Locus of Control, Attitudes Toward Physical Activity, and Exercise Adherence

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The purpose of this investigation was to examine the relationship between exercise adherence and the combined effects of locus of control and attitudes toward physical activity. The primary instruments used were the Internal, Powerful Others, and Chance Scales (Levenson, 1974); the Exercise Objectives Locus of Control Scales (developed by the first author); and the Revised Children's Attitudes Toward Physical Activity Inventory (Schutz, Smoll, & Wood, 1981a). The subjects were 61 females, ages 15-57 ($M = 28$), voluntarily participating in 8- to 12-week aerobic fitness programs. Findings indicated only a weak relationship between adherence and the combination of locus of control and attitudes. Results of stepwise regression analysis revealed that two attitude measures were the best predictors of exercise adherence. In general, those subjects who at the outset of the programs had a less positive attitude toward participating in physical activity for continuing social relations and a more positive attitude toward participating in order to reduce stress and tension tended to have a higher percent attendance.

Concern over high rates of attrition in adult exercise programs has given rise to numerous adherence studies, many of which have attempted to identify characteristics associated with dropout behavior. Although this approach has produced some interesting results, simply identifying dropout characteristics does not provide an explanation for them. As in other areas of sport psychology research (Landers, 1983), there appears to be a need for theory-guided adherence investigations. The use of conceptually relevant social psychological theories in the study of exercise adherence may yield a more complete understanding of the behavior, which in turn could serve as the basis for more effective interventions to facilitate adherence.

One theoretical construct of potential relevance to the study of exercise adherence is locus of control. This concept was originally conceived (Rotter, 1966) as a person's generalized expectancy to perceive reinforcements as being either dependent upon one's own behavior (internal control) or contingent upon forces beyond one's control (external control). The locus of control construct developed out of social learning theory (Rotter, 1964; Rotter, Chance, & Phares, 1972), which postulates that the potential for a behavior...
to occur is a function of both the expectancy that the behavior will lead to a reinforcement and the value of that reinforcement. Consistent with this concept, exercise adherence should be greatest among those who value highly one or more exercise reinforcements (e.g., release of tension) and have an internal locus of control (i.e., a high expectancy that their behavior will result in the reinforcements).

There have been attempts (Dishman, Ickes, & Morgan, 1980; O'Connell & Price, 1982) to examine the relationship between exercise program adherence and locus of control. Results of these investigations have demonstrated little or no relationship between these two factors. However, there are two possible reasons for this: failure to take the value of exercise reinforcement into account and use of health-specific locus of control measures. Addressing problems related to locus of control research, Rotter (1975) suggested that in keeping with social learning theory one must include a measure of reinforcement value along with locus of control when attempting to predict behavior.

Initial support for the efficacy of this contention was obtained in an exercise adherence study (Dishman & Gettrnan, 1980) which used the Health Locus of Control (HLC) Scale (Wallston, Wallston, Kaplan, & Maides, 1976) along with a measure of health and fitness value (Kenyon, 1968a). Results showed no significant difference between adherers and dropouts based solely on HLC scores. However, when median splits of the HLC scores were combined with median splits of health and fitness value scores, it was found that subjects with an internal locus of control and high health and fitness value scores were significantly more likely to adhere than subjects with an external locus of control and low health and fitness value scores.

Use of a health-specific locus of control scale in the previously mentioned study was based on the assumption that health is the primary reinforcement of exercise. Although this may be true, there is some evidence that physical activity has multiple reinforcements (e.g., Kenyon, 1968a). Some individuals might perceive that other exercise reinforcements are at least as important as health. As a result it may be possible to achieve a stronger relationship between locus of control and adherence, using a locus of control instrument which takes into account the multiple reinforcements associated with exercise.

When predictability is of prime importance, specific measures of expectancy may be more beneficial than generalized measures (Phares, 1976; Rotter, 1975; Saltzer, 1982). Since better predictability of exercise behavior may provide important clinical advantages for improving adherence, an exercise-specific locus of control measure could be very useful. There is little evidence about the use of exercise-specific locus of control measures in connection with exercise adherence. However, one such inventory, the Exercise Locus of Control Scale, was developed (Noland, 1981) and used to examine the exercise behavior of women ($N = 215$) in two age groups (25-45 yrs, 46-65 yrs). The older group demonstrated a significant positive relationship between internality and exercise behavior, and a negative relationship between exercise behavior and the chance and powerful others scales.

