-efficacy scale is a

five-item questionnaire and uses a 5-point Likert-type scale (1, "not at all confident" to 5, "extremely confident"). Each item contains a statement that relates to an individual's perceived ability to participate in exercise.

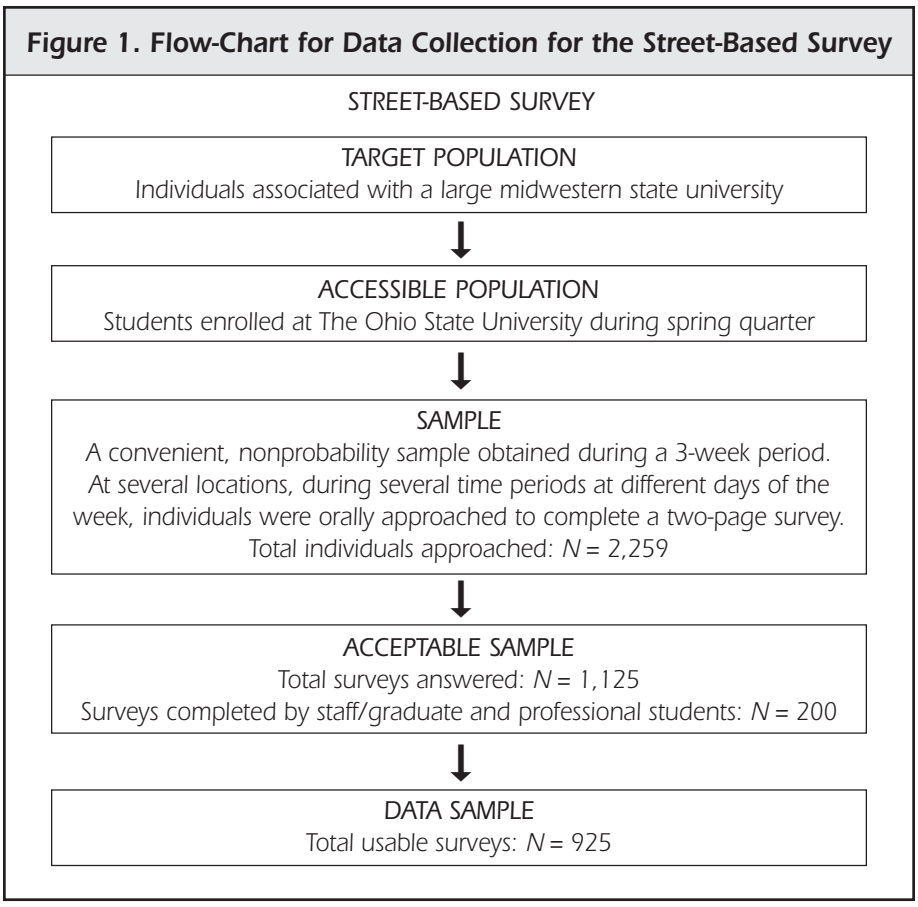
Level of exercise and behavioral intentions were used to classify students into one of five exercise stages based on TTM. Regular exercise was defined as three times or more per week for 20 minutes or longer each session. The five exercise stages are (1) precontemplation (currently not exercising and no intention of beginning to exercise); (2) contemplation (currently not exercising but thinking about starting to exercise within the next 6 months); (3) preparation (currently exercising but irregularly); (4) action (exercises regularly but has done so for less than 6 months); and (5) maintenance (currently exercise regularly for at least 6 months) (Marcus et al., 1992). Respondents answered "yes" or "no" to five questions related to exercise behavior and intentions. Based on these responses they were classified in one of five stages using a standard algorithm. Concurrent validity with the self-report 7-day physical activity recall instruments has been established in young adults.

The survey was field tested for clarity and reliability in a sample of undergraduate students over a 1-week period (n= 48). The intraclass correlation for days per week of sweat-induced physical activity was 0.90. Test-retest reliability for the self-efficacy scale over a 1-week period was 0.94. The kappa index for reliability for the exercise stage questionnaire over a 1-week period was ≥ 0.81 (Silver et al., 2000).

Data Analyses

Descriptive statistics were used to describe the sample on demographics, level of physical activity, exercise stage, and self-efficacy for exercise. Chi-square analyses were used to compare the sample with the undergraduate population on demographics. Self-efficacy was scored by calculating a mean t-score of the sum of the five-items on the 5-point Likert-type scale. A higher score indicates greater self-efficacy for exercise. Because it has been suggested that self-efficacy scores increase linearly across exercise stages as determined by the TTM, inferential statistics (analysis of variance) were used to assess the relationship between the TTM and self-efficacy for exercise questionnaire. Tukey post-hoc test was used to locate significant differences between the different stages. Because national data suggest that females are less active then males, data were also analyzed by sex. Results are presented as mean ± *SD*. An α level of $p < .05$ was set *apriori*. Data were analyzed using SAS JMP (SAS Institute Inc., Cary, NC).

