

## **The Subjective Exercise Experiences Scale (SEES): Development and Preliminary Validation**

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This paper documents the development and validation of the three-factor Subjective Exercise Experiences Scale (SEES), a measure of global psychological responses to the stimulus properties of exercise. Two of these factors correspond to the positive and negative poles associated with psychological health, Positive Well-Being and Psychological Distress, whereas the third factor represents subjective indicants of Fatigue. The three-factor structure originally established by exploratory factor analysis using young adults was also supported in middle-aged exercising adults using confirmatory factor analytic techniques. Moreover, convergent and discriminant validity for the SEES subscales was demonstrated by examining relations with measures of affect regularly employed in exercise domain. The SEES may represent a useful starting point for more thoroughly examining exercise and subjective responses at the global level, and these dimensions of the scale may represent possible antecedents of specific affective responsivity.

Key words: exercise, measurement, well-being, psychological health

Physical activity and fitness have been identified as priority areas in general health promotion and specific objectives for the nation's health (U.S. Department of Health and Human Services, 1990). Although the concomitant physiological gains attributed to regular exercise are consistently reported in the literature (see Bouchard, Shephard, Stephens, Sutton, & McPherson, 1990), the effects of exercise on psychological health and well-being are less clear. Over 1,000 studies have been published in this area (Hughes, 1984), and several substantive reviews exist that, in general, identify many of the same problems with the extant literature (Folkins & Sime, 1981; North, McCullagh, & Tran, 1990; Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991; Plante & Rodin, 1990). Although many studies extol the almost intuitive psychological benefits of exercise, just as many fail to find any association. In large part this equivocality can be characterized as due

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to any single or combination of the following problems: poorly designed studies, inadequate or no control groups, inadequate length or inappropriate exercise programs, small and often nonrepresentative (e.g., male, clinical) samples, lack of follow-up, inability to control for attrition problems, small subject to variable ratios, poorly conceptualized, and lacking a sound theoretical framework (McAuley, 1994). However, of more relevance to the present paper are two further intimately related issues, the operational definition of psychological health and its measurement.

### Defining and Measuring Psychological Health

Psychological or mental health is generally acknowledged to comprise both negative and positive emotional or affective states, and these states can be dichotomized in terms of psychological distress (e.g., anxiety, depression, stress-related emotions) and psychological well-being (e.g., positive affect) (McAuley, 1994; Stewart & King, 1991). However, a recent review of 81 studies examining the psychological effects of exercise (Leith & Taylor, 1990) revealed few studies to have as their focus outcome variables other than anxiety, depression, personality, mood, or self-concept. Similarly, Hughes (1984) focused his review on study outcomes of mood, personality, and cognition, subsuming under the "mood" category the specific outcomes of depression, anxiety, anger, and irritability. Even the NIMH Consensus Panel (see Morgan & Goldston, 1987) appears to conceive of positive mental health and well-being as largely the absence or reduction of *negative* symptomology.

Indeed, knowledge of the effects of exercise and physical activity on psychological well-being might be argued to have progressed no further than it had over a decade ago, when Folkins and Sime (1981) suggested that the extant evidence examining the hypothesis that psychological well-being is associated with exercise/fitness had largely been based on studies examining stress-related emotion, primarily anxiety. One exception to this focus on negative symptomology, however, has been the work of Thayer (1987), whose assessments of exercise effects on mood have encompassed measures of energy and tension. Clearly, for a more accurate understanding of the exercise-psychological well-being relationship, a multidimensional approach to the measurement of exercise-induced experiences must be taken.

A number of measures have been employed in the extant exercise literature that have attempted to assess such responses to exercise, but few have been developed with an intent to assess psychological responses that are a direct response to the exercise stimulus. For example, the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971) has been widely used in the exercise literature to determine distinctive mood changes along several dimensions as well as total mood disturbance. The utility of this measure for assessing exercise effects is limited for two reasons. First, the POMS is heavily skewed toward measuring negative states. Second, the construct validity of this measure in diverse samples of exercising or physically active adults beyond college age is limited, and the relevance of many of the items to the exercise setting is questionable.