While the title of this exercise-specific inventory and the findings of Noland's study suggest that the Exercise Locus of Control Scale may be appropriate for examining locus of control in an exercise adherence study, closer inspection of the instrument reveals that the scales are aimed at individuals' perceptions of what controls their exercise behavior rather than their perceptions of what controls their reinforcements. In other words, the Exercise Locus of Control Scale does not conform to the basic assumption that locus of control is a reinforcement expectancy variable. Consequently it was deemed necessary to develop and test a more theoretically sound exercise-specific inventory.
A generalized measure allows prediction in a wide range of situations. Although no mention has been made of generalized locus of control measures in studies of exercise program adherence, results of related studies demonstrate the potential usefulness of such measures. Significant positive relationships have been found between internal locus of control and adherence to women’s intercollegiate sports (Moore, 1980), and to participation in physical activity (Bonds, 1980; Sonstroem & Walker, 1973).

The main objective of this study was to examine the relationship between exercise program adherence and the combined effects of values held toward physical activity and locus of control using a generalized measure—the Internal, Powerful Others, and Chance (IPC) scales (Levenson, 1974, 1981)—and a specific exercise reinforcement locus of control measure—the Exercise Objectives Locus of Control (EOLOC) scales, developed by the first author. It was hypothesized that when locus of control was measured by the internal scales of the IPC and EOLOC inventories, adherence would be positively related to the combined effects of locus of control and values held toward physical activity. In addition, it was expected that adherence would be negatively related to the combined effects of locus of control and values held toward physical activity when locus of control was measured by the powerful others and chance scales of the IPC and EOLOC inventories.

Supplementary objectives of the study included testing the psychometric properties and potential efficacy of the newly developed EOLOC scales and assessing a variety of factors found to be related to adherence in other studies (e.g., social support, goal attainment, previous behavior). The exercise behavior of participants subsequent to their quitting or completing the program was also examined.

Method

Subjects and Setting

The subjects were 61 females, ages 15 to 57 ($M = 28$), who had chosen to participate in 8- to 12-week fitness programs offered at various schools and community centers throughout the Greater Vancouver and Fraser Valley areas. These coeducational programs were sponsored by a local fitness organization that maintains uniformity of instruction, content, and level of difficulty across programs. Participants who reported that they had not exercised regularly (2 to 3 times a week) over the previous year were requested by the fitness instructors to participate in this study. Volunteers were taken from 14 programs which met 2 or 3 times a week for 1 hour. Registered participants ($n = 48$) paid a fee of $1.50 per class while drop-in ($n = 13$) participants paid $2 per class. The programs were designed to increase cardiovascular endurance, flexibility, strength, body awareness, and movement control.

Measures

Generalized locus of control was measured using Levenson’s IPC scales (1974, 1981) which comprise three 8-item subscales presented as a unified scale of 24 items. Subjects rated each item on a 6-point Likert scale with a checkmark under the heading they felt was most appropriate. These responses were scored from 1 (strongly disagree) to 6 (strongly agree), and a total score was computed for each subscale. This method of rating differs from Levenson’s format in which subjects are asked to respond to each statement by circling a number ranging from −3 to +3. Scoring was altered because of concern that subjects would be less inclined to disagree with statements if they attached a
negative connotation to negative numbers. Internal consistency estimates of the IPC scales have been moderate, ranging from .51 to .67 for the internal scale, .72 to .82 for the powerful others scale, and .73 to .79 for the chance scale (Levenson, 1981).

Exercise-specific locus of control was measured using the EOLOC scales developed by the first author (see Appendices A and B for scale development and items). The EOLOC scales consist of three 6-item subscales presented as a unified scale. Each item was rated on a 5-point Likert scale, ranging from strongly agree (5) to strongly disagree (1). A score ranging from 6 to 30 was obtained for each subscale.

