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Physical Fitness and Self-Image: An Evaluation of the Exercise Self-Schema Questionnaire Using Direct Measures of Physical Fitness

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ABSTRACT

International Journal of Exercise Science 9(4): 445-459, 2016. The purpose of this study was to perform a construct validity assessment of Kendzierski's exercise self-schema theory questionnaire using objective measures of health-related physical fitness. This study tested the hypothesis that individuals with an exercise self-schema would possess significantly greater physical fitness than those who did not across three domains of health-related physical fitness: Body composition, cardiovascular fitness, and upper-body muscular endurance. Undergraduate student participants from one private university on the west coast of the United States completed informed consent forms and the exercise self-schema questionnaire within a classroom setting or at an on-campus outside tabling session. Participants not meeting inclusion criteria for Kendzierski's three original schema groups were categorized as "unschematic," and were included within MANCOVA/ANCOVA analyses, where gender served as the covariate. Participants underwent lab-based fitness assessments administered in accordance with the 2013 American College of Sports Medicine Guidelines for Exercise Testing and Prescription. The hypothesis of this study was partially supported. Specifically, exerciser schematics were significantly leaner than aschematics ($p = .002$) and they had greater levels of upper-body muscular endurance compared to both aschematic and nonexerciser schematics ($p = .002$). However, no differences were observed for cardiovascular fitness (i.e., predicted V_{O2Max} $p = .410$). The findings of this study help to establish the construct validity of Kendzierski's self-report exercise self-schema categorization scheme. Visual inspection of the data, as well as computed effect size measures suggest exercise self-schema is associated with dimensions of one's physical fitness.

KEY WORDS: Applied exercise physiology, behavior, correlates, motivation, maintenance, psychology, routine, self-image

INTRODUCTION

A self-image, also referred to as a self-schema, is formed via the generalization one adopts about herself or himself

concerning a specific behavior, and it is theorized to influence human behavior through its role in information processing (33). It is a central mechanism for the processing of all information; this includes

information received from the environment (e.g., physical, social), as well as information retrieved from memory as part of recall and the process of decision making (33). The processing of information includes the act of filtration, categorization, storage and retrieval of received stimuli in response to a person's external environment. Prior to making a behavioral decision or developing a judgment, people may consciously or subconsciously reference a self-schema if established. Thus, schemas represent a way in which learning and self-beliefs both shape behavior and offer perspective regarding who one is (31, 50-52). Not only do self-schemas guide perspective, they also decrease information processing, interpretation and decision making steps by forging heuristics (33, 31, 57).

While "self" beliefs might not always be grounded in 'reality,' they do not stop such beliefs from shaping one's exercise behaviors and habits (1). Specifically, those with a self-image and self-belief system that is orientated toward being 'healthy' tend to engage in health promoting behaviors more so than those who do not (7, 30). As noted, this circuitous process is self-reinforcing, with individuals constantly striving to have their self-image, self-beliefs, and overt behaviors in harmony so as to reduce their degree of anxiety and stress (44). This process has been observed in physical activity and exercise settings (10, 11).

People who are exerciser schematics (i.e., those with an established self-image for exercising) not only possess greater intention to exercise, but they also act on their intention to exercise more often than those who lack such an orientation (16, 45). This is especially important given the

significant influence exercise has upon various health risks and its positive association with overall quality of life, wellbeing and vitality (6, 34). While a relationship among researcher measured physical fitness and relative risk for all-cause mortality and chronic disease(s) has been observed, relatively few researchers have examined the relationship between researcher measured physical fitness and exercise self-schema. Even among those who have, the data have been primarily tautological in nature. That is, when similar measurement approaches are employed in research (e.g., self-report measures compared with other self-report measures), common sources of measurement error remain unaccounted for. For example, commonly known sources of error for self-report measures include item interpretation, recall and social desirability. This unaccounted for error is referred to as measurement error. Reducing measurement error is an important aim of research (27).