The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) comprises two 10-item mood scales that appear to adequately

reflect the basic two-factor model of affective structure, negative and positive affect. Although Watson and colleagues (Clark & Watson, 1988; Watson, 1988; Watson et al., 1988) report adequate psychometric properties for the PANAS and have reported data to support the relationship between self-reported physical activity and the PANAS, recent reports have cast suspicion on the conceptual basis of this measure (see Green, Goldman, & Salovey, 1993). Moreover, from an exercise perspective, the PANAS employs items of questionable relevance to the stimulus properties of exercise.

More recently, Rejeski and his colleagues provided support for the efficacy of the Feeling Scale (FS; Rejeski, Best, Griffith, & Kenney, 1987). The FS is an 11-point single-item scale designed to assess the pleasure/displeasure core of emotions (Frijda, 1988). Initial validation of the FS to tap in-task affect has been presented by Rejeski and his colleagues (Hardy & Rejeski, 1989; Rejeski et al., 1987). It is argued, however, that reliance on a single-item affect scale is too simplistic and that the presumption of affect as bipolar and therefore unidimensional (i.e., positive and negative affect are at opposite ends of the same continuum) is troublesome from both conceptual and theoretical perspectives (Watson et al., 1988).

From a conceptual perspective, we concur with the broader social psychological literature that suggests emotional or affective responses vary along two (positive and negative) and possibly more dimensions (e.g., Diener, Larsen, Levine, & Emmons, 1985; Russell, 1980; Watson et al., 1988). We further recognize that the stimulus properties of the exercise environment may give rise to subjective interpretations of physical symptoms during and following exercise. Individuals' perceptions of somatic states (fatigue, pain) can also be perceived as subjective feeling states—the reader is directed to Clore, Ortony, and Foss (1987) for a general discussion of this point and to Gauvin and Brawley (1993) for a discussion specific to exercise. Although such responses can be classified as affective responses, they may also be representative of perceived physiological activation (i.e., nonmental states) and thereby may be discarded as affects (see Clore et al., 1987).

Nevertheless, physiological cues are elemental to exercise participation and must result in some psychological responses that represent the individuals' feelings resulting from those cues. Indeed, there is some historical precedent for expecting such responses to occur in terms of the antecedents of perceived physical exertion (see Kinsman & Weiser, 1976). Thus, the likelihood that the exercise stimulus produces *subjective experiences* that vary along a dimension other than positive and negative dimensions appears a possibility. A final pragmatic concern that has driven the development of such a measure is the need for a relatively short but sufficiently sensitive instrument that (a) can be employed during activity if necessary, (b) is capable of being used in multiple administrations, and (c) is able to assess subjective experiences that are unique to the exercise domain. Consequently, the purpose of this paper is to present evidence for the development and initial validation of a brief measure of psychological responsiveness to exercise.

## Study 1

Study 1 served two purposes. The first was to determine which items from a comprehensive pool reflected subjective responses that were content (face)

valid for use in the exercise domain. The second was to further refine this reduced pool of items to some conceptually meaningful structure.

### *Method*

An initial pool of 367 items representing subjective responses and feeling states was developed. These items were taken from a wide variety of affective measures typically employed in the literature, including the POMS (McNair, et al., 1971), the PANAS (Watson et al., 1988), the Multiple Affective Adjective Check List (MAACL; Zuckerman & Lubin, 1965), and the Affect Dictionary (Whissell, Fournier, Pelland, & Weir, 1986).

