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The Evaluation of Factors Affecting Adherence to an Exercise Program among College Students

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THE EVALUATION OF FACTORS AFFECTING ADHERENCE TO AN EXERCISE PROGRAM AMONG COLLEGE STUDENTS

by

Mark Robert Dean

A Dissertation
Submitted to the
Faculty of the Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Philosophy
Department of Psychology

Western Michigan University
Kalamazoo, Michigan
June 1987

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Though investigative studies have identified the many benefits of aerobic exercise for both biological and behavioral health, only a small percentage of individuals maintain regular exercise. Team or group exercise programs report higher participation rates, but studies of individually prescribed exercise programs typically report problems of compliance and attrition. The purpose of the present study was to evaluate the effectiveness of various interventions—including the provision of course bonus points, cash lottery, and partner assignment—designed to increase exercise compliance among college students. Thirty-two student volunteers reporting "no current exercise" were randomly assigned to either the "partner" or the "individual" exercise group. Subjects in the partner group were then assigned an exercise companion determined to be their best match, based on similar exercise objectives, comparable physical fitness levels, and shared personal and professional interests. Members of both experimental groups were able to earn up to five bonus points and have their names entered into a $20.00 cash lottery for exercising. A multiple baseline design was employed to compare the exercise frequency and attrition rates across subjects and groups. Course bonus points combined with a lottery was an effec-
tive intervention: 78% of the students from the combined partner and individual groups began to exercise, after a self-reported baseline of no exercise. Although not independent of one another nor statistically significant, each evaluative measure favored the partner intervention. Fewer members of the partner group were lost to attrition; consequently the partners earned more exercise points overall. Also, of the subjects remaining in the program, 57% of the partner group reached 100% compliance by exercising at the maximum frequency necessary to earn all of the possible points, in contrast to only 18% compliance by the members of the individual group. The need for structured incentives and social reinforcement for aerobic exercise was reviewed.
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The evaluation of factors affecting adherence to an exercise program among college students

Dean, Mark Robert, Ph.D.
Western Michigan University, 1987
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ACKNOWLEDGMENTS

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Mark Robert Dean

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CHAPTER I

INTRODUCTION

Exercise has received considerable attention in recent years, with regard to both cardiovascular risk reduction and general life-quality improvements for health maintenance. A brief review of both the psychological/behavioral benefits and the biological/medical benefits of exercise will now be provided.

Psychological/Behavioral Benefits

Researchers have used personality profile measures, self-concept ratings and body attitude scales to illustrate the potential, positive psychological effects of exercise. In response to questionnaire inquiries and clinical assessment inventories, participants have reported enhanced "well-being" (Collingwood & Willet, 1971) and improved "self-confidence" (Massie & Shephard, 1971) after participating in exercise programs.

The possible physiological mediators of exercise-induced changes in psychological health have not been conclusively identified. Exercise has been associated with acute changes in norepinephrine catecholamine levels (Dinsdale & Moss, 1980). Also, sustained aerobic exercise increases the secretion of beta-endorphins, the body's "natural opiates," in the brain and in other tissues (Carr, Bullen, & Skrinar, 1981). These biochemical changes may positively affect be-
havior by helping insomniacs to sleep and by improving the individual's self-report of "mood" (Appenzeller, 1982).

Exercise-related psychological changes include decreases in depression (Greist, Klein, Eischens, Gurman, & Morgan, 1979) and decreases in anxiety (devries, 1981). The apparent antidepressive and anxiolytic effects of aerobic exercise continue to be a topic of great interest (Martin & Dubbert, 1982).

Biological/Medical Benefits

Aerobic exercise training has consistently been shown to produce weight loss and improvement in body composition (lean to fat ratio) for obese as well as for normal weight individuals (Keef & Blumenthal, 1980; Martin & Dubbert, 1982). Regular exercise appears to be more effective for weight reduction than standard diets, though controlled studies support the hypothesis that exercise is most effective when combined with a reduced caloric intake (Stalonas, Johnson, & Christ, 1978).

Exercise may also play an important role in the management of diabetes. Regular moderate exercise has been recommended for diabetics, along with diet and insulin, because of its ability to reduce plasma insulin and improve insulin sensitivity and its potential to improve metabolic control (Richter, Ruderman, & Schneider, 1981).

Epidemiological studies indicate an inverse relationship between cigarette smoking and habitual physical exercise (Criqui, 1980). Reportedly, smokers are far less likely to enter exercise programs.
(Massie & Shephard, 1971) and those who do enter are likely to drop out early (Oldridge, Wicks, Hanley, Sulton, & Jones, 1978). Other indications are that smokers who begin aerobic training programs often quit smoking (Morgan, 1977). Further evidence is that exercise may be useful in accelerating the ventilation of carbon monoxide for those smokers who are unable or unwilling to quit (Frederiksen & Martin, 1979).

Exercise has been employed perhaps most extensively in the prevention and treatment of coronary heart disease. Exercise has been shown to improve cardiovascular risk profiles in healthy individuals as well as in high-risk, coronary patients (Kannel & Sorlie, 1979; Mann, Garrett, Farhi, Murray, & Billings, 1969). Exercise has been associated with: (a) decreases in resting and active heart rate, (b) increases in stroke volume and oxygen utilization, and (c) reductions in the harmful plasma triglycerides and LDL cholesterol (see Martin & Dubbert, 1982, for a review). Though we are still unable to make conclusive statements, there is evidence that exercise may reduce blood pressure in hypertensives, independent of weight or dietary sodium reductions (Boyer & Kasch, 1970; Choquette & Ferguson, 1973).

