

Exercise and Self-Esteem in Middle-Aged Adults: Multidimensional Relationships and Physical Fitness and Self-Efficacy Influences

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In the context of sedentary middle-aged adults, the present study examined the relationships among domain-specific and global levels of self-esteem over the course of a 20-week exercise program. Additionally, the roles played by physical fitness, body composition, self-efficacy, and exercise participation as possible contributors to changes in physical self-worth were examined. Significant improvements in self-esteem at all levels were discovered with global esteem, physical self-worth, and perceptions of physical condition and attractive body increasing. Tests of the hierarchical structure of self-esteem showed greater improvements in physical condition and physical self-worth than global esteem and the relationships between global esteem and subdomain levels were shown to be mediated by physical self-worth. Hierarchical regression analyses showed changes in ratings of importance to have little impact on changes in physical self-worth. Both changes in efficacy and aerobic capacity were demonstrated to account for modest but significant variation in physical self-esteem. Results are discussed in terms of contemporary models of self-esteem, potential mediators of exercise effects on esteem, and the need to measure the constructs of interest appropriately.

KEY WORDS: exercise; middle-aged adults; self-efficacy; self-esteem.

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INTRODUCTION

Although a host of psychological variables has been identified as being influenced by exercise and physical activity, a number of authors have gone so far as to suggest that such participation may have the greatest potential benefit for the enhancement of self-esteem (Folkins and Sime, 1981; Hughes, 1984). Self-esteem can broadly be defined as encompassing the favorable views one holds regarding one's self, and as it is considered a focal aspect of psychological health and well-being (Rosenberg, 1965), it is not surprising that a considerable corpus of literature exists that attempts to establish the link between physical activity participation and self-esteem. Indeed, several major reviews of this literature currently exist (Doan and Schernam, 1987; Gruber, 1986; Sonstroem, 1984), with approximately 60% of studies reviewed reporting a positive association between physical activity participation and higher levels of self-esteem (McAuley, 1994). Although this has led to a widespread lay acceptance of enhanced self-esteem being an automatic outcome of physical activity participation, several other conclusions can be reached regarding this relationship. First, the majority of studies in this area has been cross-sectional examining relationships between exercise and self-esteem at one point in time. Second, there has been an overreliance on the assessment of global self-esteem, a relatively stable entity, to the exclusion of measures of domain-specific esteem, and the examination of multidimensional and hierarchical models of self-esteem. Third, few studies exist that assess relations among changes in esteem at the domain level and changes in esteem at the global level. Finally, the association between exercise participation and enhanced self-esteem appears strongest in those subjects with initially low levels of self-esteem. In summary, one might therefore conclude that the consensus of the literature in this area is equivocal at best.

Perhaps one of the most critical issues cited above concerns the measurement of self-esteem. As noted, it is typically measured as a global construct consequently ignoring more contemporary conceptualizations of the construct that embrace multidimensional and hierarchical models of self-esteem (e.g., Marsh and Shavelson, 1985; Shavelson *et al.*, 1976). Such models suggest that self-esteem is composed of several first-order dimensions (e.g., physical and academic self-esteem) that undergird a higher- or second-order factor comprised of global self-esteem. These lower-order dimensions are further proposed to be influenced by subareas relevant to the specific dimension. Thus, in the case of physical self-esteem, areas such as fitness, strength, and so forth might be hypothesized to be influential determinants at the subdomain level. Following this lead, Fox and Corbin (1989) developed the Physical Self-Perception Profile (PSPP), which posits

global self-esteem to be related to physical self-worth (esteem) at the domain level and that underlying this level are perceptions of *physical conditioning, attractive body, physical strength, and sports competence* at the subdomain level. The measure and the relations theorized among its components have been validated in adult samples and the psychometric properties appear adequate. Implicit in this model is the role played by physical self-worth/esteem in mediating the effects of domain-specific changes on global self-esteem.

