A Multidimensional Physical Self-Concept and Its Relations to Multiple Components of Physical Fitness

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This study examines relations between six components of physical self-concept (Endurance, Balance, Flexibility, Strength, Appearance, and general Physical Ability) and five components of physical fitness (Endurance, Balance, Flexibility, Static Strength, Explosive Strength/Power) for a sample (N = 105) of young adolescent girls aged 13 and 14. Hierarchical confirmatory factor analyses identified the six physical self-concept scales and provided support for a multidimensional, hierarchical model of physical self-concept. The pattern of correlations between specific components of physical self-concept and physical fitness generally supported the construct validity of the self-concept responses, and the correlation between second-order factors representing general physical self-concept and general physical fitness (r = .76) was substantial.

Key words: components of self-concept, Self-Description Questionnaire

The focus of the present investigation is on a multidimensional, hierarchical physical self-concept and its relation to multiple dimensions of physical fitness. Historically, self-concept researchers have emphasized a broad, global construct that did not differentiate among specific domains. In an attempt to remedy this problem, Shavelson, Hubner, and Stanton (1976) developed a multifaceted, hierarchical model of self-concept, although they were able to identify no single instrument that could differentiate among the broad academic, social, and physical domains that they posited. More recently, researchers have developed self-concept instruments to measure specific domains that are at least loosely based on an explicit theoretical model such as the Shavelson et al. model and then used factor analysis to support these a priori domains (see review by Marsh, 1990). The

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Self-Description Questionnaires (SDQ; Marsh, 1990) were specifically designed to test the Shavelson et al. (1976) model and provide the strongest support for it. Factor analyses have consistently identified the scales that the SDQ instruments are designed to measure, and construct validity studies have supported a priori relations between SDQ responses and external criteria (Marsh, 1990). Within this general self-concept framework, it is also reasonable to posit more detailed hierarchies that are specific to a particular domain of self-concept such as the academic domain (Marsh, 1990; Marsh, Byrne, & Shavelson, 1988) and, of particular relevance to the present investigation, the physical domain (Fox & Corbin, 1989; Sonstroem, Speliotis, & Fava, 1992).

Support for the Shavelson et al. model is based primarily on multiple components of academic self-concept, their relation to performances in different academic areas, and their distinctiveness from other components of self-concept (Marsh, 1990, 1993a). There is, however, also support for both the model and the SDQ instruments in the physical domain. Factor analyses (e.g., Marsh, 1990) have consistently differentiated responses to the SDQ Physical Ability and Physical Appearance scales from each other and from other SDQ scales. Jackson and Marsh (1986) demonstrated that athletic participation by high school and young adult women was substantially related to Physical Ability self-concept, but was substantially less correlated with nonphysical areas of self-concept. Marsh and Peart (1988) demonstrated that physical fitness was substantially related to Physical Ability self-concept, modestly related to Physical Appearance self-concept, and unrelated to other areas of self-concept. Marsh and Peart also contrasted competitive and cooperative aerobics interventions. Both interventions led to substantial increases in physical fitness. However, consistent with a priori predictions, the cooperative intervention led to an increase in Physical Ability self-concept, the competitive intervention led to a decline in Physical Ability self-concept, and neither intervention had any substantial effect on nonphysical SDQ scales. Marsh, Richards, and Barnes (1986a, 1986b) demonstrated that participation in Outward Bound had significant effects on those SDQ factors most relevant to the program—particularly Physical Ability self-concept—and that the size and pattern of these effects were stable over an 18-month follow-up. Collectively, these studies support the construct validity of responses to the SDQ physical scales.

Using data from the Australian Health and Fitness survey, Marsh (1993b) related a single-item physical fitness self-concept scale to a diverse set of physical fitness indicators. For a nationally representative sample of Australian boys and girls aged 9 to 15, physical self-concept was significantly correlated to a variety of components of physical fitness. Although the size of relations increased somewhat with age, the pattern of relations was consistent for responses by boys and by girls. Commenting on limitations of the study, Marsh specifically noted that multiple dimensions of physical self-concept should be considered and that a multifaceted, hierarchical structure of physical self-concept is consistent with the Marsh/Shavelson model of self-concept, particularly their more differentiated, multidimensional model of academic self-concept (Marsh, Byrne, & Shavelson, 1988).