Compliance, Adherence, and Attrition Factors

The terms "compliance" and "adherence" are commonly used interchangeably in the literature when describing exercise participation; definitions used, however, are not identical. For our purposes, compliance or adherence to exercise or other therapeutic
regimens can generally be defined as the extent to which an individual participates in and completes an agreed upon program.

Adherence to an activity program may be important for individuals who wish to enjoy the quality of life and health enhancement effects attributable to exercise. However, adherence to an exercise program can be a much more serious concern for the person who has high blood pressure or coronary heart disease or for the person who has trouble with depression or anxiety.

Despite the accumulating evidence for the "life-promoting" value of exercise, cardiac patients typically show poor compliance to even medically prescribed and supervised exercise programs (Oldridge, 1979b, 1982). Though the need for, or benefit of, exercise may seem clear, approximately two-thirds of Americans do not exercise regularly with up to 45% not exercising at all (Martin & Dubbert, 1982). Of those who begin to exercise, approximately one-half will drop out as early as three months into the program (Dishman, 1982). Thus, high attrition rates occur regardless of whether individuals exercise for general health promotion or for rehabilitation following medical treatment (Oldridge, 1979b).

Given the magnitude of the problem, there is surprisingly little experimental research on exercise compliance. Many correlational studies exist, but these consist mainly of retrospective analyses of variables that characterize various exercise programs, the exercise dropout, the poor adherer, and the good adherer.

Martin and Dubbert (1982) cited the following participant characteristics associated with poor compliance: cigarette smoking, high
percent of body fat, fatigue and perceived exertion, lack of spouse support, and low initial level of fitness. Identified program components associated with poor compliance included an inconvenient facility location and excessive intensity of the exercise program.

Shephard (1985) reviewed three 1981 Canadian studies: the Canada Fitness Survey Study of 13,500 households, the Toronto Life Assurance Study of 1800 office workers, and the General Food Study of 535 corporate exercise program enrollees. Shephard provided the following summary data: (a) Respondents most frequently identified four reasons for exercise: to feel better, to have a more attractive body, to socialize, and to be more healthy. (b) The three most frequent reasons given for not exercising were "lack of time," followed by "loss of interest," and "exercising alone."

Some of the concepts and descriptive terms used in these studies require exact definition or translation for purposes of clarity. For example, individuals frequently cited "loss of interest" or "lack of time" as an explanation for their exercise dropout (Shephard, 1985). By itself, however, these explanations are difficult to clearly understand; exactly why a person "lost interest," for example, remains unspecified. If our purpose is to design a successful exercise program intervention, we might benefit by evaluating behavior directly; advantage could be derived from analyzing the program components that serve to strengthen or reinforce the exercise behavior while simultaneously identifying those components that inadvertently punish its occurrence (Skinner, 1969). The assumption being made here is that the individual might not report a
"lack of time" or a "loss of interest" if we are able to design a more reinforcing, less punitive exercise program.

All of the exercise compliance factors identified above could be conceptualized in a dichotomous manner as involving either a form of punishment or a form of reinforcement. Once each factor is clearly identified as such, we can attempt to design an exercise program accordingly, i.e., by decreasing the possible punishment involved with participation while simultaneously increasing the reinforcement the participant might receive. For instance, knowing that "excessive exercise intensity" is one of the reasons for non-compliance, we could attempt to individually tailor the exercise program. Because we know that a commonly cited reason for non-compliance is "exercising alone," we could attempt to have an individual exercise with another individual or have him or her join a group exercise program. Thus, the extensive survey data available can serve a critical function if we analyze it to design an effective exercise program.

There have been few studies conducted that provide scientifically tested methods for improving exercise participation and longer term adherence; however, some of the factors associated with low compliance/dropout and high attendance/adherence have been subjected to experimental evaluation.

For instance, the three subjects in a study by Keefe and Blumenthal (1980) were allowed to set easily attainable exercise goals. The intensity of exercise was thereby controlled and a gradual shaping of exercise behavior resulted. Subjects provided their own reinforcers (e.g., pre-selected gifts) when they attained
their exercise goals. Exercise duration and frequency increased for each member.

Massie and Shephard (1971) report that group, social support is as important for exercise programs as it is for weight loss or drug and alcohol treatment programs. In the Massie and Shephard study, volunteers were recruited through the Ontario Heart Foundation and the Toronto YMCA to participate in an aerobics fitness program. The subjects were matched on physiological measures of physical fitness and then randomly assigned either to exercise in a group with other members of the YWCA or to exercise on their own. Focusing primarily on the attrition results, the authors report large statistical group differences with 52% of the members of the individual group dropping out of the exercise program in contrast to only an 18% loss of subjects from the YWCA group.

Behavioral contracting has been shown to be effective for behavior management in a wide range of applied settings (Epstein & Wing, 1979), and contracts have been successful with exercise as well. Oldridge and Jones (1981) found that cardiac patients who signed an agreement to complete the exercise program had better adherence than those who did not.