Values held toward physical activity were measured using the Revised CATPA inventory (Schutz, Smoll, Carre, & Mosher, in press). Subjects were required to rate seven subdomains of physical activity on a 5-point semantic differential scale which used five bipolar adjectives. A score ranging from 5 to 25 was obtained for each subscale with the exception of health and fitness, which had two scores—one for the first two word pairs and one for the last three word pairs. Internal consistency estimates of the Revised CATPA inventory have been reported as being relatively high, with Cronbach’s alphas ranging from .77 to .94 (Schutz, Smoll, & Wood, 1981a). Kenyon’s (1968b) Attitude Toward Physical Activity Scale (ATPA), from which CATPA was derived, was not used in this study for two reasons. First, the simplified wording in the Revised CATPA makes the statements clearer and reduces the possibility of ambiguous or inconsistent interpretation, and second, it was considered more time efficient and psychometrically superior to ATPA (Schutz et al., 1981a) while yielding equivalent results (Schutz & Smoll, 1977).

Social desirability was measured using the M-C 1(10) scale (Strahan & Gerbashi, 1972), a 10-item version of the 33-item Marlow-Crowne Social Desirability Scale (Crowne & Marlow, 1960). This measure was used to determine whether the EOLOC scales were contaminated by social desirability.

Adherence data were determined from class attendance sheets maintained by the program instructors. All attendance records were forwarded to the head office where they were made available to the researcher.

Procedure

Before the fitness programs began, instructors were given packages containing the first questionnaire, a cover letter, pencil, and prestamped envelope bearing the address of the investigator. The instructors were asked to distribute these packages to registered participants who had not previously enrolled in the program or had not followed a regular regimen of physical activity over the last year. Neither the instructors nor the subjects were informed that adherence was the focus of the study.

The cover letter accompanying each questionnaire briefly described the study, requested informed consent, and contained general instructions on how to complete the questionnaire. Subjects were asked not to collaborate with others when completing the questionnaire, and were assured that all data would be kept confidential. A summary report of the study results was to be the reward for participation.

The first questionnaire consisted of six sections, the first pertaining to demographic and behavioral factors such as age, sex, smoking habits, leisure and work activity, employment status, spouse and family support, and previous exercise behavior. This was followed by the IPC scales, Revised CATPA inventory, and the M-C 1(10) scale. Subjects were then asked to list the goals they most wanted to achieve (up to three), and to rate on a 5-point Likert scale their expectancy of successfully obtaining each of them. The EOLOC scales made up the final section of this 13-page questionnaire.
Approximately 120 questionnaires were distributed. In order to obtain more candid responses, subjects were not to put their names on the questionnaires. However, since names were needed in order to trace daily attendance, instructors were asked to record each subject’s name, telephone number, and questionnaire number.

A few weeks after the fitness programs ended, the researcher telephoned 63 of the 66 subjects for whom names were available (no phone numbers were given for the other 3) and asked if they would complete a follow-up questionnaire. All but one agreed, and subsequently each received a second questionnaire in the mail.

The follow-up questionnaire comprised three parts. The EOLOC was included in order to obtain a measure of the test-retest stability of locus of control orientation as measured by this instrument. Subjects were asked to rate how successful they had been at achieving the exercise goals they had recorded in the first questionnaire. A distinction was made between dropouts and adherers (i.e., subjects who reported attending classes until the program terminated) and both groups were then asked about their subsequent exercise behavior. Those who had not finished the program were asked why they had stopped attending.

**Data Analysis**

In keeping with the exploratory nature of this study, exercise adherence was measured using three methods. In the first method, subjects were divided into three groups based on the percentage of classes attended. These groups were then classified into low attendance (under 50%), moderate attendance (50-74%), and high attendance (over 74%). These percentages were chosen to yield approximately equal group sizes.

Second, since a number of previous studies (e.g., Dishman & Gettman, 1980; Massie & Shephard, 1971) have categorized adherers and dropouts according to whether they attended until the end of their program, an additional method of measuring adherence classified subjects into three groups according to their attendance during the final six fitness classes in their program. One group consisted of those who did not attend any of the last six classes. The second group included subjects who attended more than one and less than six of the last classes. The third group comprised those who attended the last class and at least three other classes of the final six. These groupings were chosen to reflect the degree of commitment at the end of the program.

The third technique used for measuring adherence was percent attendance measured on an interval scale rather than by discrete categories. The three methods chosen reflect common practice in current adherence literature, that is, (a) discrete classifications based on percent attendance, (b) discrete classifications based on an arbitrary cutoff point (e.g., last week) defining dropouts, and (c) a nondiscrete (continuous) scale of percent attendance.