Marsh (1993b) proposed that a particularly fruitful direction for such research would be to relate a multidimensional profile of physical fitness indicators to a parallel set of multidimensional physical self-concept scales. For this purpose, Marsh proposed the potential usefulness of the widely used Physical Self-Perception Profile.
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(PSPP; Fox, 1990; Fox & Corbin, 1989) and the unpublished Sutherland and Marsh (1982) Physical Ability and Self Description Scale, which is the basis of the present investigation.

The PSPP (Fox & Corbin, 1989; Sonstroem, Speliotis, & Fava, 1992) measures four physical subdomains (Bodily Attractiveness, Sports Competence, Physical Strength, and Physical Conditioning/Exercise) as well as a global Physical Self-Worth scale. Factor analyses identified the four subdomains (although the global physical scale was not included in these factor analyses) and the self-concept responses predicted degree and type of physical activity involvement. Also, the pattern of relations among the self-concept scales supported their hierarchical model of physical self-concept and provided further support for the Shavelson et al. (1976) model. Fox and Corbin (1989) noted, however, that the Physical Attractiveness scale was not substantially related to physical activity, although it was more strongly correlated with both their Physical Self-Worth scale and a general Self-Esteem scale (see also Marsh, 1990). Fox and Corbin focused primarily on the internal structure of physical self-concept, and tests of the divergent validity were not emphasized.

Potentially useful directions for future research with the PSPP and other multidimensional physical self-concept scales include stronger tests of (a) the hierarchical model based on hierarchical confirmatory factor analyses (e.g., Marsh & Hocevar, 1985), (b) the divergent validity of the physical self-concept responses based on relations to specific criteria logically related to each scale, and (c) relations between their physical self-concept hierarchy and a hierarchy of physical fitness measures. The purpose of the present investigation is to pursue these issues by examining relations between responses to the Sutherland and Marsh physical self-concept instrument and multiple dimensions of physical fitness.

Methods

Subjects

Subjects (Ss) were 105 girls attending one of two private girls’ schools in metropolitan Sydney. All participants were in the eighth grade and were either 13 or 14 years of age. The girls came from primarily middle- and upper-middle-class backgrounds. After obtaining consent from the school and parents, the physical fitness tests and the physical self-concept instrument were administered during physical education classes. The average performances on the physical fitness tests by these girls were well below the normative average performances of 14-year-old girls published by Fleishman (1964).

Measures

The physical fitness tests included four tests from Fleishman’s Basic Fitness Tests (1964) and the 12-Minute Run Test recommended by Cooper (1968). The tests, administered according to instructions presented by Fleishman and by Cooper, were Static Strength using a hand grip dynamometer, Balance (gross body equilibrium) based on ability to remain balanced on a 1.91 cm rail, using their preferred foot, with hands on hips and their eyes closed; shuttle run test (Explosive Strength/Power) in which Ss ran back and forth five times between
two lines 18.29 metres apart (i.e., a total of 91.44 metres); dynamic Flexibility in which Ss bent forward without bending their knees to touch an X marked on the floor, straightened up, and without moving their feet, twisted to the left and touched an X located about shoulder height directly behind them for as many cycles as possible in 20 seconds; and 12-minute run (Endurance), which was substituted for the 600 yard run/walk test originally recommended by Fleishman (1964) because it was deemed a more valid test of endurance (Cooper, 1968).

The physical self-concept items that comprise the Sutherland and Marsh (1982) instrument and its a priori scales are presented in Figure 1. Instructions, format, and the 6-point response scale were based on the SDQII (Marsh, 1990), as were the general Physical Ability and Physical Appearance scales. The Balance, Flexibility, and Endurance self-concept scales were designed to match and be most highly correlated with the corresponding fitness tests of Balance, Flexibility, and Endurance, whereas the Strength self-concept factor was designed to correspond to and be most highly correlated with the Static Strength and shuttle run (Explosive Strength) tests. The general Physical Ability scale from the SDQII was expected to be substantially correlated with all the physical fitness components, but to be most highly correlated with Endurance—the most general component of fitness. The Physical Appearance self-concept scale based on the SDQII was not predicted to be substantially correlated to any of the fitness tests. Coefficient alpha estimates of reliability were consistently high for all six physical self-concept scales (.84 to .92). An exploratory factor analysis—a principal axis factor extraction with a Kaiser normalization followed by an oblique rotation—clearly identified each of the six a priori scales in that each measured variable loaded more substantially on its intended scale than on any other scale.