Sonstroem and his colleagues have contributed considerably to our contemporary understanding of exercise and self-esteem relationships (e.g., Marsh and Sonstroem, 1995; Sonstroem *et al.*, 1992, 1994) from the perspectives of both advancing models of exercise self-esteem (Sonstroem and Morgan, 1989) and attesting to the psychometric efficacy of recently developed measures. For example, and of particular interest in the present study, Sonstroem *et al.* (1992) administered the PSPP (Fox, 1991; Fox and Corbin, 1989) to adults in their middle and later years, successfully demonstrating that physical self-worth mediated relations among global self-esteem and subdomain levels of sport confidence, physical conditioning, attractive body, and strength. More specifically, all zero-order correlations between self-esteem and subdomain levels were reduced considerably when statistically controlling for physical self-worth. However, self-esteem remained significantly correlated with physical condition and attractive body in females and sport confidence and attractive body in males (r 's = .16 to .22; n = 149 and 111, respectively, for females and males). Additionally, Sonstroem *et al.* (1992) provide evidence to suggest that the PSPP can effectively discriminate between exercisers and nonexercisers and degree of exercise involvement for both males and females.

In a more recent study of female aerobic dance participants, Sonstroem *et al.* (1994) presented further evidence for the validity of the PSPP and the predicted associations between the subdomains of attractive body and physical condition and the degree of exercise and dance participation. In further evaluation of the proposed hierarchical model, some caution was recommended with respect to the potential for overlap of the physical self-worth and attractive body concepts. This is perhaps an understandable association given the sample employed and the current social emphasis equating attractive bodies and physiques with health and well-being (Sonstroem *et al.*, 1994).

Although the measurement of the self-esteem construct has recently taken center stage in debating the equivocal nature of the exercise-self-esteem relationship, a further issue raised by scholars in this area has been that of the role played by the degree of importance individuals attach to the domain of interest (Fox and Corbin, 1989; Marsh, 1994; Marsh and

Sonstroem, 1995). That is, evidence of a relationship between exercise and self-esteem may well be absent in individuals who place no importance in physical activity or fitness, for example. Thus, several individuals have argued that, to paraphrase Marsh (1994), importance may be important and therefore should be measured when examining self-esteem development (Fox and Corbin, 1989; Marsh and Sonstroem, 1995). In a recent and very thorough reexamination of the Sonstroem *et al.* (1994) data, Marsh and Sonstroem offer some compelling evidence to suggest that the contribution of importance ratings to global and physical self-esteem is negligible. However, such ratings appear to play a role of some importance in the prediction of exercise behavior. Consequently, any effect that importance has on self-esteem may be indirect rather than direct, as previously thought. Moreover, whether exercise participation can change ratings of importance at the subdomain level and whether these changes play a moderating role in the proposed hierarchical relationships has yet to be determined.

In spite of a recent energetic flurry of activity in the area of exercise and self-esteem relationships from a more sophisticated conceptual and psychometric perspective (e.g., Sonstroem *et al.*, 1992, 1994; Marsh *et al.*, 1994; Fox and Corbin, 1989), these studies have focused, in large part, upon relationships based upon single-instance measurement. That is, they have focused, for example, on how exercisers and nonexercisers may be discriminated based upon measures of self-concept. Few studies, to our knowledge, have adopted the concept of hierarchical multidimensional models, employed domain-specific measures, and examined these relationships over time in the context of exercise training. Whether these relationships at the global, domain, and subdomain levels exhibit similar patterns of relationships to those more firmly established in cross-sectional studies is not known. Moreover, as noted earlier exercise effects on importance ratings have not been evaluated and few studies have made any conscious attempts to examine the moderating effects of importance on self-esteem development (March, 1994; Marsh and Sonstroem, 1995).