Multivariate analyses of variance (MANOVA) were used to test for any differences among the low, moderate, and high attendance groups. Separate MANOVAs used the following two sets of dependent variables: EOLOC (3 scores) and CATPA (8 scores); IPC (3 scores) and CATPA (8 scores). CATPA was used in both MANOVAs because, in keeping with social learning theory, the locus of control–CATPA interrelationship was of primary interest. Two separate MANOVAs were also used to test the difference between the three last-six-classes adherence groups on the strength of their EOLOC and CATPA scores, and on their IPC and CATPA scores.

Since some information is lost by classifying attendance into discrete categories, stepwise multiple regression analyses were conducted in order to determine whether a linear relationship exists between percent attendance and the two sets of predictor variables (i.e., EOLOC and CATPA, IPC and CATPA).
Social learning theory suggests that locus of control and reinforcement value combine in a multiplicative manner rather than additively. Since stepwise multiple regression on the raw scores combines variables under an additive model, several multiplicative effects were obtained and subsequently subjected to stepwise multiple regression analysis. Each of the three locus of control subdomains (internal, powerful others, and chance) of the EOLOC and IPC scales were multiplied by social continuation and catharsis—the two CATPA variables that correlated highest with percent attendance. As a result, six new variables were created, each one the product of an expectancy score and a value score. These interactive variables were created to test the extent to which the joint effect of expectancy and value affects exercise adherence.

Procedure for Handling Missing Values. Missing values from the IPC (5 subjects each had 1 missing value) and EOLOC scales were replaced with the corresponding group item mean. Data missing from CATPA subdomains (2 subjects each missed 1 subdomain) were replaced with a value of 15 since this score indicates midpoint responses on the 5 bipolar adjectives of the semantic differential scale. Six subjects completed the CATPA inventory incorrectly, resulting in missing values for all eight subdomains. These values were not replaced and these six subjects were not used in any analyses utilizing CATPA scores. Missing responses from demographic items and other questionnaire data were not altered.

Results

Questionnaire Return

Of the approximately 120 initial questionnaires distributed, 91 were returned. Since only 4 of these questionnaires were completed by males, they were eliminated, thereby reducing the number to 87. Because some fitness instructors had not recorded the names of subjects who were given questionnaires, only 66 of the returned questionnaires had names to match them. A total of 62 follow-up questionnaires were distributed, of which 53 were returned. Attendance data were not available for 5 of the 66 subjects for whom names were available, thereby reducing the number of usable initial questionnaires to 61.

Descriptive Statistics

Attendance ranged from 6% to 100%, with a mean attendance rate of 60%. In all, 16 subjects (26%) were absent from the final six classes of the program, while 28 (46%) attended one to five of the last six classes (excluding the final class) and 17 subjects (28%) attended the last class and at least three others of the last six. These results are comparable to the mean percent attendance and dropout percentages reported in exercise adherence studies of similar length (Epstein, Wing, Thompson, & Griffin, 1980; O'Connell & Price, 1982).

In general, the sample tended to be internally oriented. The average internal score on the IPC was approximately 37, out of a maximum of 48, compared to the average external scores of 20 and 21. Similarly, the internal average of 27 out of a possible 30 on the EOLOC was substantially higher than the external scales' average scores of 10 and
11. This finding supports Levenson’s (1981) belief that subjects engaged in health related activities tend to be more internal. In this study, subjects also tended to score more homogeneously on the EOLOC scales than on the IPC scales. This is especially true of the internal scale of the EOLOC, on which 72% of the subjects scored either 29 or 30 out of 30.

The mean CATPA scores were all very positive with the exception of the vertigo and ascetic subdomains. This result agrees with the finding of an earlier study (Schutz, Smoll, & Wood, 1981b) in which 215 young female athletes were seen to have considerably less positive attitudes about these two variables than about other CATPA variables.

**MANOVA Analyses**

Multivariate analyses of variance revealed no significant difference among low, moderate, and high attenders on their EOLOC and CATPA scores, $F < 1.0$, or on their IPC and CATPA scores, $F(22, 84) = 1.24, p > .24$. In addition, results of two separate MANOVAs showed no significant difference between the three last-six-classes adherence groups on the strength of their EOLOC and CATPA scores, $F(22, 84) = 1.11, p > .35$, or on their IPC and CATPA scores, $F(22, 84) = 1.13, p > .33$. These nonsignificant results indicate there is essentially no difference among adherence groups in locus of control orientation or attitudes toward physical activity.