Statistical Analyses

As recommended for analyses of SDQ responses (e.g., Marsh, 1990, 1992, 1993a), all factor analyses were conducted on item-pair responses in which the first two items in each scale (as shown in Figure 1) were averaged to form the first item pair, the second two items were averaged to form the second item pair, and so forth. The use of item pairs is recommended because item-pair scores are more reliable and contain less idiosyncratic variance and because the ratio of the number of measured variables to the number of Ss is doubled. This is particularly important in the present investigation in which the number of Ss \( N = 105 \) is small in relation to the number of items (50), so that even the ratio of Ss to item-pairs (105/25) is marginal.

Confirmatory factor analyses (CFA), performed with LISREL 7 (Jöreskog & Sörbom, 1988), were used to test the a priori factor structure underlying the self-concept responses and physical fitness tests. In CFA the researcher posits an a priori structure and tests the ability of a solution based on this structure to fit the data by demonstrating that (a) the solution is well defined, (b) parameter estimates are consistent with theory and a priori predictions, and (c) the \( \chi^2 \) and subjective indices of fit are reasonable (Marsh, Balla, & McDonald, 1988; McDonald & Marsh, 1990). For present purposes the Relative Noncentrality Index (RNI) and the Tucker-Lewis Index (TLI) recommended by McDonald and Marsh (1990) are considered. Both indices vary along a 0-to-1 continuum in which values greater than .9 are typically taken to reflect an acceptable fit. The
Physical Appearance
- I am attractive for my age.
- I believe I have a nicely shaped body.
* I am ugly.
- I am good looking.
- I have a nice looking face.
* Nobody thinks that I’m good looking.
- My body looks nice.
- I’m better looking than most of my friends.

Physical Ability
* I am awkward at things like sport, gym, and dance.
* I hate things like sport, gym, and dance.
- I can run a long way without stopping.
- I enjoy things like sport, gym, and dance.
- I am good at things like sport, gym, and dance.
* I try to get out of sports and physical education classes whenever I can.
* I am lazy when it comes to sports and hard physical exercise.
- I am better than most of my friends at things like sport, gym, and dance.

Strength
- I am stronger than most girls my age.
* I lack the strength needed to run fast.
- I am good at lifting heavy objects.
* I am weak in physical tasks.
- I would do well in a test of strength.
* I am weak and have no muscles.
* I have always been weak in physical activities.
- I have a lot of power in my body.

Balance
- I would be successful on a test of balance.
* I fall over often when trying to balance.
- I think I could hold a balanced position for a long time.
- I rarely lose my balance.
* I am not a very good balancer.
- When necessary I think I could keep my body in a stable position.
* I have little balancing ability.
- I have a good sense of balance.

Flexibility
* I have never been able to bend, twist, or turn my body easily.
- I think I am flexible enough for most sports.
* It is difficult for me to bend and move quickly in different directions.

Figure 1 — The Sutherland and Marsh (1982) Instrument: 50 items and 6 a priori scales. Note. Asterisks denote negatively worded items that should be reverse scored.
* These two scales were from the SDQII instrument. b For more general use, the word girl should be replaced with people. (Continued on next page)
Flexibility (Continued)

*My body is stiff and inflexible.
My body parts bend and move in most directions well.
I think I would perform well on a test measuring flexibility.
I can bend and turn my body easily in games and sports.

Endurance
*I never last long in physical activities.
I am fit and can last a long time during physical activities.
*I have poor endurance in physical tasks.
I can last a long time in most physical activities.
*I am exhausted quickly by physical tasks.
I think I could run a long way without getting tired.
I can exert myself for a long period of time if I have to.
*I have very little stamina.
I do not tire easily in physical activities.
I get tired quickly if I start to run.

RNI contains no penalty for a lack of parsimony so that the addition of new
parameters automatically leads to an improved fit that may reflect capitalization
on chance, whereas the TLI contains a penalty for a lack of parsimony.

Results

The first-order factor structure underlying the six components of physical
self-concept and the five components of physical fitness (Table 1) was well-
defined, the goodness of fit was reasonable (RNI = .911), and all the factor
loadings relating the measured variables to their latent constructs were statistically
significant and substantial (see Table 1).