Of further interest, in the exercise-esteem relationship is the determination of what the underlying mechanisms might be that contribute to this relationship. For example, Sonstroem and Morgan (1989) have postulated a model that suggests changes in physical self-efficacy brought about by exercise training influence physical self-worth, which, in turn, is directly related to global esteem. They also suggest that changes in efficacy bring about changes in esteem at the domain level. Sonstroem *et al.* (1991) tested such structural relations in an adult sample and were able to demonstrate support for the efficacy-physical competence-global esteem relations. Whether such relationships are independent of changes in physical function or exercise participation was not determined due to the one-time measure-

ment of the constructs of interest. Furthermore, although Sonstroem *et al.* (1991) examined self-efficacy and physical competence relationships with global esteem, Marsh (1994) and Marsh and Sonstroem (1995) have recently argued that in the context of physical activity, perhaps the focus of esteem-related research should be placed on physical self-worth rather than global indices. In the Sonstroem *et al.* (1991) paper, physical esteem is operationalized as physical competence and represented by measured constructs determining subjects' estimation of their physical condition and physical doubt. Recent developments in the measurement of esteem (e.g., Fox and Corbin, 1989) may allow for a more accurate assessment of physical self-worth. At any rate, the Sonstroem *et al.* (1991) study represents one of the few attempts at tackling the issue of what mechanisms may undergird the exercise-self-esteem relationship.

The objectives of the present study were quite straightforward. First, in the context of previously sedentary middle-aged males and females, we were interested in evaluating the relationships among global and domain-specific self-esteem, as well as ratings of importance over the course of a structured exercise program. Employing contemporary measures of these constructs, we examined the proposed hierarchy of self-esteem relations in the physical activity domain by assessing the degree to which relations between subdomain measures of the physical self and global self-esteem were mediated by physical self-esteem. Additionally, we evaluated the moderating effect of changes in importance ratings on relations among subdomain and domain level changes in self-esteem. Finally, we conducted exploratory analyses to determine the extent to which changes in efficacy and aerobic capacity, as well as overall exercise participation in the program, were related to changes in physical self-worth.

METHOD

Subjects

Sedentary, middle-aged ($M = 54.5$ years) males ($N = 56$) and females ($N = 58$) recruited through local media advertising to participate in a 20-week exercise program served as subjects for the present study. An individual was eligible to participate in the program if he/she was (a) between 45 and 64 years of age; (b) sedentary, as defined by a lack of regular involvement in exercise during the previous 6 months; and (c) healthy to the degree that participation in exercise testing and an exercise program would not exacerbate any existing symptomatology. This latter condition was de-

terminated by a preprogram physician examination and medical clearance for exercise participation.

Compliance

Although 113 subjects were initially screened for participation in the program, complete data were available for 83 subjects (females = 42, males = 41) and these data were employed in subsequent analyses. Further details relative to compliance issues (McAuley *et al.*, 1994) and physiological changes brought about by the program (McAuley *et al.*, 1995) have been published elsewhere.

Measures

Self-Esteem Measures. To assess *global* self-esteem, Rosenberg's (1965) Global Self-Esteem Scale was administered. This measure is a well-validated 10-item assessment of one's overall assessment of self-worth scored on a 1-5 scale. Internal consistency for the measure in the present sample was excellent ($\alpha = .91$). Fox and Corbin's (1989) Physical Self-Perception Profile (PSPP) was employed to determine subjects' perceptions of esteem relative to the physical domain. The PSPP is comprised of five subscales, four of which represent the subdomains of *perceived sport competence*, *physical condition*, *attractive body*, and *physical strength*. These four subdomains are proposed to underlie the physical domain scale of *physical self-worth*. Each scale is composed of six items, with items being scored from 1 to 4, thus each scale score can range from 6 to 24. Internal consistency for all subscales of the PSPP was acceptable, $\alpha = .87$ to $.94$. Due to the aerobic nature of the exercise program, no remarkable changes were expected in the subdomains of physical strength and perceived sport competence. Initial analyses supported such expectations and subsequent analyses focused on theoretical relations among the physical condition and attractive body subdomains and physical and general self-esteem.

Importance Measures. The Perceived Importance Profile (PIP; Fox, 1990) was employed to determine the degree to which subjects perceived each of the subdomains of physical self-worth were of importance to them. Each of these importance ratings is comprised of two items with scale scores ranging from 2 to 8.

Self-Efficacy. The Perceived Physical Ability subscale of the Physical Self-Efficacy scale developed by Ryckmann *et al.* (1982) was employed to measure physical self-efficacy. This is a measure that assesses confidence

in physical capabilities and was judged most suitable to the present objectives due to its assessment of overall physical efficacy rather than one specific component of efficacy.