**Stepwise Multiple Regression**

Results of the stepwise multiple regression procedure, using EOLOC and CATPA as predictors, revealed a significant linear relationship, $F(3, 51) = 5.07, p < .01$, between percent attendance and three CATPA variables. With the $F$-to-enter set at 2.0, social continuation, catharsis, and health and fitness:value contributed to the prediction equation. In a second multiple regression analysis, using IPC and CATPA as predictors, the two external locus of control variables entered the regression equation, $F(5, 49) = 4.13, p = .01$, following the three CATPA variables mentioned above. Inclusion of these five variables resulted in a multiple correlation of .54 (adjusted $R^2 = .22$). However, most of the variance accounted for was due to social continuation and catharsis (adjusted $R^2 = .16$). Since these factors account for only 22% of the variance in percent attendance, they cannot be considered strong predictors. In general, individuals with higher percent attendance tended at the beginning of the fitness program to have less positive attitudes toward physical activity as a means of continuing social relations and achieving health and fitness, and more positive attitudes toward physical activity for release of tension. They also held weaker beliefs that their reinforcements are controlled by powerful others and a stronger belief that chance elements affect their lives.

Results of a multiple regression analysis using EOLOC and CATPA, as well as six interactive variables (internal, powerful others, and chance scales were each multiplied by catharsis and social continuation), revealed no change in the previously described regression equation. When this procedure was repeated using IPC and CATPA as well as six interactive variables, a small but significant linear relationship, $F(5, 49) = 4.39, p < .01$, was found between percent attendance and five variables (Table 1). These variables entered the regression equation in the following order: social continuation, catharsis, powerful others $\times$ catharsis, chance, and internal $\times$ social continuation. As a result of including interactive variables in the analysis, the multiple $R$ was increased slightly to .56, with an adjusted $R^2$ of .24. Again most of the variance accounted for was a result of social continuation and catharsis (adjusted $R^2 = .16$).
Table 1

Stepwise Multiple Regression Results
(Predictors = IPC, CATPA, and Interactive Variables)

<table>
<thead>
<tr>
<th>Step no.</th>
<th>Variable entereda</th>
<th>F-to-enter</th>
<th>$\beta^b$</th>
<th>$R^2$</th>
<th>SEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>—</td>
<td>—</td>
<td>+34.96</td>
<td>—</td>
<td>27.11</td>
</tr>
<tr>
<td>1</td>
<td>Social continuation</td>
<td>7.53</td>
<td>-3.90</td>
<td>.11</td>
<td>25.60</td>
</tr>
<tr>
<td>2</td>
<td>Catharsis</td>
<td>4.28</td>
<td>+3.50</td>
<td>.16</td>
<td>24.84</td>
</tr>
<tr>
<td>3</td>
<td>PO x catharsis</td>
<td>2.81</td>
<td>-0.07</td>
<td>.19</td>
<td>24.42</td>
</tr>
<tr>
<td>4</td>
<td>IPC chance</td>
<td>2.84</td>
<td>+1.29</td>
<td>.22</td>
<td>24.0</td>
</tr>
<tr>
<td>5</td>
<td>IN x social contin.</td>
<td>2.48</td>
<td>+0.04</td>
<td>.24</td>
<td>23.64</td>
</tr>
</tbody>
</table>

$^a$PO = IPC powerful others; IN = IPC internal; Social contin. = social continuation.

$^b$F(5, 49) = 4.39, $p < .01$

Chi-Square Analysis

The chi-square analysis showed that adherence, as measured by high, moderate, and low attendance, was independent ($p > .10$) of any nominally scaled questionnaire variables such as percent leisure time activity, enrolling with a friend, and so forth. Only the smoking and spouse support variables approached significance ($p < .10$).

Of those subjects who claimed to have remained in the program until it ended ($n = 35$), 88% said they intended to continue exercising regularly (2 to 3 times a week). Of these, 83% said they intended to enroll in another fitness class. Fifteen subjects said they had dropped out of the program, and 6 of them claimed they were still exercising regularly—primarily through aerobic activities such as jogging, biking, swimming, and cross-country skiing.