Figure 1. Flow-Chart for Data Collection for the Street-Based Survey



RESULTS

Demographic Characteristics

Table 1 provides a comparison of demographic variables between the sample and the university's undergraduate population at the time the study was conducted. The sample was statistically different on age, sex, and enrollment status when compared to the undergraduate population. The sample had an over-representation of younger and female students. There was an underrepresentation of Asian or Pacific Islander students ($p < .0001$).

Sweat-Induced Activity

Seventeen percent of the students reported no regular activity long enough to work up a sweat, whereas 33% of the students did not participate in vigorous physical activity (≥3 days/week) that induced sweating. There was no significant difference in participation in physical activity for days per week of activity among females and males. Females exercised on average 3.1 (*SD*=1.9) days/wk, whereas males exercised on average 3.0 (*SD*=1.9) days/week.

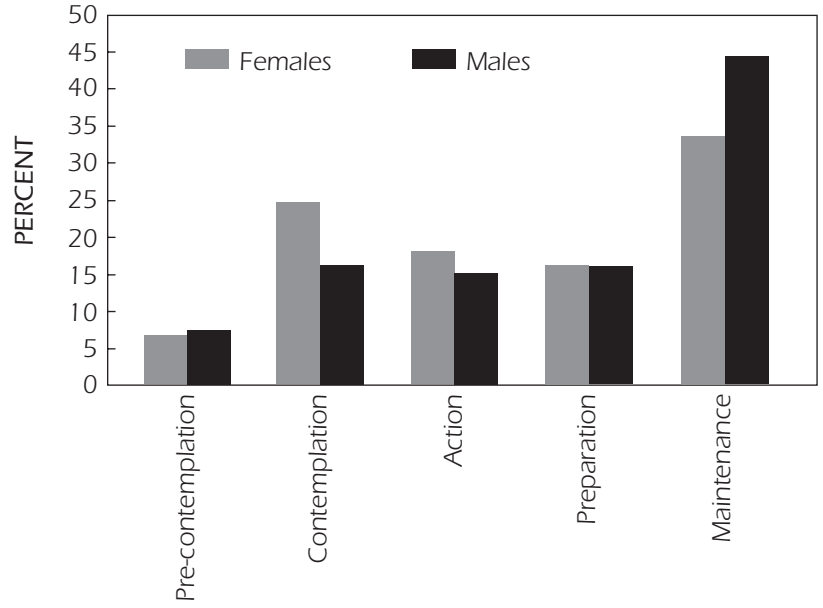
Exercise Stage

The distribution of the students among the fives stages of change was as follows:

Table 1. Demographic Characteristics of the Undergraduate Population (UG) at The Ohio State University and of the Undergraduate Students who Responded to the Survey

Characteristic	Survey (n = 925) (%)	UG at Time of Street-Based Survey (N = 32,166) (%)
Sex		
Female	52.6	47.5
Male	47.4	52.5
Age		
17–24 y	94.5	87.5
≥25 y	5.5	12.5
Ethnicity		
White, not Hispanic	78.6	80.5
Black, not Hispanic	9.6	7.6
Hispanic or Latino	1.4	1.9
Asian or Pacific Islander	5.9	8.5
American Indian Alaskan Native	0.0	0.5
Other	4.6	4.7

Figure 2. Distribution of Female and Male Students by Exercise Stage



precontemplation (n=60, 7%); contemplation (n=157, 17%); preparation (n=134, 14%); action (n=148, 16%); and maintenance (n=426, 46%). Chi-square analysis revealed a significant difference between males and females in exercise stage (χ^2=31.5, p=<.0001). Male students were more likely to be in the action and maintenance stages (65%) compared with the female students (59%) (Figure 2).

Physical Activity and Self-Efficacy for Exercise as a Function of Exercise Stage

When days per week of physical activity was analyzed as a function of exercise stage, there was no significant interaction between sex and stage. There was a main effect for stage, indicating that days per week was significantly different across the preparation (2.3 days/week), action (3.5 days/week), and maintenance (4.1 days/week) stages (Figure 3). Students in the precontemplation and contemplation stages did not differ in self-reported number of days of physical activity.