Nonetheless, evidence does suggest that exerciser schematics may experience a higher level of physical fitness than those lacking an exercise self-schema, even after controlling for other cognitive-behavioral correlates (e.g., attitude and self-efficacy). For example, Yin and Boyd found that college students categorized as exerciser schematics expended approximately 2.3 to 3.3 times as many kilocalories over seven days compared to those lacking an exercise self-schema according to subjective reports (57). Estabrooks and Courneya found that exerciser schematics attended the on-campus fitness center more often, and they also found exerciser schematics reported significantly greater intention to exercise at

moderate and strenuous intensity levels than those lacking an exerciser self-schema (16).

From a health perspective, volume (i.e., duration and frequency) and intensity level (effort) are important traits of exercise behavior. The American College of Sports Medicine and American Heart Association acknowledge the existence of a dose-response relationship between exercise and disease risk, where greater exercise (i.e., duration, frequency or effort) correlates inversely with disease pathogenesis and status (46). Beacham *et al.* found that middle-aged adults in their community study who had an exercise self-schema were more likely to meet the exercise frequency guidelines established by the American College of Sports Medicine (7). Finally, Harju and Reed found that those with an exercise self-schema had higher levels of cardiorespiratory fitness than those who lacked an exercise self-schema (i.e., exerciser schematics versus aschematics; 24). However, for their assessment of cardiorespiratory fitness they used a non-exercise based test, and their between group results were non-significant. Thus, while the extant literature does suggest a positive relationship likely exists between behavioral patterns and levels of fitness on the basis of self-schema classification (i.e., those with vs. those without an exercise self-schema), gaps in the literature remain.

Finally, while there are precedents for assessing psychological variables in conjunction with physical fitness related variables (9), this is not something that is routinely done in sport and exercise psychology research, which limits our

understanding of how psychological constructs and physical qualities interact over time (43,47). The present study attempts to address this void in the extant literature by examining the relationship between exercise self-schema and physical fitness.

The purpose of this study was to evaluate Kendzierski's (28) exercise self-schema theory questionnaire using direct measures of physical fitness. Specifically, aerobic capacity (i.e., cardiovascular fitness), lean body mass and upper-body muscular endurance were assessed in this study. Understanding the relationship between Kendzierski's (28) questionnaire and direct measures of physical fitness builds upon the extant literature, which to date appears to have largely relied on indirect assessments of physical activity and/or physical fitness (16, 24, 31, 45, 57). This study specifically tested the hypothesis that individuals with an exercise self-schema would possess significantly greater directly measured physical fitness than those who lacked one across three physical fitness domains, namely body composition, cardiovascular fitness and upper-body muscular endurance.

METHODS

Participants

Following Institutional Review Board (IRB) approval from the university where the study was conducted, a convenience sample of university students were recruited from 11 different departments, spanning five different schools/colleges at one private university on the west coast of the United States. All participants completed an informed consent form prior

to their participation. Data were collected between May 2013 and December 2013.

The primary mechanism for recruitment was visiting the classrooms of consenting professors. Professors were contacted in the order that courses appeared in the online catalog. Contact was made via email requesting that an invitational announcement be allowed during class time. Additionally, professors within the first author's department were emailed. The informed consent document was distributed after a scripted overview of the study was verbally presented. Students agreeing to participate were also given the exercise self-schema questionnaire and their contact information was collected to schedule a fitness assessment appointment. A secondary mechanism for participant recruitment was tabling in front of the side entrance to the university's university center. At this site, a simple poster was created to assist in summarizing the study aims and the fitness assessments that would be undertaken.

Exclusion/inclusion criteria: only currently enrolled undergraduate students who were not actively participating on intercollegiate sports teams were eligible to participate. Further, students had to verbally confirm if they met all pre-assessment instruction, such as obtaining an adequate amount of sleep (i.e., seven to nine hours) and not engaging in strenuous exercise 12 hours prior to their scheduled appointment time. Table 1 offers a complete list of the pre-assessment instructions. Participants were screened to determine whether those guidelines were followed. For those who had not followed the guidelines, their appointments were rescheduled.