Epstein, Thompson, Wing, & Griffin (1980) compared weekly attendance contracts ($1.00 deposit return) with an attendance lottery and control condition across a 25-day jogging program. All the subjects received feedback on their resting and maximal heart rates on a daily basis. Both the lottery and contracting interventions were associated with statistically significant higher at-
tendance than the control group. Approximately 64% of both the lottery and contracting group members maintained attendance, as contrasted with 46% of the members from the control group.

Wysocki, Hall, Iwata, and Riordan (1979) utilized a multiple baseline design to study the effect of contracting for exercise aerobic points to earn back personal items placed on deposit. Seven of the 12 subjects at least doubled their aerobic points earned during the contracting intervention. Unfortunately, four subjects dropped out before completing the program.

The most successful results to date have been reported by Martin, Dubbert, Katell, Thompson, Raczinski, Lake, Smith, Webster, Sikora, & Cohen (1984). Over a four-year period, 143 apparently healthy sedentary adults were randomly assigned to treatment groups for six consecutive studies. These adults enrolled in a non-credit college exercise class which met formally twice a week, with a third-day exercise session required but completed outside of class. Martin et al. (1984) provided individualized positive feedback to each member of the experimental groups during each of the six 10-week studies. The positive feedback was delivered twice during each session, for approximately two minutes each time, as one of the experimenters ran along side the subject during exercise. One example of such personalized feedback was: "Your pace is perfect right now. You are doing very well."

These researchers systematically added experimental procedures to the feedback intervention to determine if they could enhance treatment effects. The procedures evaluated included goal setting
strategies, lottery reinforcers, cognitive strategies during the exercise, and relapse prevention training.

The interventions were successful with statistically significant differences between groups. Adherence levels reached approximately 70 to 85%, with adherence being defined as "not having missed six consecutive sessions." Flexible rather than fixed goal setting opportunity was the most effective addition to the personalized feedback component, with lottery reinforcers the least important addition.

These results are unprecedented in the exercise literature. Their reported adherence levels are superior to the mean adherence levels of approximately 55% reported for other exercise studies (Dishman, 1982; Morgan, 1977).

The data in all of the above cited studies must be interpreted cautiously because each suffers from one or more of the methodological weaknesses that characterize the exercise and mental health literature (Folkins & Sime, 1981). First, the authors relied partially or exclusively on self-report measures of exercise, a source subject to inaccuracy. Second, direct experimenter involvement with the exercise participants may have inadvertently confounded the empirical assessment of other adherence factors. That is, unspecified behaviors related to "experimenter expectation" may have influenced the subjects' behavior; as a result the study becomes more difficult to replicate, limiting the generality of the research findings. Third, the time, effort, or financial cost required to administer the health program may be prohibitive, limiting the application possibilities.
The series of six studies completed by Martin et al. (1984) suffered from several of these limitations. They relied on self-report for their third day adherence measures; also, they may have confounded the assessment of specific adherence factors by allowing the researchers to personally participate with the subjects during each intervention; and finally, the cost of having a member of the research team provide individualized feedback to each subject may be prohibitive for wide scale application of their exercise program.

The implications of the six Martin et al. (1984) studies are noteworthy, however, and may be summarized as follows: When engaging in a potentially difficult activity such as aerobic exercise, participants appear to greatly benefit from regular reinforcement, in the form of encouragement and positive feedback. And this reinforcement is most effective when provided personally, immediately after the exercise behavior occurs.

There is a notable absence of exercise research involving special populations. One exception was a study by Allen and Iwata (1980) who employed a Premack (1959) group contingency to increase exercise in ten mentally retarded subjects. A high rate activity (i.e., games) was provided contingent on completion of the low-rate activity, exercise calisthenics. The procedure led to increases in both exercise participation and completion, as well as a decrease in the amount of time required to conduct the exercise session.

Preliminary Research

As mentioned earlier, exercise reportedly can be a helpful supplemental treatment for a wide range of behavioral problems,
including depression (Greist et al. 1979) and anxiety (deVries, 1981). A pilot study (Johnson & Dean, 1985) had three purposes: (a) to extent the potential benefits of exercise to special populations, namely to those individuals who have been hospitalized for behavior problems or who are currently handicapped or disabled; (b) to design an exercise program based on the numerous survey studies that have identified factors that might be associated with greater exercise compliance; and (c) to systematically replicate selected components of the research reported by Martin et al. (1984).

The ten subjects in this study resided in a low-income housing project and subsisted on general assistance (welfare), disability or social security income. The subjects had various degrees of behavioral (i.e., psychological) difficulty, with three members requiring previous inpatient hospitalizations.

They responded voluntarily to an announcement that they could have their names placed into a prize lottery upon participation. All subjects reported a current inability to initiate or maintain an exercise activity. They earned a chance to win the weekly lottery by joining the exercise group, which walked for 20 minutes three times a week. Each week a $5.00 cash prize was awarded while second and third place winners received a free record or musical tape.