These items were compiled in list form and mailed to 7 expert judges, all doctoral level researchers in the area of psychosocial responses to exercise and physical activity. The judges were asked to indicate the suitability of each item as a subjective experience likely to be influenced, either positively or negatively, by exercise participation. For an item to be retained for the next stage of scale development, the item had to be identified by at least 6 of the 7 judges (86% agreement) as influenced by exercise. From the original 367-item pool, the judges agreed on 46 subjective responses as influenced by participation in exercise or physical activity.

These 46 items were administered to 454 (189 males; 265 females) undergraduate students (age  $M = 20.78$  years,  $SD = 2.18$ ) enrolled in 13 physical activity classes at a large comprehensive university. Subjects were asked to indicate to what extent exercise participation influenced, either positively or negatively, each of the 46 subjective states. Subjects were cautioned not to focus on the exercise situation (e.g., the location or instructor) in making their judgments but on the exercise bout itself. Subjects then indicated on an 11-point scale the degree to which exercise increased, decreased, or did not influence each affective state. The scale ranged from  $-5$  (*large decrease*), through 0 (*no change*), to  $+5$  (*large increase*). A total of 412 complete and usable responses were available for subsequent analysis.

### *Results and Discussion*

To reduce the items to a meaningful and manageable structure, a principal axis factor analysis with varimax rotation was conducted. Criteria for retention of an item on a factor was set at .50 with no cross-loadings greater than .35. From this analysis emerged a three-factor structure. The first factor incorporated 15 items, all reflecting Positive Well-Being (PWB) aspects of exercise participation, and the second and third factors comprised 4 items each, representing the Psychological Distress (PD) and Fatigue aspects of the exercise experience.

Because we were interested in developing a relatively brief measure of subjective responsiveness to exercise, we attempted to reduce the rather large number of items that made up the PWB factor while retaining the integrity of the construct. In so doing, we elected to retain the 4 items that had the strongest loadings on this factor to create a balanced scale. We then correlated the factor score of these items with that of the remaining 11 items from the PWB factor to determine the extent to which the 4 chosen items reflected the original items resulting from

**Table 1** The Subjective Exercise Experiences Scale (SEES): Factor Loadings Generated Via Exploratory Factor Analysis

Item	Dimension loadings		
	Positive well-being	Psychological distress	Fatigue
Positive well-being			
Strong	.78	-.16	-.02
Great	.83	-.26	-.06
Positive	.69	-.30	-.03
Terrific	.77	-.21	-.08
Psychological distress			
Crummy	-.23	.85	.21
Awful	-.23	.72	.21
Miserable	-.32	.66	.20
Discouraged	-.23	.55	.15
Fatigue			
Exhausted	-.05	.16	.87
Fatigued	-.06	.15	.83
Tired	-.01	.13	.78
Drained	-.09	.24	.67

the factor analysis. This correlation was .91 suggesting that the 4 final items adequately reflect PWB. The 12 items comprising the Subjective Exercise Experiences Scale (SEES) and their factor loadings are shown in Table 1. The PWB dimension accounted for 19.6% of the variation, and the PD and Fatigue dimensions accounted for 7 and 39% of the variation, respectively.

Internal consistency was determined by calculating coefficient alpha. All three scales were highly reliable: PWB  $\alpha = .86$ , PD  $\alpha = .85$ , and Fatigue  $\alpha = .88$ . The correlations among the dimensions suggest that the dimensions of the SEES are also somewhat related. PWB correlated moderately with PD ( $r = -.52$ ) and weakly with Fatigue ( $r = -.13$ ), and these latter two dimensions were also moderately correlated ( $r = .38$ ).

At this stage of the scale's development, it appears that a relatively brief (12 items), three-factor scale representing subjective responsiveness to exercise participation has emerged. The PWB and PD dimensions represent the positive and negative poles of overall psychological health (McAuley, 1994; Stewart & King, 1991) and appear to be present in the exercise setting as well. Such a finding is in itself important, because positive psychological responses are typically overlooked as outcomes of physical activity participation, with much of the empirical attention focused upon exercise's ability to reduce anxiety, depression, and other stress-related emotions (see Hughes, 1984; North et al., 1990; Petruzello et al., 1991, for reviews). Finally, the data suggest the existence of a feeling state that encompasses feelings of physical exhaustion and fatigue. In sum, these

three dimensions of subjective exercise experience provide some initial support for the multidimensional measurement of psychological responsiveness to the stimulus properties of exercise.