Correlations among the six components of physical self-concept were sub-
stantial, varying from .448 to .899 (Table 1). Not surprisingly, the general Physical
Ability scale from the SDQII was substantially correlated with the specific compo-
nents of physical self-concept. Among the specific components, correlations
involving Endurance tended to be the highest, whereas those involving Physical
Appearance were lowest. Correlations among the five components of physical
fitness were substantially smaller, varying from .024 to .394. The largest correla-
tions involved the Endurance component of physical fitness, whereas the smallest
involved the Balance component.

Correlations between the physical self-concept and physical fitness factors
varied from −.052 to .643 (Table 1). Consistent with a priori predictions, Endur-
ance self-concept was most highly correlated with Endurance fitness (r = .643),
and Strength self-concept was most highly correlated with the Static Strength
(r = .442) and Shuttle Run (r = .441) tests. Although Flexibility self-concept
was significantly correlated with the Flexibility test (r = .211), it was more highly
Table 1  Factor Analysis of Self-Concept (SC) and Physical Fitness (Fit) Measures: First-Order Factors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor loadings</th>
<th>Unique Covar&lt;sup&gt;a&lt;/sup&gt;</th>
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<tbody>
<tr>
<td>SC Appear1</td>
<td>651 0 0 0 0 0 0 0 0 0 0 0</td>
<td>577</td>
</tr>
<tr>
<td>SC Appear2</td>
<td>850 0 0 0 0 0 0 0 0 0 0 0</td>
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<tr>
<td>SC Appear3</td>
<td>838 0 0 0 0 0 0 0 0 0 0 0</td>
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<td>SC Appear4</td>
<td>814 0 0 0 0 0 0 0 0 0 0 0</td>
<td>337 205</td>
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</tr>
<tr>
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<td>0 805 0 0 0 0 0 0 0 0 0 0</td>
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<tr>
<td>SC Physical4</td>
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<tr>
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<tr>
<td>SC Strong3</td>
<td>0 0 776 0 0 0 0 0 0 0 0 0</td>
<td>398 202</td>
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<tr>
<td>SC Strong4</td>
<td>0 0 922 0 0 0 0 0 0 0 0 0</td>
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<td>SC Flexible2</td>
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<tr>
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<tr>
<td>SC Fit Endure&lt;sup&gt;b&lt;/sup&gt;</td>
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Factor correlations

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<th>Factor loadings</th>
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</tr>
<tr>
<td>SC Physical</td>
<td>455 –</td>
</tr>
<tr>
<td>SC Strong</td>
<td>538 825 –</td>
</tr>
<tr>
<td>SC Balance</td>
<td>529 449 481 –</td>
</tr>
<tr>
<td>SC Flexible</td>
<td>549 786 775 723 –</td>
</tr>
</tbody>
</table>

(Continued)
correlated with the Endurance, Shuttle Run, and Static Strength tests. Balance self-concept was not significantly related to the Balance test \((r = .097)\), although the Balance test was not significantly related to any other measure of fitness or self-concept. The general Physical Ability scale was significantly correlated with all the fitness tests except Balance, but the largest correlation was with Endurance \((r = .594)\). Physical Appearance self-concept was not significantly correlated with any of the fitness tests.

The first hierarchical model (Model A in Figure 2) posited a single hierarchical component of physical self-concept and a single hierarchical component of physical fitness. The very high correlation between the general fitness and general physical self-concept factors \((r = .76)\) offered strong support for the convergent validity of the physical self-concept responses in relation to physical fitness. Model A did not fit the data as well as the first-order factor (RNIs of .911 vs. .883), but it did surprisingly well given its parsimony.

Inspection of the first-order factor suggested that there was a clear relation between the two strength components, in addition to a general agreement based particularly on the endurance components. In Model B (Figure 2), higher order strength factors were posited for both the self-concept and fitness sides of the model. Although this model was able to fit the data better than Model A (RNIs of .892 vs. .883), inspection of LISREL's modification indices (Jöreskog & Sörbom, 1988) suggested the need for a correlation between the residual variances associated with the Balance and Flexibility self-concept factors, as shown in Figure 2. This model provided an acceptable fit to the data \((RNI = .902)\), and the TLI, which took into account model parsimony, was actually better for this model \((.891)\) than for the first-order factor \((.890)\). Although the correlation between the general physical self-concept and physical fitness factors was still substantial \((r = .77)\), the correlation between the two strength factors \((r = .45)\) was also large.
Figure 2 — Three models of relations between multiple dimensions of physical self-concept and multiple components of physical fitness. Except for higher order factor loadings of Balance, all parameter estimates are significant \((p < .05)\). RNI = Relative Noncentrality Index. TLI = Tucker-Lewis Index.  