For each item on the self-efficacy scale, subjects were asked to indicate the degree of confidence in their capabilities to successfully execute that behavior. These responses were scored on a 100-point percentage scale comprised of 10-point increments (100% = complete certainty, 0% = highly uncertain). Total strength of self-efficacy was then calculated by summing the confidence ratings and dividing by the total number of items in the scale, resulting in a maximum possible efficacy score of 100. These assessments are in accord with the recommendations of Bandura (1977, 1986). Internal consistency for the scale was good ($\alpha = .91$).

Aerobic Capacity. The modified Astrand-Ryhming protocol (Siconolfi *et al.*, 1982) was employed to determine estimated $\dot{V}O_{2\max}$. This procedure required subjects to pedal at 50 rpm at an initial workload of 150 kg/min. The workload was increased by 150 kg/min every 2 min until the subject reached 70% of their predicted maximum heart rate ($220 - \text{age} \times .70$). Heart rate was assessed each minute and blood pressure every 2 min.

Exercise Participation. Logs of subject participation were kept on a daily basis during the exercise program by the exercise personnel in charge of the program. Thus, for the purpose of the present study exercise participation was operationally defined as subjects' exercise frequency and was measured by the total number of exercise sessions in which subjects had participated in over five months.

Body Composition. Percentage of body fat was employed as a measure of body composition and was determined using the three-site technique and generalized equation developed by Jackson *et al.* (1980) and the four-site technique and equation developed by Durnin and Womersley (1974). Because the Jackson *et al.* (1980) technique tends to underestimate body fat and the Durnin and Womersley (1974) approach tends to overestimate, the mean of the two measures was employed in the present study.

Procedure

Prior to and following the exercise program, all subjects reported to our laboratories for physiological assessments and at that time completed the self-esteem measures and importance ratings. The 20-week exercise program was designed for middle-aged adults and employed low-impact aerobic exercise, in this case walking. Subjects exercised three times per week (frequency), beginning at 10-15 minutes and progressing up to 40 min by the midpoint of the program. The exercise class was composed of

a warm-up, aerobic activity period, and then a cool-down phase. Subjects were led in stretching and flexibility exercises by the exercise leaders for approximately 10 min each session. They then participated in the walking program, the aerobic portion of the session. Participation in this phase was closely monitored by the exercise leaders and subjects engaged in aerobic activity for progressively longer durations each week for the first 10 weeks. That is, the aerobic activity was designed to last for 15 min for the first 2 weeks and gradually increased to 40 min by the tenth week. This latter prescription of duration was maintained for the remainder of the program.

Data Analysis

A series of mixed model multivariate analyses of variance with sex as the between-subjects variable, time as the within-subjects variable, and values for pre- and postprogram esteem measures and importance ratings as dependent variables were used to assess changes in esteem and importance over the course of the program. Correlational and hierarchical multiple regression analyses were employed to examine relationships among the esteem measures and to test the veracity of the proposed hierarchical ordering of esteem. Hierarchical regression analyses using cross-product interaction terms of importance ratings with subdomain measures of esteem were employed to determine whether relationships among changes in subdomain self-esteem and changes in physical self-worth were moderated by importance ratings. Finally, hierarchical regression analyses were employed to determine the contribution of fitness, body composition, exercise participation, and self-efficacy to changes in physical self-esteem.

RESULTS

Changes in Multidimensional Self-Esteem and Ratings of Importance

The multivariate effect for sex of subject [$F(4,79) = 1.28, p > .10$] and the interaction between sex and time were nonsignificant [$F(4,79) = 1.73, p > .10$]. There was, however, a significant multivariate effect for time [$F(4,79) = 464.38, p < .0001$]. This overall multivariate effect was followed up with univariate analyses employing a Bonferroni correction ($p = .012$) to adjust for the possibility of a Type 1 error and the calculation of effect sizes. Means, standard deviations, and effect sizes for pre- and postprogram self-esteem measures are detailed in Table I. Overall, these data indicate that there was a significant, albeit relatively modest increase in *global self-*