Additionally, one participant was excluded from the study due to taking medication to manage hypertension. Hypertension medication can affect the accuracy of cardiovascular fitness assessments because it affects heart rate and the force of heart beats (3).

Table 1. Participant pre-assessment instructions sent via email (24)

-
- Please wear athletic attire. If female, please wear a sports bra
 - Please drink water regularly to ensure that you are hydrated
 - Please do your best to get plenty of sleep (i.e., 7-9 hours) before your appointment
 - Abstain from eating any food 4 hours before your appointment
 - Abstain from all strenuous exercise 12 hours before appointment
 - Abstain from caffeine 12 hours before your appointment
 - Abstain from nicotine 3 hours before appointment
 - Abstain from alcohol 24 hours before appointment
 - With respect to medication, please alert the researcher of any over the counter or prescribed medications you are currently taking
-

Participation was completely voluntary. To the best of the authors' knowledge, no participant received any extra credit for their participation. Participants were offered their individual assessment results, which were accompanied by interpretive guidelines. Participants were also encouraged to contact the first author if they had any questions. All study participants received a debriefing email that thanked them for participating in the study, informed them of their right to have their data excluded from the study and informed them how to obtain a full copy of the study.

Protocol

The exercise self-schema questionnaire is based on the self-schema questionnaire developed by Markus (33) and later adapted to the behavioral domain of exercise by Kendzierski (28). The questionnaire asked participants to rate the degree to which three behavioral phrases described them. Responses to each statement were assessed using an 11-point scale, where 1 corresponded to “the behavior does not describe me” and 11 corresponded to “the behavior describes me.” Participants were also asked to rate three phrases concerning how important it was for them to be engaged in exercise, with 1 representing “not at all important” and 11 representing “very important.”

On the basis of their responses, participants were then placed into *a priori* categories. Those categorized as exerciser schematics must have rated two of the three exercise descriptions as “extremely self-descriptive,” as well as have rated two of the three self-image descriptions as “extremely important.” These qualitative descriptors corresponded to each item being scored numerically between 8 and 11. To be classified as nonexerciser schematic, a participant needed to rate two of the three descriptors as “extremely non-descriptive,” as well as have rated two of the three self-image descriptors as “extremely important.” The score ranges for this categorization were 1-4 and 8-11, respectively. Those responding with numeric values of 5-7 on the self-description measures, and 1-7 on the self-image importance measures, were classified as aschematic. Following the classification protocol of Sheeran and Orbell, participants who did not meet the inclusion criteria for

the above three groups were classified as “unschematic” (45).

Three physical fitness assessments were performed in accordance with the *American College of Sports Medicine Guidelines for Exercise Testing and Prescription* (2): A three-site skin fold assessment was used to assess lean body mass, the Åstrand-Ryhming cycle-ergometer protocol was used to predict maximum oxygen consumptive capacity, and a sex specific maximum push-up protocol was used to assess upper-body muscular endurance.

There are three specific reasons for the use of the above fitness assessments. First, each protocol takes less than 10 minutes to administer and collectively may be completed in a relatively short amount of time (e.g., 30 minutes), which minimizes the time-burden to participating. Second, the protocols are highly inclusive. Participants of low fitness levels or those living a sedentary lifestyle are not automatically excluded because of inadequate fitness levels (49). Finally, the protocols are simple, easy to administer and widely used within the field of exercise assessment and prescription, which facilitates replication (and possibly extension) of this study’s findings by others.

Upon arrival to the lab, participants were asked to sit for three minutes during which time each protocol was explained to them. Next, the participants had their resting heart rate and blood pressure assessed and they completed the *Physical Activity Readiness Questionnaire* (PAR-Q; 12). Following completion of the PAR-Q, height and body mass were measured. Prior to

beginning the protocols, each participant was invited to ask questions for clarification, and they were informed that they could opt out of completing any protocol that they were uncomfortable performing. The protocols were performed in the following order: Skin-fold, cycle ergometer and push-up. Each session was conducted individually and privately, unless the participant made the request to have another student present (e.g., friend).