(Continued on next page)
In an alternative conceptualization of relations between physical self-concept and fitness (Model C), correlations between residual first-order factors on each side of the model were evaluated. Thus, for example, this model tested whether there was residual variance in the physical fitness Strength component (i.e., variance in addition to that explained by the general physical fitness factor) that was related to the residual variance in the Strength self-concept factor. In an initial model, six correlated uniquenesses were posited, but in Model C shown in Figure 2, only those that were statistically significant were retained. After partialling out variance attributable to the general factors, Endurance fitness was significantly related to Endurance and Physical Ability self-concepts, whereas Strength fitness was significantly related to Strength self-concept. Models B and C were very similar in their ability to fit the data and resulted in similar interpretations.

**Discussion and Implications**

The present investigation supports a multidimensional, hierarchical representation of the physical self-concept domain. Exploratory and confirmatory factor analyses clearly identified the six a priori physical self-concept scales. Consistent with a hierarchical representation, the general Physical Ability scale from the SDQII was substantially correlated with all the specific components of physical self-concept. There were also substantial correlations between the self-concept responses and five components of physical fitness indicators. General (second-order) factors reflecting the two constructs were substantially correlated ($r = .76$). Also, self-concepts of Endurance, Strength, and Flexibility were all
significantly correlated with matching components of physical fitness (Table 1). Physical Appearance was not posited to be correlated with any of the physical fitness indicators, so this lack of correlation may be consistent with support for the divergent validity of the self-concept responses (also see Fox & Corbin, 1989). The lack of correlation between the Balance self-concept and fitness may, however, call into question the validity of responses to this component of physical self-concept.

Interpretations of these results should be evaluated in relation to limitations of this study, the most serious being the small, unrepresentative sample of young adolescent girls who apparently were physically unfit. Although the implications of this limitation are unknown, support for the construct validity of the physical self-concept responses would probably be better for a more diverse sample of older children. Relations between self-concept and external criteria typically become stronger with age (Marsh, 1990, 1993a, 1993b), and physical self-concepts may be particularly volatile for 13-year-old girls who are experiencing so many other physiological and psychological changes associated with the onset of puberty.

Also, because the girls in this sample were young and appeared to be physically unfit, they may have had a limited basis for forming self-perceptions in relation to specific components such as balance and flexibility. This apparent lack of physical fitness may also explain why the Endurance components dominated the general factors of physical fitness and physical self-concept. A second general limitation in the present investigation is the small number of physical fitness tests that were considered. The inclusion of multiple indicators of each component of physical fitness would have provided a stronger application of the CFA approach, an evaluation of the construct validity of the components of fitness that were considered for this particular sample, and tests of some alternative explanations of the results proposed here.

It is also relevant to compare the present findings with those from the Fox and Corbin (1989) study. Both studies provided support for a multidimensional, hierarchical physical self-concept construct, and there is an apparent similarity in the scales that were considered. At least superficially, 4 of 6 scales considered here (Endurance, Strength, Physical Appearance, and Physical Ability) match those on the Fox (1990) PSPP instrument (Physical Condition, Physical Strength, Body Attractiveness, and Physical Self-Worth). The PSPP Physical Self-Worth scale, however, may reflect mood-related affect as well as general self-evaluations of physical competence. Consistent with this speculation is the fact that this is apparently the least reliable and least stable of the five PSPP scales (Fox, 1990, p. 9) even though the Shavelson et al. (1976) model suggests that more global constructs should be more stable. Also, the PSPP Physical Condition scale apparently reflects a combination of physical endurance like the Endurance scale considered here and an adherence to physical exercise. The Flexibility and Balance scales considered here have no direct counterparts in the PSPP.

Interestingly, neither study considered a physical health scale that may be an important aspect of physical self-concept. Although Fox and Corbin (1990) reported moderate relations between self-reported physical activity and physical self-concept responses, they did not pursue construct validity studies in which their scales were related to external criteria that were specific to particular scales as in the present investigation. Given the apparent similarity between the instruments, it would be useful to conduct a multitrait-multimethod study based on
both instruments and, perhaps, a range of external criteria that are logically related to the specific scales from each instrument (e.g., the Marsh, Byrne, & Shavelson, 1988, study of the academic self-concept domain).

References


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