## Study 2

In the initial study we reported a three-factor affective structure for the SEES derived from a large sample of college undergraduates engaged in physical activity classes. Because such a sample is relatively homogeneous, it is necessary to determine the degree to which the hypothesized factor structure is generalizable to other samples. Therefore, the second study was undertaken to demonstrate construct (factorial) validity and reliability of the SEES by confirmation of the three-factor structure representing exercise-induced affect in a sample of older exercising males and females. Secondly, as exercise is proposed to positively influence psychological states, we examined the degree to which an acute bout of relatively intense exercise influenced the dimensions of the SEES, thus examining further its construct validity.

### Method

Subjects were 100 middle-aged ( $M = 54.34$  years) males ( $n = 49$ ) and females ( $n = 51$ ) participating in a submaximal cycle ergometer graded exercise test (GXT) as part of a postexercise program physiological evaluation. When subjects reported to the laboratory for their evaluation, they completed the SEES, indicating the degree to which they were experiencing each of the items at that point in time. Assessments of weight, height, body composition, girth, flexibility, and muscular endurance were then completed. Immediately following completion of the GXT, they completed the SEES once again. The SEES (see Appendix) was scored on a 7-point Likert scale with verbal anchors of *not at all* (1) and *very much so* (7) and a midpoint anchor of *moderately so* (4). Dimension scores were arrived at by summing the items comprising each subscale. These procedures took approximately one hour.

### Results and Discussion

*Confirmatory Factor Analyses.* To examine the stability of the hypothesized factor structure of the SEES in this sample, a confirmatory factor analysis of the pre- and postexercise data were conducted employing the LISREL 7 (Jöreskog & Sörbom, 1989) computer program. This method was used to verify a hypothesized factor structure composed of 12 observed variables (items) loading on three latent constructs (dimensions). All of the loadings of the items on their hypothesized dimensions were statistically significant, as denoted by  $t$  values greater than 1.96.

The goodness-of-fit indices calculated for pre- and post-GXT data, respectively, were as follows: pre-GXT  $\chi^2(51) = 73.69$ ,  $p < .05$ ; post-GXT,  $\chi^2(51) = 81.06$ ,  $p < .005$ ; goodness-of-fit index = .89, .88; and the root mean square residual = .05, .06. Because the chi-square is extremely sensitive to sample size, we also calculated the  $\chi^2/df$  ratio. It is generally accepted in the literature that a  $\chi^2/df$  ratio of  $>2.0$  is indicative of a poor fit, although acceptable ratios of  $<5.0$

have been proposed (e.g., Wheaton, Muthén, Alwin, & Summers, 1977). The  $\chi^2/df$  ratio for the hypothesized three-factor model in the present data were 1.44 and 1.58, suggesting a tenable fit.

Finally, the proposed factor structure was compared to a null or completely independent model, and a normed fit index, coefficient delta (Bentler & Bonett, 1980), was subsequently calculated. This index can range from 0 to 1.0 and relative-to-the-present model is attained by comparing the restricted three-factor model to a 12-factor null model in which each item is considered to represent one orthogonal factor. Coefficient delta for this sample was .87 for the pre-GXT data and .86 for the post-GXT data. In all, these indices of fit suggest that the present data fit the model reasonably well. The standardized maximal likelihood factor loadings of the items on their proposed dimensions and the  $t$  values associated with these loadings are depicted in Table 2.