Measurements were performed on the right side of participants' body while they were in a standing upright position using a Harpenden caliper (Baty International, Victoria Road, Burgess Hill, West Sussex, RH15 9LR, United Kingdom). For men, the abdomen, chest and thigh were the measurement sites. For women, the suprailium, thigh and triceps were the measurement sites. Three measurements were performed at each skin-fold site and values were read to the nearest 0.1 millimeter. The average of the two most consistent measurements were used. Table 2 lists the specific equations used to estimate body composition within this study.

Table 2. Study equations to used to estimate participants' body composition (25)

Equation 1. Body density equation for male participants

Body density = $1.1125025 - 0.0013125$ (sum of three skinfolds) + 0.0000055 (sum of three skin-folds)² - 0.000244 (age) [Standard Error of Estimate 0.008 or ~3.6% fat]

Equation 2. Body density equation for female participants

Body density = $1.089733 - 0.009245$ (sum of three skinfolds) + 0.0000025 (sum of three skinfolds)² - 0.0000979 (age) [SEE 0.009 or ~3.9% fat]

Equation 3. Equation to estimate percentage body fat based on body density calculations

Siri's % fat equation: % fat = $(495/\text{body density}) - 450$

The Åstrand-Ryhming cycle-ergometer protocol is a submaximal exercise test shown to accurately predict maximum oxygen consumption, with the referent being direct measures of oxygen consumption (VO_2 max) using graded exercise stress tests, especially when heart rate age-adjusted factors are applied (15). The average standard deviation for VO_2 max between the Åstrand-Ryhming cycle-ergometer protocol and directly measured VO_2 max is ~15% (14). A recent study by Hoehen and colleagues found acceptable correlation for men ($r = .94$), women ($r = .74$), respectively, and their sample as a whole ($r = .84$; 30). Values for maximum oxygen consumption were derived using Sinconolfi *et al.*'s modified version of the original nomogram developed by Åstrand and Rhyning (48). The increases in reliability between the submaximal cycle-ergometer protocol and VO_2 max observed within the literature are credited to modifications made to the nomogram and the creation of heart-rate correction factors based on each participant's age (37).

The Åstrand-Ryhming cycle-ergometer protocol uses participant's heart rate response to exercise to predict maximum oxygen consumption. Because heart rate closely correlates with oxygen consumption, accurate predictions of maximum oxygen consumptions are possible (4). Heart rate was measured via Polar Heart Rate Monitors (Polar Electro Inc., 1111 Marcus Avenue, Suite M15, Lake Success, NY 11042-1034). At the end of six minutes, the participants were asked to continue cycling for two minutes at a leisurely pace and against a low resistance to cool down. Time was kept using a standard stopwatch. Predicted maximum

oxygen consumption was determined from the published nomogram, with liters converted to milliliters per kilogram of body mass (2).

It should be noted that for those under 35 years of age the heart rate correction factor does not meaningfully improve the correlation between the Åstrand-Ryhming cycle-ergometer protocol and other VO_2 max direct assessments (14). This recommendation is supported by the observations of Cink and Thomas, who observed no significant difference between corrected and uncorrected predictions (15). Thus, the heart rate correction factor was not applied to the participants of this study because each was under 35 years of age.

The ACSM maximum push-up protocol is a reliable field test of muscular strength (19). For example, Augustsson and colleagues observed a high intra-class correlation coefficient (i.e., 0.92 to 0.95) between participants using a test-retest design for female and male college students (5).

Push-ups were performed on a standard exercise mat. On the down position, participants were asked to ensure that their chest made contact with a towel rolled four-inches in height. Participants were asked to complete as many push-ups as possible within one bout. No time limit was given. Male participants were to assume the standard push-up starting position with their hands shoulder-width apart and elbows and body straight. Female participants held a similar upper body frame as that of the males, with their lower-body position being modified to allow the knees to touch the mat at 90 degrees flexion and their ankles crossed. For male

participants, the low position was when the chest made contact with the rolled towel on the ground. For female participants, the low position was when the chest made contact with the rolled towel on the ground.