Table I. Means, Standard Deviations, and Effect Sizes for Changes in Multidimensional Self-Esteem and Importance Ratings Over the 20-Week Exercise Program

| | Preprogram | Postprogram | Effect size |
|-------------------------------|--------------|--------------|-------------|
| Global esteem | 38.67 (6.91) | 40.19 (6.49) | .22 |
| Physical self-worth | 13.08 (2.93) | 14.42 (3.51) | .41 |
| Physical condition | 11.94 (2.55) | 13.49 (3.22) | .54 |
| Attractive body | 12.41 (3.06) | 12.90 (3.52) | .39 |
| Physical condition importance | 5.27 (1.09) | 5.26 (1.35) | .00 |
| Attractive body importance | 5.13 (1.02) | 4.75 (1.27) | -.33 |

esteem over the course of the exercise program ($t = 3.09, p < .003$; ES = .22). The change in *physical self-worth* was stronger, as predicted ($t = 4.17, p < .0001$; ES = .41), with subjects' perceptions of their physical self improving over the 20-week period. Examination of the effect sizes for changes in the two subdomains revealed only a small and nonsignificant effect for *attractive body* ($t = 1.71, p = .08$; ES = .15). However, a significant increase over time occurred for *physical condition* ($t = 5.4, p < .0001$; ES = .54), as one would expect given the aerobic nature of the exercise program. Thus, it appears that the primary changes in self-esteem over the 20-week period were physical condition at the subdomain level and physical self-worth at the domain levels, each witnessing an increase in self-esteem considerably larger than the global esteem effect.

The mixed-model multivariate analysis of variance examining changes in ratings of importance revealed a significant multivariate effect only for time [$F(4,82) = 9.08, p < .0001$]. Subsequent univariate and simple effects analyses indicated that this effect was due largely to differences placed on the importance of attractive body, with subjects rating it as being significantly less important at program end than preprogram ($t = 3.53, p < .001$; ES = -.33). Changes in importance ratings over time are also shown in Table I.

Relationships Among Changes in Self-Esteem Levels

The hierarchical structure of self-esteem that has driven much of the contemporary research in this area suggests that changes at the subdomain level are related to changes in global self-esteem through the mediation of the domain-specific levels of esteem (e.g., physical self-worth). To test the veracity of such a hypothesis, we conducted a series of hierarchical regression analyses regressing the postprogram values of global, domain, and the two subdomain measures of esteem on their preprogram values to calculate

Table II. Hierarchical Regression Analyses Showing Variation in Changes in Physical Self-Worth Accounted for by Changes in Esteem at the Subdomain Levels, Changes in Importance Ratings, and the Cross-Product of Importance and Esteem

| Predictor | R^2 | β | F for change | p |
|---|-------|---------|----------------|-------|
| Physical condition | | | | |
| Esteem | .179 | .52 | 25.40 | .0001 |
| Importance | .027 | .20 | 03.84 | .053 |
| Self \times Importance | .006 | -.06 | 00.90 | n.s. |
| Total $R^2 = .44$, $F(3,79) = 20.83$, $p < .0001$ | | | | |
| Attractive Body | | | | |
| Esteem | .484 | .72 | 31.08 | .0001 |
| Importance | .008 | .09 | 01.38 | n.s. |
| Self \times Importance | .029 | -.17 | 04.85 | .03 |
| Total $R^2 = .53$, $F(3,78) = 29.77$, $p < .0001$ | | | | |

residualized change scores. These scores represent the change over time in variables after controlling for the variation in postprogram scores due to preprogram scores (Cohen and Cohen, 1983). Correlation of these residual scores indicated that changes at the subdomain level, physical condition and attractive body, were significantly associated with changes in global self-esteem (r 's = .39 and .33, respectively; $p < .001$). As expected, these subdomain changes were more strongly related to changes at the domain level, a finding in concert with the hierarchical model of self-esteem. Specifically, physical condition and attractive body were significantly related to physical self-worth (r 's = .64 and .71, $p < .0001$, respectively).