*Effects of Acute Exercise on Affective Change.* The exercise bout produced a significant reduction ( $p < .0001$ ) in PD from pre-GXT ( $M = 6.33$ ,  $SD = 3.44$ ) to post-GXT ( $M = 4.97$ ,  $SD = 1.71$ ). PWB was significantly enhanced from pre-GXT ( $M = 20.97$ ,  $SD = 4.65$ ) to post-GXT ( $M = 22.26$ ,  $SD = 4.32$ ,  $p < .005$ ) participation, and Fatigue was also increased significantly (pre-GXT  $M = 9.68$ ,  $SD = 5.36$ ; post-GXT  $M = 11.13$ ,  $SD = 4.85$ ;  $p < .05$ ). Once again, these data suggest that acute exercise significantly impacts on psychological responses in terms of reducing Psychological Distress and enhancing Positive Well-Being. Interestingly, the impact of exercise on negative states appears to be greater (22% decrease) than for positive states (6% increase). This is perhaps a reflection of relatively high levels of PWB present in the sample to begin with. Although an increase in Fatigue was demonstrated, it should be remembered that subjects

**Table 2 Standardized Maximum Likelihood Factor Loadings and  $t$  Values for Postexercise Confirmatory Factor Analysis of the SEES**

Item	Loading	$t$ value
Positive well-being		
Strong	.79	8.98
Great	.76	8.59
Positive	.87	10.40
Terrific	.85	10.04
Psychological distress		
Crummy	.57	5.27
Awful	.62	5.76
Miserable	.55	5.06
Discouraged	.35	3.07
Fatigue		
Exhausted	.70	7.66
Fatigued	.90	10.83
Tired	.90	9.18
Drained	.74	8.22

were older adults completing a relatively strenuous (although not maximally taxing) physical test. Thus, results again suggest that one can feel physically fatigued and at the same time feel very positive about the experience. Clearly, the degree to which the Fatigue dimension is influenced will depend on a number of factors, including physical fitness and conditioning levels, stage of exercise participation, and exercise environment (e.g., clinical, rehabilitative setting vs. active, free-living setting).

### Study 3

The third data set focused on demonstrating the criterion-related validity of SEES. To achieve this end, we examined the convergent and discriminant validity of the SEES subscales by correlating them with three measures typically employed in the literature to determine affective change as a function of physical activity: the PANAS (Watson et al., 1988), the State Anxiety Inventory (SAI; Spielberger, Gorsuch, & Lushene, 1970); and the FS (Hardy & Rejeski, 1989; Rejeski et al., 1987). As noted, all of these measures have been employed in the literature to examine the influence of exercise stimuli on psychological responsiveness. Thus, we would expect to see convergent validity in terms of positive correlations between measures of similar constructs (e.g., measures of positive subjective experiences) and inverse relationships between measures of opposing constructs (e.g., positive and negative states and anxiety). Finally, we hypothesized that Fatigue would be *unrelated* to those affective measures typically employed in this literature and would therefore demonstrate discriminant validity for the SEES.

#### Method

Fifty-one middle-aged ( $M = 55$  years) males ( $n = 27$ ) and females ( $n = 24$ ) enrolled in a structured exercise program for previously sedentary older adults participated as subjects in this study. At the time of data collection subjects were participating in a one-mile timed walk on an indoor synthetic track as part of an on-going monthly evaluation of physical conditioning progress. Immediately prior to and following the exercise bout, subjects completed the measures listed above, indicating how they were feeling at each particular point in time (i.e., right now). The PANAS was scored, as recommended by Watson et al. (1988), on a 5-point scale ranging from *very slightly or not at all* (1) to *extremely* (5). The FS was scored on an 11-point scale that ranged from 5 (*very good feeling*) through 0 (*neutral feeling*), to -5 (*very bad feeling*). The SEES was scored on a 7-point Likert scale with verbal anchors of *not at all* (1) and *very much so* (7) and a midpoint anchor of *moderately so* (4). The version of the SAI employed was the shortened 8-item scale scored on a 4-point scale ranging from 1 (*not at all*) to 4 (*very much so*). The items on each scale were preceded by the stem "I feel . . ." followed by the specific affective item.