Statistical Analysis

The four exercise self-schema category system acted as the independent variables within the statistical analysis, with each component of physical fitness serving as a dependent variable. Because fitness is known to vary between men and women, with men often exhibiting greater physical fitness than women (8), and because some of the assessments followed sex-specific protocol, gender served as a covariate in the statistical analysis. Furthermore, given that past research results on exercise self-schema theory does not indicate that schema formation is gendered, hypotheses on the basis of gender were not advanced (7).

Data were analyzed using an omnibus multivariate test initially (i.e., MANCOVA), with follow-up univariate tests (i.e., ANCOVA's) as appropriate (i.e., if one or more significant differences were detected by the omnibus analysis; 35). This analytical method was selected because the objective of this study was to determine if participants would differ on the basis of their assessed physical fitness levels once categorized using the exercise self-schema questionnaire coding system developed by Kendzierski (28), rather than to determine if the results of the physical fitness assessments would predict participants' self-schema categorization (20,35,36). Because self-schemas are generalizations that people conclude about themselves for a specific behavior based on how *descriptive*

and *important* the specific behavior is perceived to be to their self-identities, it is not likely that physical fitness by itself would be an accurate predictor of self-schema categorization (31). This serves as an additional justification for why a MANCOVA was an appropriate statistical analysis to test this study's hypothesis. To account for multiple comparisons and the possibility of an inflated Type-1 error rate, alpha was adjusted using the *Bonferonni* correction in each univariate post-hoc follow-up test (54). The significance value for the study was set at $P < 0.05$.

RESULTS

Seventy people participated in the study. The mean age of the participants was 19.6 years (± 1.7), with the range being 18-25 years. The mean body-fat percentage was 15.9 (± 6.7), with the range being 4.5-31.3. The mean VO_{2Max} value was 40.2 ml/kg/min (± 9.8), with the range being 20.6-64.8. The mean maximum push-up value was 21 (± 12), with the range being 0-51. Table 3 provides a more complete description of the participants' demographic characteristics, including a percentage break down of the self-schema category groups.

The omnibus MANCOVA test results indicated that participants within the various self-schema category groups differed significantly by physical fitness level [*Pillai's Trace* = .351, $F(1,3) = 2.518$, p -value $< .001$, $\eta^2 = .93$] and that follow-up univariate analysis was justified. The follow-up univariate ANCOVA results revealed that the results of the physical fitness assessments significantly differed for two of the three dependent variables. The

one exception was VO_{2max} . These results are summarized in Table 4.

Post-hoc comparisons for percentage body fat showed that exerciser schematics were significantly leaner than aschematics ($p = 0.001$), while for maximum push-ups, exerciser schematics were significantly more fit than both the aschematic ($p = 0.002$) and nonexerciser schematic ($p = 0.037$) groups. The partial eta-squared values for both percentage body fat and maximum push-up tests indicate that the exercise self-schema category system explained between a minimal to typical amount of variance for both variables (54).

Table 3. Demographics¹

	\bar{x}	
Age	19.6 (± 1.7)	
	<i>n</i>	(%)
Gender		
Men	38	(54.3%)
Women	32	(45.7%)
Race		
Asian/Pacific Islander	30	(42.9%)
Black, Non-Hispanic	5	(0.07%)
Hispanic	9	(12.9%)
Multi-Ethnic	14	(20.0%)
White, Non-Hispanic	16	(22.9%)
Self-schema Groups		
Aschematics	26	(37.1%)
Exerciser Schematics	29	(41.4%)
Nonexerciser schematics	6	(0.09%)
Unscheamtics	9	(12.9%)

¹Percentage values are rounded.