Based on the data that have been obtained from retrospective survey studies regarding exercise compliance factors, the established exercise sessions for this study incorporated the following: (a) low intensity exercise, i.e., brisk walking, to avoid over-exertion by the subjects; (b) convenient time scheduling, i.e., exercising just
before dinner when all subjects had free time; and (c) convenient exercise location, i.e., exercise conducted right from the residence of the subjects, to decrease the possibility that the subjects could claim "lack of time" (Shephard, 1985) or "inconvenient facility location" (Martin & Dubbert, 1982) as a reason for not exercising. To systematically replicate the findings of Martin et al. (1984), the experimenters walked with the subjects during each session so that the subjects could receive immediate social feedback and reinforcement while they exercised. An across subjects multiple baseline research design was employed (Baer, Wolf, & Risley, 1968).

Results suggest that an award lottery combined with social reinforcement and careful program design can serve as a successful exercise intervention for subjects with behavioral problems. If we include all subjects who initially agreed to participate and were medically cleared for exercise, results are that subjects attended 44 exercise sessions out of a total possible of 77, yielding a 57% compliance rate. Of the seven subjects who began to exercise i.e., completing at least one session, exercise rates yielded a 70% compliance result with 44 scheduled exercise sessions attended out of a total possible of 63. Three subjects dropped out of the study. These compliance data can be improved upon, and further research with special populations is greatly needed.

Present Research

The present study was an attempt to systematically replicate and extend the findings of Johnson and Dean (1985) by: (a) assess-
ing the value of an award lottery for the exercise compliance of college students, (b) replicating the findings of Martin et al. (1984), and (c) drawing on the correlational data that have identified potentially important exercise program components.

Course bonus points and cash lottery were used to evaluate a variation of the Martin et al. (1984) procedure. This was done by matching individuals with an exercise partner, a companion determined to be most ideally suited to him or her based on a self-report of exercise objectives, current physical fitness level, and personal and professional goals. The expectation was that the individualized positive feedback, proven to be so important for exercise adherence in the Martin et al. (1984) studies, would occur naturally, perhaps inevitably, if the partners exercised together. The hypothesis was that those individuals assigned to exercise with a companion would demonstrate greater adherence to the exercise regimen than the individuals who were assigned to exercise alone. Emphasis was placed on the development of an exercise program that could be implemented in a wide range of clinical and non-clinical settings.
CHAPTER II

METHOD

Subjects and Settings

Thirty-two undergraduate university students, from a total of 80 students in two sections of an introductory psychology course, volunteered to participate by responding to an announcement that they could earn bonus points counting toward their course grade and have their names entered into a prize lottery upon participation. Only those students who indicated that they were not currently engaging in aerobic exercise were selected. Given this single criterion, all students expressing an interest in participation were accepted.

Exercise activities occurred in various university settings; each was equipped with facilities for aerobic exercise. Most commonly, an indoor 220-yard track and a 25-yard pool served for exercise purposes.

Experimental Conditions

Group Assignment

All students enrolled in two sections of an introductory psychology class were first asked to complete a simple questionnaire concerning their exercise activities. No information about the exercise point program was provided and completion of the survey was
voluntary. Those students reporting no current exercise then had the option to participate in the exercise incentive program.

Thirty-two students volunteered and received a random assignment to one of two experimental conditions, either the "partner group" for exercising with a companion or the "individual group" for exercising on their own. Members from both groups received instructions to walk or jog for their exercise, with the exception of two members from each group who swam. These four individuals started exercising during the same intervention phase to counterbalance experimental conditions.

**Partner Selection and Assignment**

The subjects in the partner group completed an extensive exercise questionnaire (see Appendix A). They were asked to provide the following: (a) information about their hobbies, interests, and free time activities; (b) information about their personal and professional goals; (c) personal data regarding their height, weight, and current level of physical fitness (on a scale of one-to-five, with five signifying "excellent condition"); (d) explanation as to why they were not currently exercising; (e) identification of their personal objectives for the program by stating their weekly goals for both exercise frequency and duration; and (f) indication of prioritized, best days and times available for exercise for scheduling purposes.

Based on this profile information, subjects in this group were matched with a partner for exercise to earn their bonus points. To
the extent possible, the partner assignments resulted from identified commonalities across individuals with particular attention paid to the subjects' current level of fitness, scheduling opportunities, and individual exercise objectives.

During the intervention phases, the partners received exercise instructions, were introduced to one another, and were given a brief rationale for their assignment. The subjects agreed that they could only earn points by exercising with their assigned partner. Otherwise, bonus point and lottery incentives for members of the partner group were identical to those provided for the members of the individual group.

**Standardized Instructions and Report Forms**

Social contact between the research staff and subjects was minimal throughout the study; written, standardized instructions served as the primary means of communication. Instruction sheets distributed to the students indicated the "rules" of participation, the method of receiving bonus points, and the proper method of completing and returning exercise data sheets, with the warning that they would lose all bonus points "earned to date" if any inaccuracies were found in their report forms (see Appendix B for the complete list of standardized instructions).

Each week, all subjects in the intervention phase: (a) completed an "intent to exercise" schedule form that indicated dates, times, and planned exercise location, and (b) submitted their signed exercise affidavits for bonus points. Meanwhile, subjects in the
baseline condition completed a weekly report form that indicated whether or not they had exercised during the previous week (see Appendix C for these forms).