Internal consistency for the five-item self-efficacy questionnaire was 0.77. Total scores for self-efficacy were consistent across sex. When self-efficacy scores were analyzed as a function of exercise stage there was a main effect. Tukey post-hoc analysis revealed that self-efficacy scores were significantly different as a function of exercise stage such that self-efficacy was lowest for precontemplation and was highest for maintenance with contemplation, preparation, and action stages ordered between those two stages (p<.0001) (Figure 4). As expected from these results, the self-efficacy scores increased from the precontemplation through the maintenance stage. The proportion of variance explained in self-efficacy by exercise stage distribution was 26%.

DISCUSSION

The current study used a street-based survey method to collect information from college students on self-reported level of physical activity, exercise self-efficacy, and stages of change for exercise behavior at a large midwestern university. When conducting survey research, the ideal sample is similar to the demographics of the accessible population. In this study the sample was different on several demographic variables when compared with the accessible population at the time the study was conducted. Because of the differences in demographic characteristics between the sample and the accessible

population, different strategies need to be explored to enhance the representation of students in the sample. The sample was obtained with a response rate of 50%. Although this response rate is higher than the response rates obtained from this population using mail-based survey methods, it is not perfect. Because nearly 50% of the approached individuals did not respond to the survey, this limits the extent to which the results can be generalized. Different methods need to be explored to improve the response rate in this population utilizing a street-based survey. Furthermore, to attain a sample that represents the accessible population, it may be necessary to monitor the demographics of the population and to change the locations and times of day of sampling to secure responses that represent the under sampled demographics. Nevertheless, these results suggest that the street-based survey can produce a higher response rate compared to a mailed survey in this population (Silver et al., 2000).

Other benefits of the street-based survey are the low cost, short data collection time, short data analysis turn around, and involvement of undergraduate students in a research project. The disadvantages of the street-based survey were a nonrandom sample and that there was no opportunity for any follow-up questions. A mail survey does have the advantages of accessing a random sample, opportunity for a follow-up questionnaire, and providing sufficient time for respondents to give thoughtful answers to the questions asked. Compared to the street-based survey, however, a mail survey costs more money, has a long data collection time-frame, and provides few opportunities for encouraging return of the survey, which all can lead to a lower response rate. In addition, there is no assurance that the person who received the questionnaire actually completed the questionnaire, and there are no opportunities to provide assistance with answering the questions. Therefore, the low cost, ease of data collection, and short

Figure 3. Mean Days of Sweat-Induced Physical Activity (± SD) by Exercise Stage

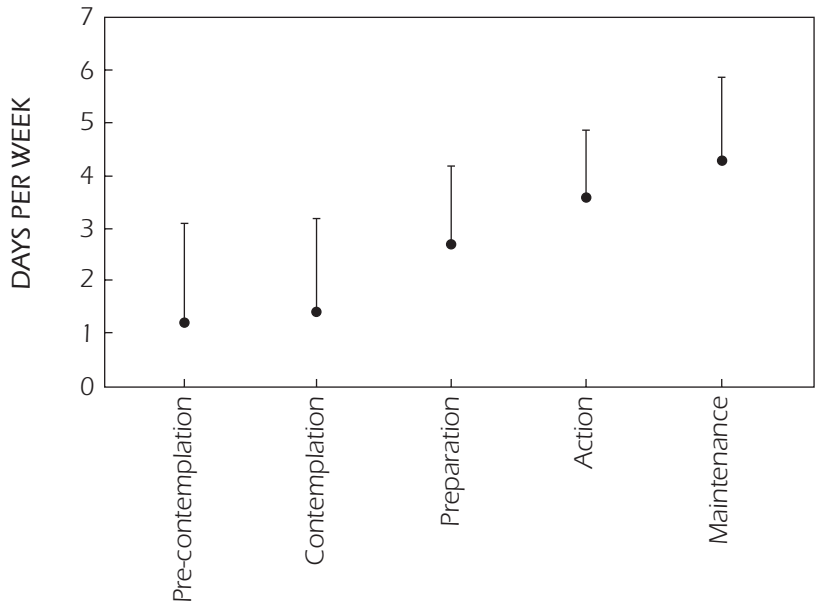
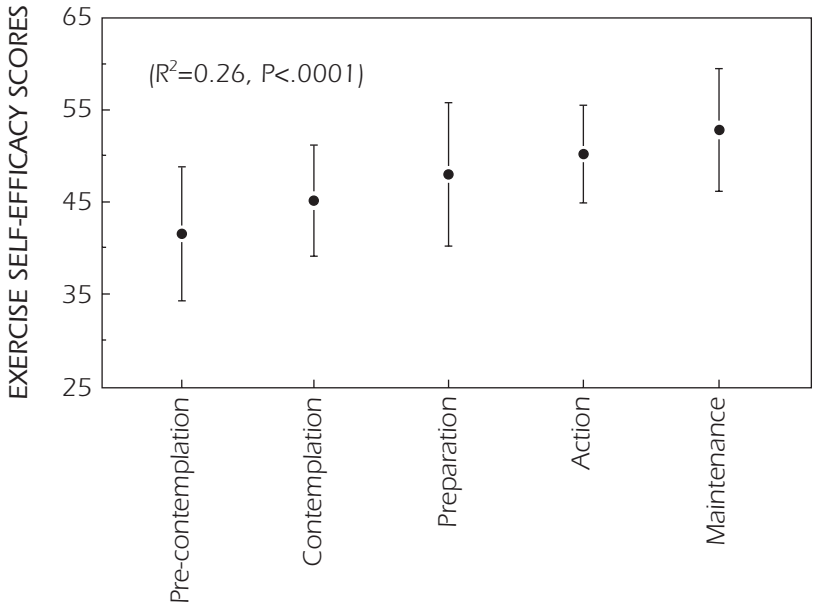