Table 4. Comparison results for the physical fitness assessments across schemata categories^{1,2,3}

	Exerciser Schematics	Aschematics	Nonexerciser Schematics	Unschematics	<i>F-value</i>	<i>df</i>	<i>p-value</i>	η^2
Body fat (%)	11.9 (± 5.8) ^{ac}	19.1 (± 6.0) ^{bd}	18.2 (± 5.0) ^{acd}	15.5 (± 6.7) ^{acd}	5.7	(1,3)	0.002	0.21
VO ₂ Max (ml/kg/min)	43.8 (± 8.9) ^a	37.3 (± 8.7) ^a	38.9 (± 10.3) ^a	38.9 (± 13.5) ^a	0.975	(1,3)	0.410	0.04
Max push-ups	28 (± 10.0) ^{ad}	15 (± 12.0) ^{bc}	15 (± 8.0) ^{bc}	21 (± 12.0) ^{abcd}	5.64	(1,3)	0.002	0.21

¹A different superscript letter represents significant difference at a *p*-value of 0.05 based on *Bonferonni* post-hoc tests.

²Unrounded whole numbers are presented for maximum push-up values.

³The omnibus analysis consisted of an *n*-size of 62. Sample size varied for univariate pair-wise comparisons due to some participants not completing all three fitness assessments. The following values represent the *n*-size for body fat (%), VO₂max, and max push-ups, respectively: 69, 70, 70.

DISCUSSION

The aim of this study was to evaluate the exercise self-schema questionnaire along three dimensions of physical fitness. The study objective was to determine if directly assessed physical fitness levels would differ between participants on the basis of their exercise self-schema classification. It was hypothesized that exerciser schematics would possess significantly greater physical fitness and body leanness. The hypothesis of this study was partially supported. Specifically, exerciser schematics were significantly leaner than aschematics and had a significantly greater level of upper-body muscular endurance compared to both aschematics and nonexerciser schematics. However, no differences were observed for cardiovascular fitness (i.e., VO₂ max) between the categories. This latter result gives credence to the work of Harju and Reed (24), who reported that exercise self-schema groups (i.e., exerciser schematics vs. aschematics) did not differ significantly from one another using a non-exercise test predication formula to predict VO₂ max.

The previously mentioned result does not tell the complete story, however. Physical fitness is a multi-dimensional construct and the finding that participants did differ on two of the three domains directly assessed is novel. Interestingly, the two significant domains of physical fitness where differences were observed were visual or appearance-based in nature (i.e., having a lean and/or strong appearance). This may be important in terms of developing and reinforcing one's self-schema. Displaying body strength or having a lean appearance may be highly valued in society. In other words, physical displays of fitness are a source of body capital, which might affect one's social status (13,26). This preliminary and novel finding suggests that self-schema formation may orientate more saliently around the appearance-based components of physical fitness. If supported in future research, this may be because self-schemas are constructed within a social context that might emphasize visible displays of fitness (17,40), which in turn might result in certain forms of physical fitness promoting behaviors to be prioritized over others

(12,56). Given that body capital can promote positive feelings, such as pride and confidence (42), it is not surprising that weight lifting and body resistance exercises could contribute to the formation of an exercise self-schema. While all schema categories scored relatively well within cardiovascular fitness, it could be that the participants categorized as exerciser schematics within this study may take extra care to develop their muscular fitness. It would be important to better understand the exercise patterns of exerciser schematics before concluding possession of such a self-schema uniquely promotes health and longevity (53).

Another unique observation of this study was the comparison between aschematic and nonexerciser schematic participants. Research on exercise intention and exercise behavior consistently demonstrate a hierarchical relationship between the three original groups proposed by Kendzierski (28). Although the difference is often nonsignificant, aschematics often do report both greater intention and exercise frequency than do nonexerciser schematics (7,10,57). Kendzierski attributed this relationship to the fact that in addition to being mildly important, aschematics are also believed to view the behavior as mildly descriptive (29). Aschematics may report equivalent frequency levels to exerciser schematics, but because they rank importance lower, they are less likely to readily recover should they experience a lapse (32). The nonsignificant differences observed between aschematics and nonexerciser schematics in this study support these previous observations. It may be, too, that fitness values between the two groups would equalize with a larger

sample size, especially for the nonexerciser schematics category. This speculation is informed by the findings of Sheeran and Orbell (45), who found nonsignificant difference between exerciser schematics and nonexerciser schematics in regards to acting on the intention to exercise. As they suggest, perhaps importance rather than descriptiveness plays a crucial mediating role in the intention-behavior relationship.