**Exercise Incentives**

Course bonus points and a $20.00 cash lottery served as potential incentives for exercise. Members of both experimental groups received 0.5 bonus points for each submitted exercise affidavit signed by university recreation facility staff. Students could earn up to five bonus points but needed a minimum of three points in order to have their names entered into the cash lottery drawing. Any point(s) earned applied to their (225 possible) point total for their grade in the introductory psychology course. (Though bonus points were used as incentives for exercise, any subject could also earn his or her maximum of five points through other course activities, e.g., by attending outside lectures, etc. Because subjects could earn points from non-exercise activities, the ability of points to control exercise-related behaviors may have been weakened.)

**Experimental Design and Procedure**

The design involved a multiple baseline across subjects (Baer, Wolf, & Risley, 1968) to assess the combined effects of bonus points and lottery on exercise behavior while also serving to assess any differential effects of the partner-versus-individual group assignment.

Four new subjects from each group received intervention instruction sheets at approximately two week intervals. Thus, a total
of eight subjects (four from each group) received written instructions that they could now earn bonus points for exercising. This occurred during weeks 5, 7, 9, and 11 until all 32 subjects had been so informed.

**Reliability**

Each occurrence of an exercise activity required the documentation of both date and time by a staff member of the university field house, serving as an affidavit that the students had attended the recreational facility; direct staff observation of a subject's behavior was not assured, however, due to differences in the location of the facility office and the exercise activity. Visits by a member of the research team for direct observations occurred two to three times a week for five weeks allowing for approximately 20% of all reported exercise to be checked. Interobserver observations yielded 100% agreement with the student's prestated schedule plan and the university signed affidavits (see Appendix C for exercise report forms).
CHAPTER III

RESULTS AND DISCUSSION

Course bonus points combined with a lottery was an effective incentive for 78% of the non-exercising students (combined groups), causing them to begin aerobic exercise (see Figure 1). Twenty-five out of 32 students who self-reported an activity level of "no exercise" during baseline did begin to exercise once the incentive conditions were in effect.

In addition, each evaluative measure favored the partner group (see Table 1) though statistical differences were not found. The partner group had only two members drop out of the exercise program, as contrasted with five members who dropped out of the individual group. Therefore, the total number of exercise sessions completed by the partner group (110) was greater than that completed by the individual group (71). In addition, of the subjects remaining in the exercise program, 57% of the partner group reached 100% compliance by exercising at the maximum frequency necessary to earn all of the possible points, in contrast to only 18% compliance by the members of the individual group.

These results indicate that course bonus points and an award lottery can be successfully used to encourage students to begin exercising. The results also suggest that individuals are more likely to engage in aerobic activity if they are matched with an exercise companion.
Figure 1. Mean Frequency Of Exercise During Each Week Of The Semester. Each Data Point Represents The Average Frequency For Two Sets Of Two Subjects.
Table 1

<table>
<thead>
<tr>
<th></th>
<th>Individual Group</th>
<th>Partner Group</th>
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<tbody>
<tr>
<td>Mean frequency of exercise sessions</td>
<td>6.5</td>
<td>7.9</td>
</tr>
<tr>
<td>of members (excluding non-participants):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program non-participants:</td>
<td>Five Subjects (31%)</td>
<td>Two Subjects (12.5%)</td>
</tr>
<tr>
<td>Total number of exercise sessions completed:</td>
<td>71</td>
<td>110</td>
</tr>
<tr>
<td>Number of participants earning 100% of possible exercise points (excluding drop-outs):</td>
<td>Two Subjects (18%)</td>
<td>Eight Subjects (57%)</td>
</tr>
</tbody>
</table>

N=16 for each group

Prior research has shown that award lotteries can be effective for increasing exercise participation (Oldridge & Jones, 1981). A pilot study (Johnson & Dean, 1985) to the present research suggested that an award lottery can be effective for increasing exercise activity in individuals with behavior problems. The need for the lottery as an incentive in the present study, however, remains unclear. In order to have their name entered into the lottery, subjects had to earn three points (out of a total possible of five). Only two students in the partner condition and three students in the individual condition earned the three points necessary for a chance at winning the lottery without going beyond that minimal point value.
in earnings. One would assume that if the lottery was the sole controlling variable for exercise, more students might have stopped exercising once they had earned the necessary three points. Eleven members of the partner group continued exercising, however, as did five members of the individual group. An alternative interpretation might be that the three point lottery requirement played a role for the initiation of exercise but once other rewards associated with exercise were contacted, the lottery became less important.

The high interobserver reliability of exercise occurrence obtained during the experiment warrants analysis. Several factors may have contributed. Each subject completed a form specifying the scheduled time and place for exercise (see Appendix C). The subjects had earlier received an instruction form stating that they would lose all points earned to date if any inaccuracies in their report forms were identified (see Appendix B); in fact, several subjects called the research office to notify the staff when they were unable to exercise as planned. Also, it may have become common knowledge that reliability checks were indeed being conducted. Finally, a subject assigned to exercise with a partner may have exercised as scheduled to avoid the social punishment that might have occurred if he or she failed to attend an agreed upon meeting.