Figure 4. Mean Exercise Self-Efficacy Scores (± SD) by Exercise Stage



turnaround for availability of results supports the feasibility of the street-based survey method.

The value of this method in physical activity research is also noted by the fact that the results for self-reported physical activity frequency and stages of change were similar to what has been reported previously for college students in the United States (Calfas et al., 1994, Pinto et al., 1995). Based on the stages of change questionnaire, 38% of the sample reported no activity, they were thinking about exercising, or that they were involved in regular exercise (≤3 times per week for 20 min or longer). These characteristics are representative of the precontemplation, contemplation, or preparation stages. Although these results are based on self-report, these data indicate that a large proportion of the undergraduate population on this campus does not have a regularly active lifestyle. The percentage of students who were inactive or irregularly active is similar to results reported earlier (Pinto et al., 1995; Sallis, Calfas, & Nichols, 1999). In a sample of undergraduate students at a private university in Rhode Island, 40% of the students who participated in the survey were irregularly active (precontemplators, contemplators, or students in the preparation stage) (Pinto et al., 1995), whereas in California this percentage was 45% (Sallis et al., 1999). These studies imply that although the university setting offers a wide variety of opportunities to be regularly physically active, significantly more students can become more involved in participation in higher levels of physical activity. In this case of a total of 32,166 students, about 12,224 students need to increase their level of physical activity.

As has been demonstrated in other populations, self-efficacy scores are significantly related to exercise stage. Specifically, there was an increase in exercise self-efficacy scores from precontemplation through the maintenance stages. Thus, students with low perceived confidence in their ability to participate in physical activity (low scores on exercise self-efficacy), were likely to be inactive or irregularly active compared to the students with greater exercise self-efficacy. Although this relationship has been reported previously in the literature with different populations (Marcus & Owen, 1992; Sallis et al., 1999), this finding has only recently been reported in college students (Silver et al., 2000) and is confirmed by this study.

There were significant differences in physical activity frequency based on the students' exercise stage. There were no differences between frequency of physical activity between the early stages (precontemplation and contemplation), which was expected based on the stage definition, that is "not participating in regular physical activity." There were increasingly more days of physical activity reported from preparation to maintenance stages, and this is consistent with the definitions for these stages. This supports the use of the TTM in determining students' level of participation in physical activity according to the stages and presumably relates to their readiness for change in exercise behavior. Further, the relationship found between self-efficacy and exercise stage (r^2=0.26) supports the application of the TTM with a college population that may help guide development and evaluation of intervention strategies on physical activity. For example, strategies to enhance exercise self-efficacy could be implemented with students classified as precontemplation, contemplation, and preparation. Presumably, increasing a student's exercise self-efficacy may then result in an increased amount of physical activity, and a progression toward maintaining a regular level of physical activity.

In summary, the low cost, ease of data collection, and short turnaround for availability of results supports the usefulness of the street-based survey method. Additional strategies to enhance the representation of students using the street-based survey should be explored. Based on self-reported levels of physical activity, these data indicate that a large proportion of the undergraduate population on this campus does not have a regularly active lifestyle. Exercise self-efficacy seems to be an important variable in exercise behavior in college students. Efforts need to be made on college campuses that use stages of change models to implement strategies to modify students' self-efficacy for exercise and therefore exercise behaviors in the collegiate environment.

ACKNOWLEDGMENTS

The authors would like to thank Amanda Auberry; Jennifer Aufderheide; Alexandra Eversman; Anna Gerber; Emily Keltner; Josh Pratti; and Wittman Robinson for their time commitment and dedication in collecting the data. They were undergraduate students in the Sport and Exercise Science program at the time of the study.

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