Next a series of hierarchical regression analyses was conducted to determine whether the relationships at the bivariate level between global esteem and subdomain measures was mediated by physical self-worth. In these analyses, global self-esteem was regressed on each of the subdomain esteem variables while statistically controlling for physical self-worth. In all cases, these initially significant correlations were rendered nonsignificant when controlling for physical self-worth.

Moderating Effects of Importance Ratings on Physical Self-Worth

In these analyses, we examined the proposition that individuals' perceived importance of subdomains moderate the relationships between changes in esteem at the domain level (physical self-worth) and changes at the subdomain level (physical condition and attractive body). Hierarchical

regression analyses were conducted in the fashion described above to create standardized residual change scores for the four importance ratings and a cross-product term for each subdomain was created by multiplying the individual's residual importance score and their subdomain self-esteem score. The latter variable was employed as the interaction term to test the moderating effect of importance. Following this, a series of hierarchical regression analyses was conducted in which changes in physical self-worth were predicted as a function of three predictor variables: changes in subdomain esteem, changes in importance at that subdomain, and the interaction or cross-product of these two variables. In these analyses, each predictor was entered last into an equation. From these conservative analyses, the unique contribution of each predictor to variation in changes in physical self-worth is identified. Details of these analyses are given in Table II.

Specifically, the pattern of results is relatively consistent across both subdomains of physical self-esteem, with each contributing significant unique variation to physical self-worth when controlling for the importance ratings and the subdomain esteem \times importance cross-product. Only in the case of physical condition is importance important and this contribution is modest ($R^2 = .027, p = .054$). The cross-product accounted for significant, but again modest, variation in changes in physical self-worth only in the case of attractive body ($R^2 = .029, p < .05$).

Physical Self-Esteem, Self-Efficacy, and Exercise Relationships

In an exploratory effort to examine the extent to which self-efficacy changes were related to changes in physical self-esteem, we once again employed a series of hierarchical regression analyses. In so doing, we first created a residual score for self-efficacy by regressing postprogram efficacy on preprogram efficacy. Because it is highly possible that changes in physical self-esteem are brought about by physical changes resulting from exercise, we also employed change in aerobic capacity and body composition, as well as exercise frequency during the program, as predictor variables in the regression analyses. Change in aerobic capacity and body composition was represented by the simple change score from pre- to postprogram estimated $\dot{V}O_{2\max}$ and percentage body fat, respectively. Finally, because the domain level of physical self-esteem is theorized to be undergirded by subdomain levels of esteem, we also employed perceptions of physical condition and attractive body as additional predictors of physical self-esteem in the final set of regression analyses.

The analyses were conducted using the SPSS for Windows Test procedure, which tested the hypothesis that the two subdomain measures, aero-

Table III. Hierarchical Multiple Regression Analyses of Contributions to Changes in Physical Self-Worth by Changes in Subdomain Esteem, Aerobic Capacity, Percentage Body Fat, Self-Efficacy, and Exercise Frequency

| Predictor | R^2 | β | F for change | p |
|---------------------|-------|---------|----------------|-------|
| Physical condition | .488 | .21 | 47.51 | .0001 |
| Attractive body | .62 | | | |
| Self-efficacy | .025 | .17 | 4.89 | .05 |
| Aerobic capacity | .029 | .18 | 5.68 | .05 |
| Percentage body fat | .004 | -.07 | 0.89 | n.s. |
| Exercise frequency | .012 | .12 | 2.49 | n.s. |

Total $R^2 = .66$, $F(6,66) = 21.41$, $p < .0001$

Note: The two measures of subdomain esteem were entered together in the regression analyses. Standardized regression coefficients and variance reported for each variable are based upon being entered after all other independent variables.

bic capacity, body composition, efficacy, and exercise participation, each contribute unique variance to changes in physical self-worth when statistically controlling for all other variables in the equation. Such analyses allow a conservative test of the proposed theoretical relations among multidimensional self-esteem components. The overall equation was significant, with the variables accounting for 65% ($p < .0001$) of the variation in physical self-esteem ($R^2_{adj} = .62$). Perceptions of physical condition ($\beta = .21$, $p < .05$) and attractive body ($\beta = .62$, $p < .0001$) were the major contributors to the variation ($R^2 = .49$, $p < .0001$), whereas exercise frequency ($\beta = .12$, $p = ns$) and body composition ($\beta = -.07$, $p = ns$) failed to contribute significant variation. However, changes in both aerobic capacity ($R^2 = .03$, $\beta = .18$, $p < .01$) and self-efficacy ($R^2 = .025$, $\beta = .17$, $p < .05$) were independent predictors of changes in physical self-esteem. These results of these analyses are shown in Table III.