Compliance to therapeutic regimens can generally be defined as the extent to which an individual adheres to an agreed upon treatment program. All subjects in this study signed a consent form which served as a voluntary agreement on their part to exercise. Compliance in this case could then be assessed by determining the
extent to which each individual adhered to the agreed upon plan. Members of the partner group demonstrated greater compliance than the members of the individual group. If compliance is defined here as completing the entire exercise program, i.e., earning all possible points, the partners had four times as many members reach 100% compliance than did the subjects exercising alone (8 Ss versus 2 Ss).

Follow-up Research

To further assess the impact of partner assignments and social reinforcement on exercise compliance, a follow-up study was conducted (Acosta, Dean, & Malott, 1986). Many of the same independent variables employed in the above-described research were again instituted. Eighteen subjects were randomly assigned to one of three groups: the structured group where subjects exercised together at a specific time and location, the partner group where each member exercised with a companion determined to be his or her best match, and the individual group where members exercised on their own. Standardized instructions and exercise record forms for this follow-up study were identical to those used in the preceding study. Also, the individual and partner group conditions and procedures were virtually the same.

A major change in the procedure involved the inclusion of a third experimental condition, the structured group. Participants of this group exercised together on Mondays, Wednesdays, and Thursdays. Members of the research team were present at all of the
exercise sessions. The exercise participants received reinforcement before, during, and after exercise in the form of positive feedback on their attendance, their progress, and their on-going exercise as it occurred within the class session. For example, a subject would be told some variation of what follows: "Good to see you today. Glad you could join our group," when he or she arrived at the scheduled meeting. "You are doing a great job today," or similar positive feedback as he or she engaged in exercise. And "Here's your earned bonus point for the class. Good work," at the end of the exercise session. Other than these differences, the members of the individual, partner, and structured groups could each earn the same number of bonus points for exercise (a total of five) that could be applied to their point total for their psychology class.

The results indicated that bonus points and social reinforcement were both effective in increasing the frequency of aerobic exercise. Fourteen out of 18 students, all of whom reported no exercise during baseline, started to exercise in the first week after the intervention conditions were in effect. Statistically significant differences were obtained between the structured and the individual groups and the structured and the partner groups but not between the individual and the partner groups. Each member of the structured group obtained 100% exercise compliance (i.e., attended the 10 sessions necessary to earn all of the possible bonus points) with the partners reaching 70% compliance and the individuals exercising alone only reaching 20% compliance. No subjects dropped out of either the

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partner or structured group as contrasted with the individual group which had four subjects drop out.

These results suggest that an individual may demonstrate greater exercise program compliance if he or she engages in the activity with a group, and will demonstrate less compliance if he or she attempts to exercise on his or her own. The partner group members did show increased compliance with decreased attrition in comparison with the individual group, but only the structured group had statistically significant results. The exact reasons for this are unclear. Reinforcement for exercise might be more readily available in the presence of several other people (i.e., as in the structured group), rather than in the presence of just one other person, as was the case with the partner group.

A behavioral analysis of exercise may help us understand why members of the partner and structured group conditions had greater compliance than the members of the individual group. Exercising, like any other behavior, will take place only when the necessary antecedents are present and when reinforcing consequences occur\(^1\) (Skinner, 1969). But the appropriate conditions for exercise are not commonly present in the day-to-day environment. The necessary antecedents for exercise are usually absent (e.g., an exercise companion may not be available and verbal prompts to exercise may not occur). Also, punishment, rather than reinforcement, often occurs when a person begins to exercise. Punishment can come from muscular aches and pain, from lost time and the inability to engage in more reinforcing activities, or even from family or peers if the

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individual chooses exercise over family or other convivial activities. Behavior will not be maintained if immediate reinforcement is lacking, when many of the positive outcomes that can be derived from exercise (e.g., weight loss, improved physical health, etc.) are temporarily unavailable or delayed. And delayed outcomes, even if powerful in their promise, do not directly reinforce or strengthen behavior² (Malott, 1984).

The optimal success of the structured group intervention and the moderate success of the partner interventions would suggest that participants in these two groups supplied both the necessary antecedents, punishment, and positive reinforcement for one another's behavior. Some of the antecedents could come in the form of verbal prompts as reminders, such as: "Don't forget to meet at the gym tomorrow so that we can exercise to earn extra credit." Subtle or overt interpersonal punishment might have occurred if an individual failed to agree to schedule an exercise session with his or her assigned partner, or similar verbal punishment may have later occurred if he or she decided to skip a group exercise meeting. (Subjects were students in the same psychology class; they did come into contact with one another on a regular basis.) Perhaps most important was the social, positive reinforcement that inevitably occurred when the subjects participated in an exercise session together. Such antecedents, punishment, and reinforcement were not equally available for the members of the individual group, and this difference may in part explain the lower exercise compliance rates of those subjects exercising alone.
General Analysis

The present research was developed, in part, in response to the published exercise compliance survey studies (see Martin & Dubbert, 1982, for a review). These retrospective evaluations of exercise programs have identified factors associated with non-compliance or low participant involvement. The partner assignments conducted in both the present study and the follow-up study (Acosta, Dean, & Malott, 1986) resulted from an analysis of these compliance data, in terms of the possible punishing or reinforcing features of various exercise programs. Possible sources of punishment were identified as involving: (a) time and scheduling difficulties, (b) difficulties with the intensity of exercise, (c) inconvenient exercise facility location, (d) lack of family (spouse) support, and (d) exercising alone (Shephard, 1971; Martin and Dubbert, 1982). To the extent possible, partner assignments resulted from matching individuals on their time and schedule preferences, their desired level of exercise frequency and intensity, their initial level of fitness, and their shared personal and professional interests and goals. This was done to minimize the possible aversive components of exercise, while increasing the probability that the individuals would find exercise to be both "fun and rewarding."