Discussion

In general, the findings of this study suggest that locus of control measures combined with values held toward physical activity are not strongly related to exercise program adherence. The EOLOC was expected to predict adherence better than the generalized IPC, but according to the data, the reverse is true. Results also show there is no statistically significant relationship between adherence and any of the demographic, situational, and behavioral variables measured. The only factors that appear to predict adherence are two attitude variables—values held toward physical activity for social continuation and catharsis.

This study’s findings provide weak support for the hypothesis that exercise adherence is positively related to the combined effects of generalized internal locus of control and values held toward physical activity. Internal locus of control by itself does not appear in either regression equation, whereas a very small positive relationship is seen between percent attendance and the interaction of internal locus of control and attitude toward social continuation. This interactive variable is a very weak predictor of adherence, however, accounting for only 3% of the total explained variance.
Results of the multiple regression analyses provide weak support for the hypothesis that exercise adherence is negatively related to a generalized belief in powerful others control combined with exercise reinforcement values. Results show a negative relationship between powerful others and percent attendance in combination with three CATPA variables. A negative relationship also exists between percent attendance and the interaction of powerful others belief and catharsis. However, since powerful others and the interactive variable each account for only about 4% of the total variance explained in their respective regression equations, they are very poor predictors of exercise adherence.

The hypothesis is not supported that a negative relationship exists between generalized chance orientation combined with values held toward exercise. Although chance appears in both multiple regression equations, it is seen to be positively rather than negatively related to adherence (percent attendance) as predicted. Again this finding does not coincide with social learning theory which posits that the potential for a behavior to occur is lower when belief in control of reinforcement is more externally oriented (Rotter, 1966, 1975). It is not known why exercise adherence tends to be slightly greater among subjects who have a stronger general belief that luck, chance, or fate control their reinforcements.

Data indicate that there is no relationship between exercise-specific locus of control and exercise adherence. Therefore, all three hypotheses regarding the ability of the EOLOC to predict adherence can be rejected. This finding does not support the earlier suggestion that specific expectancy measures may be more beneficial than generalized instruments when predictability is of prime importance (Phares, 1976; Rotter, 1975; Saltzer, 1982). One possible reason for the failure of EOLOC to predict adherence is that the scores on the subscales, and in particular the internal scale, were quite homogeneous. With little variability to explain, it is difficult to achieve a high correlation between variables.

A possible explanation for the relative homogeneity of the EOLOC scales is that the subjects are homogeneously positive in their beliefs about internal exercise locus of control. If this is the case, the problem could perhaps be rectified by increasing the number of positively worded responses on the EOLOC scales. Another possibility is that the items in EOLOC, and in particular the internal scale, require some revisions to make them less similar in wording.

Two attitude variables—social continuation and catharsis—are seen to be related to exercise adherence, as measured by percent attendance. In general, those subjects who at the outset of the program had a less positive attitude toward participating in physical activity for continuing social relations and more positive attitude toward participating in order to reduce stress and tension tended to have a higher percent attendance. The positive relationship between exercise adherence and catharsis has been reported previously; Shephard and Cox (1980) found that female dropouts from an industrial fitness program placed significantly less value on catharsis than did adherers. The negative relationship between social continuation and adherence is interesting in light of the fact that this attitude variable has not been used in previous adherence studies. The social continuation subdomain was created recently (Schutz et al., 1981a) by splitting the social experience domain of CATPA into two separate dimensions, the other dimension being social growth (to meet new people).

Speculating on possible reasons for the negative relationship between percent attendance and social continuation, it could be that those who enroll in order to be with friends are disappointed by the lack of opportunity for social interaction during an aerobic fitness class and thus tend to participate less or to drop out. Or it may be that individuals with more positive attitudes toward social continuation have a greater tendency to enroll with a friend and to attend only when the friend attends, whereas those with a less positive
attitude toward social continuation may have more of a tendency to attend alone regard-
less of who else attends. Further work is necessary in order to achieve a better under-
standing of the relationship between adherence and social continuation value.

A number of investigators have reported relationships between exercise adherence
and demographic, situational, or behavior factors. Findings of this study indicate that age,
percent leisure time activity, employment status, types of goals set, expected success and
success in goal attainment, nonleisure exertion, family support, enrolling with or without
a friend, previous number of program enrollments or completions, sports participation,
previous individual exercise behavior, and social desirability, are all unrelated to exercise
adherence. There was a tendency for nonsmokers and those with full spouse support to
have greater percent attendance.