DISCUSSION

In spite of a large body of literature in the area of exercise and self-esteem, there have been few systematic attempts to examine multidimensional self-esteem relations over time, although several contemporary studies have documented reliable cross-sectional associations. This study demonstrated some support for the theoretical relationships suggested to exist among components of multidimensional self-esteem in the context of middle-aged adults involved in a structured exercise program. Given the

equivocal nature of the findings in the extant exercise-self-esteem literature, these results have a number of potential implications.

From a theoretical perspective, several points deserve some discussion. First, the structure of self-esteem has for some time been acknowledged as being multidimensional (Marsh and Shavelson, 1985; Shavelson *et al.*, 1976), although such an approach has, until recently (e.g., Fox and Corbin, 1989; Sonstroem *et al.*, 1992), been noticeable largely by its absence in the exercise literature. In the present study, we tested such a notion by determining the extent to which self-esteem changed over time at various levels of the hierarchy and the degree to which esteem at the domain level (physical self-worth) mediated relationships between global self-esteem and measures at the subdomain level (physical condition and attractive body). Some support for both tests of the hierarchical structure was evident. In the first, the degree of change over time was greatest at the subdomain level in the case of physical condition ($ES = .54$), followed by the domain level ($ES = .41$), and finally, the smallest change was demonstrated at the global level ($ES = .22$), although this was also statistically significant. As we have demonstrated greater changes to occur in physical self-worth and physical condition, one might question whether indeed researchers in this area should be interested in the assessment of global self-esteem at all. Rather, as has been forwarded by Marsh (1994) and Marsh and Sonstroem (1995), there may be a greater yield in placing a stronger reliance on self-perceptions specific to the physical domain (subdomain measures) and thereby relative to the focus of the research. However, if one wishes to ascertain the impact of exercise and physical activity on more global indices, then such measures may continue to prove useful, although the overall change at this level is likely to be minimal.

A second theoretical issue broached in the present study was the mediating role proposed to be played by physical self-worth in the relationship between global self-esteem and self-perceptions relative to aspects of physical activity over time. To test such a proposition, we examined the relationships between *changes* in these constructs over time. In these analyses, all significant correlations between subdomain measures and global self-esteem were rendered nonsignificant when statistically controlling for physical self-worth, suggesting that this domain-specific level of self-esteem does play a mediating role as proposed. Such a finding of course calls into question the veracity of much of the research that, other methodological shortcomings notwithstanding, has suggested exercise and physical activity may have a direct effect on global self-esteem.

A further theoretical aspect of discussion is the role played by individuals' perception of importance in the generation of self-esteem. Fox (1990), for example, has proposed a personalized hierarchical model that

posits self-esteem components at the various levels to be driven to some extent by the degree of importance that the individual attaches to the domains of interest. Limited exploration of such propositions exists in the exercise-self-esteem literature. In the present study, we were able to offer little support for the contention that importance ratings enhance self-esteem. Such findings are in some agreement with those of Marsh and Sonstroem (1995), who were unable to support the utility of Fox's (1990) perceptions of importance ratings for a personalized hierarchical model of self-esteem. Although such findings may be disappointing, it is perhaps premature to suggest that ratings of importance are not useful. Rather, it is likely that a change in the focus of such ratings may be more illuminating in understanding exercise-related self-perceptions. That is, regardless of the importance ratings' abilities to explain further domain-specific self-esteem, they may be functional for predicting other exercise-related outcomes (Marsh and Sonstroem, 1995). For example, measures of the importance of exercise in weight loss, fitness, and fat reduction may play important roles in the successful attainment of such common exercise goals. Similarly, Marsh (1994) argues that such importance ratings may also be instrumental in whether one adheres to exercise programs. That is, the degree to which one *values* such outcomes and activities may well be a determinant of exercise behavior that has been largely ignored.