Martin et al. (1984) provided immediate social reinforcement to the exercise subjects in their study, and this procedure may account for their high program adherence rates. Also, the follow-up study
(Acosta, Dean, & Malott, 1986) required staff to be present at each exercise session of the structured group to provide feedback and individualized reinforcement. The time and staff costs are high when administering such a personalized exercise program, however, and alternative methods to achieve the same results are worth considering. One of the purposes of the present research was to extend the Martin et al. (1984) findings by relying predominantly on peers, rather than staff, for social reinforcement opportunities. This was possible by providing an individual with a partner for exercise activities. Thus, staff costs were greatly reduced.

Methodological improvements on the Martin et al. (1984) study included: The use of already employed recreational personnel for documentation of a subject's attending an exercise facility; the reduction of researcher influence on the subjects' performance by reliance on written, standardized instructions; and the circumvention of problems often associated with self-report measures by relying on staff-signed exercise record forms.

As mentioned earlier, the costs of the described exercise programs appear to be manageable. Five bonus points amounted to 2% of the student's course grade; thus the use of bonus points did not seem to pose a threat to standard academic evaluation criteria. Also, signatures from recreational staff appear to be a convenient and cost-effective method of documenting attendance at an exercise facility. Finally, although partner assignments required an analysis of individual "profile" sheets, this need not be a time-consuming task. Further research is necessary to determine which "profile"
questions are most important for purposes of completing compatible partner assignments. Some or most questions might be safely excluded with equally effective results.

The results of the pilot study (Johnson & Dean, 1985), the present study, and the follow-up study (Acosta, Dean, & Malott, 1986) together suggest that social reinforcement may be important for exercise compliance. The data from the present study and the follow-up study suggest that the partner assignments may be of value in encouraging exercise activity, but further suggest that larger "structured" group interventions appear to be the most effective. This research has shown that compliance is less and attrition is greater when individuals attempt to exercise on their own.

The present research also supports the findings of Massie and Shephard (1971) that team or group exercise programs appear to show more promise than individualized exercise programs, with the latter typically reporting poor success even when the membership costs incurred by the individual are high (Massie & Shephard, 1971) or when the dangers of not exercising are potentially life threatening (see Epstein, 1980, for compliance statistics involving "physician-advised" exercise). Perhaps individuals utilizing either health center programs or medical clinics could benefit from a modified application of the partner exercise system as designed in the present series of studies. If a partner system is employed, it may be important to match individuals on fitness levels, desired exercise intensity, and scheduling goals to minimize the sources of punishment often associated with exercise, while allowing for the rein-
forcement that is possible when individuals share personal and professional interests.

Future evaluations of the incentive components used here might be conducted in more controlled environments, with a geographically stable population. School vacations and residential relocations by students can make the evaluations of experimental procedures more difficult. Settings suited for further assessment of these interventions might be health clubs or the YWCAs and YMCAs. Club members of these organizations typically have more predictable living conditions and the program managers often have greater control over membership gratuities or monetary incentives.

Additional studies are necessary to determine the potential effectiveness of partners for exercise programs. If the sample size was large, compatible partner selections would be easier. One assumption (that awaits empirical validation) is that the greater the number of commonalities shared by the partners, the higher the likelihood that each person would find exercise to be a more rewarding experience (see Appendix A for the questionnaire used in the present research to select and assign partners). Future research could experimentally analyze these partner assignment procedures to extend the methodology employed here.

Previous surveys have indicated that most beginning exercisers would have preferred to exercise with others (Heinzelmann & Bagley, 1970); other studies indicate the superiority of group exercise programs over individual exercise regimens (Massie & Shephard, 1971). In addition, studies of exercise program attrition factors
have indicated the importance of spouse support (Oldridge, 1982).
The present research provides corroborative data. The suggestion
is that, for a potentially difficult activity such as exercise, suc­
cessful results are more likely with group membership and this
membership may be important even if the group includes only two
people. A comprehensive and systematic approach is provided by
the present research to make possible the development of an exercise
program that is designed to optimize the possible sources of social
reinforcement that can be obtained through group participation.

Clinical data suggest that exercise can help people "feel bet­
ter," enhancing their reported quality of life (Collingwood & Willet,
1971; Folkins & Sime, 1981). But more important, perhaps, are the
studies that suggest that exercise can serve an important role in the
treatment of, or the prevention of, behavioral and physical illnesses
(Boyer & Kasch, 1970; Richter, 1981; Stalonas, Johnson, & Christ,
1978). Many people apparently "want" to exercise, as exemplified by
the attitude surveys and by the research data that show high initial
enrollments in a wide range of exercise programs (see Shephard,
1985, for a review); but, most people who start exercising will soon
stop (Martin & Dubbert, 1982). Additional research is essential if
we are to design more successful exercise programs, programs that
effectively help people initiate and sustain a health promoting ac­
tivity.