#### Results and Discussion

Descriptive statistics for each measure assessed prior to and following the exercise bout and the significance of any demonstrated change are shown in Table 3. As can be seen, these changes over time generally reflect increases in



**Table 3** Descriptive Data, and Degree of Change Over Time for the Feeling Scale, PANAS, SEES, State Anxiety Inventory

Affect measure	Pretest		Posttest		Change	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Feeling scale	7.29	1.91	7.84	1.64	.55	1.08*
PANAS						
Positive affect	32.57	8.72	35.00	9.27	2.43	5.65*
Negative affect	11.90	3.94	11.08	2.77	-.82	3.12*
SEES						
Positive well-being	19.55	4.73	20.37	5.24	1.23	2.56*
Psychological distress	6.63	2.45	5.39	3.35	-.96	2.37*
Fatigue	8.80	5.09	9.98	5.02	1.18	4.48*
State anxiety inventory	11.43	3.38	10.59	2.59	-.84	2.31*

\* $p < .05$ , one-tailed test.

positive responses and fatigue and decreases in negative responses and anxiety. Although all of these changes over time are relatively modest in magnitude, they are all statistically significant. Once again, we note the greatest influence on psychological responses to be evidenced in the PD dimension of the SEES. In general, the increases in positive psychological responses, although all statistically significant, were relatively small (<10% increase). As can be seen, levels of PWB were quite high to begin with, a state that may have been a function of the exercise context. That is, subjects had been exercising for approximately 10 weeks in a structured program, and elevated preexercise states may be reflective of anticipatory affect. Further examination of such a phenomenon is warranted.

With respect to the reliability of the various measures, it appears that all affective measures are internally consistent. Indeed, all three subscales of the SEES demonstrate impressive reliability (.84 to .92). Correlational analyses between the various measures taken postexercise were then conducted to determine the degree to which such measures were or were not associated, thereby providing an index of both convergent and discriminant validity for the SEES. These relationships are shown in Table 4. With respect to convergent validity, the PWB dimension of the SEES correlated positively with the measures of positive affect, specifically the PANAS and the FS (if subjects generally perceive the experience as positive on this latter scale). Similarly, the PD scale of the SEES correlated positively with indicators of negative states, specifically the negative affect scale of the PANAS and state anxiety. These relationships are moderately strong ( $r = .6$  to  $.7$ ), suggesting that the positive and negative dimensions of the SEES are relatively good representations of more general affective states, as measured by the PANAS and the FS. Moreover, such correlations may suggest that the PANAS, in particular, may well be less representative of more specific affective responsivity than it is of overall positive and negative psychological evaluation.

In an attempt to demonstrate the discriminant validity of the SEES, it is necessary to examine the correlations between the Fatigue subscale and the other measures of subjective psychological responsivity. As one can observe,

**Table 4** Correlations Between the SEES Subscales and the PANAS, Feeling Scale, and State Anxiety Measures

	Positive well-being	Psychological distress	Fatigue
Feeling scale	.69**	-.64**	-.28
PANAS			
Positive affect	.71**	-.47*	-.03
Negative affect	-.41**	.61**	-.06
State anxiety inventory	-.62**	.62**	.32

\* $p < .05$  after Bonferroni correction. \*\* $p < .01$  after Bonferroni correction.

the correlations between the Fatigue dimension and the PANAS subscales, the FS, and the SAI are all nonsignificant after Bonferroni adjustment. Thus, it appears that this dimension of subjective responsivity to exercise is orthogonal to those psychological responses typically measured in the exercise literature. The overall set of relations between the SEES subscales and those of the PANAS, SAI, and FS subscales offer some encouraging preliminary evidence to support the criterion-related validity of this measure of exercise-induced psychological responses.