Furthermore, Sheeran and Orbell (45) reported that self-schema accounted for approximately 10% of the variance in the participants' self-reported behavior. In the present study, self-schema type accounted for approximately 21% of the explained variance between-group fitness assessment results where significant differences were observed. Sheeran and Orbell (45) also found that when exerciser schematics had positive intention to exercise, they more often acted on those intentions. It may not be too much of a leap—given the findings of Harju and Reed (24), coupled with those of Beacham *et al.* (7)—to suggest that positive psychological processes may be a foundational feature of established exercise self-schemas. In other words, positive intention around exercise may be the 'norm' rather than dependent on circumstance (32).

A strength of this study is that it compared self-schema categories to one another across three directly assessed domains of physical fitness, including the category made up of individuals who did not meet inclusion criteria to the original three groups proposed by Kendzierski (28). The only significant difference observed was between exerciser schematics and one or more other categories. However, an

unexpected *descriptive* pattern was observed. Specifically, unschematic participants were most similar to exerciser schematics across all measures of physical fitness, and surpassed both aschematic and nonexerciser schematic participants in two of the three fitness categories. Within the literature, theorization concerning how unschematic participants compare to exerciser schematics is limited. Others have suggested that studies begin to address this gap (16,45,28), which was done in the present study.

Of course, this study is not without limitations. One limitation is the sample size and unequal distribution across schema categories. A more evenly distributed number of participants within each category would help to clarify observed group differences, should they exist, by minimizing within sample variance (27). Of particular concern in this study is the low statistical power for cardiovascular fitness. Within the social sciences, an observed power of .80 is considered desirable, but within the present study it was only .503, translating into a 50.3% chance that a true difference was able to be detected if it were to exist (27). Secondly, given this study used a cross-sectional design, causal inferences cannot be made concerning physical fitness distinctions (i.e., does self-schema drive physical fitness or does physical fitness drive self-schema formation?). Third, given that a convenience sampling method was employed, study findings are unable to be generalized to larger populations. Generalizability is an area of limited empirical attention concerning exercise self-schema theory (7), which may be an avenue worth pursuing in future research.

To improve upon study execution and efficiency, future studies could include a tracking system for the number of times appointments had to be rescheduled because a participant did not fully adhere to the pre-assessment instructions. While an appointment rescheduling was rare within this study, knowing the exact number would help to promote transparency. The exact number of reschedules, the specific reason why, and the average duration of each appointment could also help future researchers interested in including fitness assessments as part of their studies.

Future research may also examine whether differences exist between participants attending private and public institutions of higher education. Though the results of this study did not indicate that the participants sampled were different from college students in general with respect to the physical fitness results (39,55), the possibility exists that participants at public and private institutions differ on the basis of socioeconomic status (SES; 18). Typically, students who attend private universities in comparison to public institutions have higher SES (38). To the authors' knowledge, no such study has been performed, but likely would help understand exercise self-schema theory within a broader social context.

In addition to the above suggestions, future researchers may wish to measure additional social-cognitive and behavioral correlates known to explain exercise behavior variance, such as, attitude, intention, past behavior, perceived behavioral control, self-efficacy and various types of motivation (22,23,41). Additionally, future research

may wish to evaluate the exercise self-schema questionnaire along dimensions of physical fitness not assessed in the present study (e.g., flexibility and muscular strength).

The findings of this study help to establish the construct validity of Kendizerski's self-report measure and exercise self-schema categorization scheme (28). Since a premise of exercise self-schema theory is that possession of a self-schema streamlines decision-making processes and facilitates behavioral parsimony to an established self-image, it was hypothesized that levels of physical fitness should comport to the respective theory categories. This hypothesis was partially supported. In comparison to aschematic and nonexerciser schematic participants, exerciser schematics were observed to have significantly higher levels of physical fitness along two of the three measured dimensions. This study substantiates and extends the findings of past research on the predictive power of social-cognitive variables by demonstrating that, in part, physical fitness levels vary on the basis of self-schema classification (10, 23, 43).

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