The primary focus here has been on the initiation or acquisition
of an exercise regimen--that difficult stage when most would-be
exercisers are likely to drop out. The assumption is that delayed
health reinforcers will come into effect with sustained exercise effort. Extra management techniques may become less important as the natural benefits of exercise begin to occur. For instance, as an individual notices the weight loss or the increased physical vigor that often results from regular exercise, artificial or contrived sources of reinforcement for exercise may not be as necessary. The present series of studies can provide a useful framework and cost-effective measurement system for further investigation.
Footnotes

1. Antecedents, behaviorally defined, are stimuli that immediately precede a response and evoke its occurrence.

2. The inability of delayed consequences to directly reinforce behavior has been analyzed (Malott, 1984). A common practice of health professionals is to provide rules to clients in the form of advice or warnings to do, or not to do, a certain behavior because of some eventual outcome. But consequences are most effective when they occur contingent upon a response. Even expert advice may prove disappointingly ineffective if the consequences specified in the rule are not immediately forthcoming.
REFERENCES


Appendix A

Exercise Questionnaire
Note: All information that you provide here will be kept strictly confidential. Your name will never be mentioned in any form at any time. Of a volunteer nature, please respond with honesty to each question.

Name: ______________________ Phone #: _____________________________

Best times that you can be reached: ________________________________

Age: _______________ Height: _______________ Weight: _______________

Your hobbies and interests: __________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

How many days a week would you like to exercise? _________________

How many minutes would you like to spend each time? ______________

What would be your best day(s) and time(s) for exercising?

1) ______________________ 2) ______________________

3) ______________________ 4) ______________________

Why in your opinion do you not exercise as you'd like to?

_________________________________________________________________

What is your academic

Major? ______________________ Minor? ______________________

How do you like to spend your free
time? ____________________________

_________________________________________________________________
What are your goals or objectives, both short term and longer? (Include both personal and professional goals here.)

1) ____________________________________________

2) ____________________________________________

3) ____________________________________________

On a scale of one to five with five = "excellent," please circle what you believe to be your current level of physical fitness:

1  2  3  4  5

Please indicate your general physical condition by checking the appropriate description(s) below:

- [ ] overweight
- [ ] underweight
- [ ] low energy
- [ ] excessive energy
- [ ] anxious
- [ ] depressed

- [ ] Other descriptions (please explain):
  ____________________________________________
  ____________________________________________
  ____________________________________________

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Appendix B

Exercise Program Instructions
To: ______________________ Starting Date: _____________

Assignment: ______________________

Upon receipt of this instruction form, you are now able to earn bonus points for exercising.

1. To receive bonus points for exercise, you need to turn in a signed form (see attached sheet) each time that you exercise. Please have the staff person working at the exercise facility sign and date your form. Thanks.

2. Each exercise activity (with form signed) earns 1/2 bonus point. However, you must exercise for at least 20 minutes each time and you can only earn one-half point per day.

3. Forfeit of all points earned to date will result if your forms are found to be invalid or falsified in any way. Because accuracy of your exercise activity is critical to this program, I or a staff assistant will check to confirm your having exercised as reported. The person signing your exercise record form must be employed by the university as a member of the recreational staff. Please make sure that the phone number section of the report form is completed so that the staff person can be contacted to verify that he or she signed your form at the date and time as listed. This will be of great help to us. Thanks.

4. Note: You would have to engage in exercise activity 10 times (at 1/2 point each time) to obtain the full five bonus points possible. However, any single time will earn you point value and you can stop earning points at any time.
5. You have until the end of the semester to earn your five points. But you must turn your forms in no later than Friday of each week to earn your point(s) for that week.

6. Individuals assigned a partner are asked to exercise with that partner in order to earn bonus points.

7. Any individual who earns at least three points will have his or her name entered into the end-of-the-semester lottery for $20.00.
Appendix C

Exercise Forms
I. Exercise Plan Report

Please indicate below the day or days that you intend to exercise this week. If you do not plan on exercising, please write "None." Please list ONLY those times and exercise plans that you are sure of. Accuracy of your report and proof of your having exercised is VERY important for purposes of this study.

1) Day: ______ Time: ______ Exercise: ______ Place ______
2) Day: ______ Time: ______ Exercise: ______ Place ______
3) Day: ______ Time: ______ Exercise: ______ Place ______
4) Day: ______ Time: ______ Exercise: ______ Place ______

Your name: _________________________________

PLEASE NOTE: If you need to cancel or make any change in the above listed schedule, please call 383-0039 and let us know (leave a message). This is very important. Thanks alot.
II. Exercise Record Form

Name: ___________________________ Exercise: ______________________

Location: _______________________ Date: ___________ Time: ___________

Staff Signature: _____________________ Phone #: ________________

III. Exercise Report Form

Name: ___________________________ Today's Date: ____________

Please report the exercise that you have engaged in for the last week up until today's date. Most importantly, do NOT misrepresent or exaggerate your exercise report information. That is, be honest and do not report any more exercise than actually occurred.

There are no consequences for this self-report information. NO bonus points are involved since you are not formally earning points for exercise at this time.

<table>
<thead>
<tr>
<th>Type of Exercise</th>
<th>Number of Times</th>
<th>Time Spent</th>
</tr>
</thead>
</table>
BIBLIOGRAPHY


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