## General Discussion

We have presented data to support the development and preliminary validation of a three-factor measure of subjective responses to exercise participation. The Subjective Exercise Experience Scale (SEES) is a brief, 12-item scale assessing Positive Well-Being (PWB), Psychological Distress (PD), and Fatigue; possesses favorable psychometric properties; and is easily administered. Our data show support for the conceptual perspective that psychological responses to exercise assume a multidimensional structure anchored by positive and negative poles, as evidenced by PWB and PD. Therefore, as demonstrated here, it should be expected that the PWB and PD dimensions would be inversely and moderately correlated. We are, after all, attempting to measure subjective responses to a particular stimulus (exercise) about which there certainly can be both positive and negative feelings. Developing such measures to assess responses to a particular domain is likely to produce related factors. Moreover, as noted by Ewart (1989), the degree to which exercise and physical activity influence negative and positive psychological responses may well be differentially impacted by the *type* of activity in which one is engaged. As we have conducted our preliminary work in the context of aerobic exercise, it will be necessary to test such a hypothesis in nonaerobic settings. The third dimension emerging from our initial factor analysis, Fatigue, was strongly supported in confirmatory factor analyses of data from a further sample. This dimension may prove particularly useful in measuring subjective responses

at various dose responses, in exercise-rehabilitative settings, and quite possibly as a component of exercise prescription.

From a validity perspective, the present data provide support for the factorial, convergent, and discriminant validity of the SEES. As noted, confirmatory factor analysis provided adequate construct (factorial) validity to suggest the stability of the hypothesized three-factor structure that emerged from the exploratory factor analysis was tenable. From the perspective of convergent and discriminant validity, the SEES also holds up quite well. The PWB and PD scales of the SEES correlated moderately with their appropriate counterparts on commonly employed measures of affect and anxiety generated as a function of exercise. As noted earlier, the correlations between the PWB and PD and the Positive and Negative Affect scales of the PANAS, respectively, were moderately strong. Although such correlations are indicative of substantial shared variance, they are also suggestive that the PANAS may not be assessing affect so much as more general subjective responses. Moreover, Watson et al. (1988) proposed that the dimensions of the PANAS are orthogonal. However, the present data indicate that these two dimensions are indeed related ( $r = .40, p < .05$ , after Bonferroni adjustment). Such a relationship is consistent with the position taken by Green et al. (1993) with respect to the question of the independence of positive and negative affect. That the Fatigue subscale was unrelated to any of the other measures of subjective responsivity to exercise speaks to the discriminant validity of this scale. This is further corroborated by low to moderate correlations with the PWB ( $r = .15, p = \text{n.s.}$ ) and PD ( $r = .52, p < .05$ ).

The impetus behind the development of the SEES stems from our perspective that little effort has been devoted to research on and measurement of the stimulus properties of exercise (notable exceptions include the work of Kinsman & Weiser, 1976; Hardy & Rejeski, 1989). As such, the SEES represents a starting point perhaps for the examination of the hierarchy of psychological responses to exercise participation. It has been argued elsewhere (McAuley, 1994; Stewart & King, 1991) that psychological health has both positive and negative poles representing psychological well-being and psychological distress. At this more global level, we believe the SEES may tap such poles of subjective responses to exercise. In addition, the emergence of a Fatigue dimension poses some interesting questions with respect to whether this is a negative or positive dimension. In all probability this will depend on a number of preexisting individual conditions such as fitness level and exercise history. Certainly, if one is in good physical condition and engages in a bout of intense exercise, it is possible to perceive fatigue as a "good" rather than a "bad" feeling.