From a measurement perspective, the PSPP (Fox and Corbin, 1989) appears to have some utility for the assessment of multidimensional self-esteem in middle-aged adults. To our knowledge, this is the first report examining relationships among elements of multidimensional self-esteem over a reasonably long period of time (5 months). Whether this instrument is superior to other multidimensional measures of physical self-concept in charting esteem changes in the physical domain over time remains to be determined. Measures such as the Physical Self-Description Questionnaire (Marsh and Redmayne, 1994) and the Physical Self-Concept scale (Richards, 1988) have been developed but there have been limited attempts at comparing the relative properties of each measure (for an exception see Marsh *et al.*, 1994) or their respective abilities to reflect accurately exercise-induced changes in self-esteem in a variety of populations.

It is tempting to infer from these data that a program of low to moderately intense physical activity (brisk walking) can enhance elements of self-esteem in older adults. In a society that consistently holds the fit, young hardbody as the ideal, deteriorations in physical self-esteem are undoubtedly experienced by most of a largely sedentary population. Clearly, as we age and our levels of physical activity decrease and the propensity for injury and death from falling is increased, beliefs in physical self-worth are also likely to be impacted. Anecdotal reports in the popular media are typified

by statements regarding exercise participation's facility for making people, young and old alike, "feel better" about themselves and their physical capabilities. Yet there remain virtually no studies that have examined such a proposition over time using appropriate measures of the construct of interest, self-esteem. The fact that the changes in self-esteem were most stridently reflected in changes in the physical conditioning and physical self-worth dimensions might suggest that exercise program has had the desired effect on the areas of self-esteem most relevant to the domain of activity. However, the present study employs a within-subjects design and thereby lacks the rigorous experimental design that the addition of a control group and an alternative treatment condition might provide. The extent to which exercise causes the changes in self-esteem reported herein awaits such experimental confirmation.

In some ways, it can be further argued that our exploratory analyses of potential physical and cognitive mediators of esteem changes lend support, in the absence of a direct comparison control group, to the thesis that it is exercise that is bringing about these positive changes. In predicting changes in physical self-esteem, we demonstrated that improvements in one's sense of physical self-efficacy and enhanced levels of fitness (aerobic capacity) played significant roles above and beyond that of the subdomain-level perceptions. However, such findings must be tempered by the modest contribution these variables make to overall changes in esteem and remain to be replicated under controlled conditions. However, in the long run such small contributions might result in significant public health contributions [see Booth-Kewley and Friedman (1987) for an eloquent argument regarding the translation of small amounts of variation into public health savings]. Our findings parallel to an extent and add to those of Sonstroem *et al.* (1991), who have reported that self-efficacy is a significant predictor of physical competence which, in turn, influences general self-esteem. Like Sonstroem and his colleagues, we found self-efficacy to be significantly related to physical esteem but also found a significant contribution to be made by aerobic capacity. Moreover, our data examined these relationships in the light of changes over time rather than single instance measurement. Unfortunately, our sample size did not allow us the luxury of examining the potential structural model that would include physiological, behavioral, and social cognitive influences on subdomain perceptions and the links between the latter variables and physical and global self-esteem.

Although much has been accomplished in physical self-esteem research in recent years, it is clear that much remains to be done. Further examination of exercise-induced effects at multidimension levels across populations needs to be further documented. Having effectively done so, conscientious efforts need to be made to determine what it is that underlies

such changes in self-esteem in the physical domain. Are these changes mediated by physiological, social, cognitive, or neurological components or are complex interactions of all of these variables at work? In much the same way as we know very little about the mechanisms by which exercise and physical activity influence other psychosocial outcomes (McAuley, 1994; McAuley and Rudolph, 1995), the same is true of self-esteem. If, indeed, exercise participation has the greatest potential benefit for the enhancement of self-esteem (Folkins and Sime, 1981; Hughes, 1984), concerted efforts need to be directed at answering such questions.

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