Data from this study indicate that some individuals continue to exercise regularly
after dropping out of a supervised fitness program. Perhaps further research should
distinguish program dropouts who continue to exercise from those who cease exercising
entirely. In addition, future research might explore locus of control orientation by com-
paring participants in supervised exercise programs and individuals exhibiting spontaneous
changes in level of physical activity.

Since other studies have demonstrated the potential usefulness of situation-specific
locus of control measures, it may be worthwhile pursuing the development of an exercise
locus of control scale. Adjustments to the EOLOC scales combined with further research
may improve the ability of this instrument to predict behaviors in physical activity settings.

A consideration for future adherence research involves using locus of control in
conjunction with self-efficacy as outlined by Bandura’s (1977) self-efficacy theory. Ac-
cording to this theory, internal control consists of two expectations: the belief that one’s
behavior will result in a reinforcement outcome (outcome expectation, i.e., locus of con-
tral), and the belief that one can execute the behavior required to produce the reinforce-
ment (efficacy expectation). Initial support for the potential usefulness of this model was
obtained in a recent walking compliance study (Kaplan, Atkins, & Reinsch, 1984). Results
showed that correlations between the criterion variables and self-efficacy judgments tend-
ed to be significant for those with internal locus of control and to be nonsignificant for
those subjects with an external locus of control. It may be possible therefore to obtain
greater adherence predictability using both locus of control and self-efficacy measures in
conjunction with exercise value.

The relationship between exercise adherence and values held toward physical
activity deserves further attention. As mentioned, social continuation is of particular in-
terest because this variable was seen to be the strongest predictor of adherence in this
study and has not been used in other adherence studies.

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Appendix A

Development of the Exercise Objectives Locus of Control Scales

The EOLOC scales were modeled after Levenson’s (1974, 1981) multidimensional IPC scales which assess three distinct dimensions: internality, powerful others externality, and chance externality. Initially a 24-item test pool was developed which included eight items for each of the three subdomains (internal, powerful others, and chance) mentioned above. This inventory was presented to 10 graduate students who assessed the face validity of the factor structure and the clarity of the statements. The dimensions associated with 22 of the items were correctly identified by all 10 judges (the graduate students), while 9 of them placed the other two items in the correct grouping. None of the items were deemed unclear by the judges.

Since the judges’ responses were favorable, the same 24 items were administered to 60 participants (50 females and 10 males) from two aerobic fitness classes who ranged in age from 17 to 55 ($M = 30$). On average, the subjects had been participating in the classes for 15 months (range = 1 day to 4.5 years). Subjects responded to each item on a 5-point Likert format. A “do not understand” response category was also included in order to determine the extent to which subjects did not comprehend the items and to eliminate the ambiguity of the midpoint responses of “undecided.” An item analysis of the raw data was then completed and based on the item-total correlations; the lowest two items from each subdomain were deleted. In a subsequent analysis, all remaining item-total correlations were greater than .60, .45, and .15 for the internal, powerful others, and chance scales, respectively. Cronbach’s alphas were calculated for each subdomain following deletion of the six items, and values of .86 (internal), .79 (powerful others), and .57 (chance) were obtained. Since the chance scale had the lowest alpha and two of the remaining items in it had item-total correlations less than .20, two new chance items were developed and included in the EOLOC for the subsequent study.

The revised 20-item EOLOC was administered to 87 females, ages 15 to 57 ($M = 30$), who had elected to participate in 8- to 12-week fitness programs sponsored by a local fitness organization.

Prior to analyzing the inventory, all missing values (7 subjects had 1 missing value and 2 subjects had 2 missing values) from the raw data were replaced by the corresponding group item mean. Based on the results of an item analysis, the two items in the chance scale which correlated the lowest with the total were deleted. The item-total correlation of the remaining 18 items were all greater than .30. Cronbach’s alphas of .79, .69, and .75 were obtained for the internal, powerful others, and chance scales, respectively. A positive correlation of .402 was found between the powerful others and chance scales, while a negative correlation of $-0.40$ was found between the chance and internal scales. The internal and powerful others scales were found to be unrelated with a correlation of $-0.14$. The correlation between the IPC and EOLOC internal scales was .07, indicating no relationship between these scales. However, the powerful others and chance scales of the EOLOC and IPC correlated positively .39 and .42, respectively.