Although the SEES is not strictly proposed as a measure of emotion, it certainly appears to be a measure of responsivity from which particularized emotional states may emanate. Gauvin and Rejeski (1993) have recently developed a measure of exercise-induced feeling states that proposes to assess such dimensions as positive engagement, revitalization, and tranquility. Such responses to the exercise stimulus may well represent further underlying structural aspects of the more general psychological responses assessed by the SEES. We would echo the general sentiments of Gauvin and Rejeski (1993) in that we consider our efforts in developing this measure to be exploratory attempts to come to grips with a particularly vexing problem: the assessment of subjective responses that are driven by the stimulus properties of the exercise environment. Further

exploration of the psychometric structure of the SEES is called for, as is research that examines the relationships between the dimensions of the SEES and other elements of psychological responses to exercise.

Future research endeavors must now be employed to demonstrate continued construct validity for the SEES and to examine its utility in diverse settings and across populations. As remarked earlier, the brevity and ease of administration associated with the SEES should allow researchers to employ this measure during exercise bouts and over repeated administrations, allowing the researchers to better capture the evolution of subjective responses during activity. How different levels of exercise intensity, both objective and subjective, influence such responses is an intriguing dose-response issue that relatively brief measures like the SEES allow one to better explore. Finally, longitudinal assessments of exercise-induced feeling states in concert with measures of other psychological outcomes associated with exercise participation may allow us to better unravel those changes that occur in psychological well-being as a function of exercise and physical activity participation.

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## Appendix

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### *Instructions for Administering the Subjective Exercise Experiences Scale*

By circling a number on the scale below each of the following items, please indicate the degree to which you are experiencing each feeling *now*, at this point in time, *after exercising*.

I FEEL:

- |                |   |   |            |   |   |              |
|----------------|---|---|------------|---|---|--------------|
| 1. Great       |   |   |            |   |   |              |
| 1              | 2 | 3 | 4          | 5 | 6 | 7            |
| Not at all     |   |   | Moderately |   |   | Very much so |
| 2. Awful       |   |   |            |   |   |              |
| 1              | 2 | 3 | 4          | 5 | 6 | 7            |
| Not at all     |   |   | Moderately |   |   | Very much so |
| 3. Drained     |   |   |            |   |   |              |
| 1              | 2 | 3 | 4          | 5 | 6 | 7            |
| Not at all     |   |   | Moderately |   |   | Very much so |
| 4. Positive    |   |   |            |   |   |              |
| 1              | 2 | 3 | 4          | 5 | 6 | 7            |
| Not at all     |   |   | Moderately |   |   | Very much so |
| 5. Crummy      |   |   |            |   |   |              |
| 1              | 2 | 3 | 4          | 5 | 6 | 7            |
| Not at all     |   |   | Moderately |   |   | Very much so |
| 6. Exhausted   |   |   |            |   |   |              |
| 1              | 2 | 3 | 4          | 5 | 6 | 7            |
| Not at all     |   |   | Moderately |   |   | Very much so |
| 7. Strong      |   |   |            |   |   |              |
| 1              | 2 | 3 | 4          | 5 | 6 | 7            |
| Not at all     |   |   | Moderately |   |   | Very much so |
| 8. Discouraged |   |   |            |   |   |              |
| 1              | 2 | 3 | 4          | 5 | 6 | 7            |
| Not at all     |   |   | Moderately |   |   | Very much so |
| 9. Fatigued    |   |   |            |   |   |              |
| 1              | 2 | 3 | 4          | 5 | 6 | 7            |
| Not at all     |   |   | Moderately |   |   | Very much so |
| 10. Terrific   |   |   |            |   |   |              |
| 1              | 2 | 3 | 4          | 5 | 6 | 7            |
| Not at all     |   |   | Moderately |   |   | Very much so |

11. Miserable

1	2	3	4	5	6	7
Not at all			Moderately			Very much so

12. Tired

1	2	3	4	5	6	7
Not at all			Moderately			Very much so

*Note:* Items are summed to create a summary score for Positive Well-Being (Items 1, 4, 7, 10), Psychological Distress (Items 2, 5, 8, 11), and Fatigue (Items 3, 6, 9, 12).

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