Test-retest correlations (3 to 4 months) of the three scales were .32 (internal), .72 (powerful others), and .60 (chance), indicating that the internal scale in particular is not highly stable over time. It is possible that the subjects’ locus of control orientation changed as a result of participating in a physical activity program, as seen in a previous study (Jeffers, 1977).

Correlations of $-0.07$, $0.05$, and $0.03$ were found between a social desirability measure—the M-C I(10) Scale (Strahan & Gerbashi, 1972) and the internal, powerful...
others, and chance scales of the EOLOC. These results indicate that the EOLOC is not contaminated by social desirability.

The factor structure of the EOLOC scales was examined using principal components analysis with varimax rotation. The analysis yielded five factors (eigenvalues greater than 1), accounting for 52% of the variance. Factors 1 and 3 were both internal factors; items 11 and 13 had loadings greater than .70 on factor 1, while all six internal items loaded greater than .30 on factor 3. Only item 5 had a low loading on both factors (i.e., failed to load at least .60 on one of the two factors). Factor 2 was a chance factor with five chance items loading greater than .40. Item 2 loaded on factor 4 along with another chance item (16) and two powerful others items (15, 17). The fifth factor was a powerful others factor comprised of three items (6, 7, 14) with loadings greater than .50.

The factor structure of the EOLOC scales was reassessed when data became available for an additional 85 females, thereby increasing the sample size to 172 (see Table 2). With this larger sample the factor structure of the EOLOC became clearer. Results of the primary analysis again produced five factors (accounting for 51% of the variance), but following rotation the fifth factor was deleted as it accounted for only 4% of the total variance and had no loadings above .50. The first factor consisted solely of the six internal items, while the second factor comprised all of the chance items. As in the previous analysis, items 2 and 4 had the lowest loadings (.32 and .33, respectively). The powerful others items were split between factors 3 and 4 with items 14, 15, and 17 loading on factor 3 and items 6 and 7 loading on factor 4. Item 9 did not load on any factor.

Results of this factor analysis basically support the tridimensionality of the EOLOC

<table>
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<th>Factor 1</th>
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<th>Factor 3</th>
<th>Factor 4</th>
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<td>Variance accounted for:</td>
<td>16%</td>
<td>14%</td>
<td>10%</td>
<td>8%</td>
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</table>
scales. Items 2, 5, and 9, having relatively low loadings, appear to require further examination and/or adjustment. The powerful others scale also needs some additional work as it seems to be measuring two slightly different beliefs.

Appendix B

Exercise Objectives Locus of Control Scales

The statements listed below are commonly held opinions. You are being asked to indicate the extent to which you agree or disagree with these statements. There are no right or wrong answers. First impressions are best. Read each statement carefully, decide the extent to which you agree or disagree, and then place a checkmark under the appropriate heading. *Give your opinion on every statement.* If you find that the headings do not adequately reflect your opinion, use the one that is closest to the way you feel. If you do not understand the statement, place a checkmark under the heading “Do Not Understand.” Thank you.

1. My own actions will determine whether or not I achieve my exercise objectives.
2. If it’s meant to be, I will reach my exercise objectives.
3. Whether or not I obtain my exercise objectives depends mostly on my own behavior.
4. Whether or not I achieve my exercise objectives is largely a matter of good or bad fortune.
5. The encouragement I give myself will greatly affect whether or not I reach my exercise objectives.
6. If I do not attain my exercise goals, other people will be to blame.
7. For the most part, other people are in control over whether or not I attain my exercise goals.
8. Whether or not I achieve my exercise objectives is largely a matter of fate.
9. It is entirely up to other people whether or not I accomplish my exercise goals.
10. Whether or not I accomplish my exercise goals depends on how lucky I am.
11. I am directly responsible for whether or not I reach my exercise goals.
12. Achieving my exercise objectives will depend on how fortunate I am.
13. Whether or not I accomplish my exercise goals is entirely up to me.
14. Whether or not I reach my exercise objectives depends on the actions of certain other people.
15. Other people have the power to make certain that I accomplish my exercise objectives.
16. Not achieving my exercise objectives will be a matter of bad fortune.
17. The behavior of other people will greatly influence whether or not I reach my exercise objectives.
18. I am primarily in control over whether or not I reach my exercise objectives.

*Note:* The responses to the above inventory are: Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree, and Do Not Understand.

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