COMPLIANCE AND DROPOUT IN CARDIAC REHABILITATION

COMPLIANCE AND DROPOUT
IN A SUPERVISED EXERCISE PROGRAM OF CARDIAC REHABILITATION:
Contributing Factors and Follow-up Status

By

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ABSTRACT

Exercise programs designed for cardiac patients frequently report high dropout rates. Little is known about the reasons for this high rate of dropout; further, little is known about health behavior patterns including physical activity subsequent to graduation or dropout from exercise programs. Identification of reasons for dropout and the pattern of physical activity after participation in formal exercise rehabilitation would provide information regarding achievement and maintenance of treatment goals.

Entry characteristics were determined for 84 male cardiac patients (45 compliers and 39 dropouts) from the McMaster Cardiac Rehabilitation Exercise Program. Follow-up information pertaining to areas of: a) health; b) employment, smoking, activity, and dietary status; c) reasons for joining the program; d) perceived benefits achieved; and e) factors contributing to compliance with or dropout from the exercise program was obtained from 63 subjects (41 compliers and 22 dropouts) who responded to a questionnaire by mail.

The dropout rate at the end of the 6 month program was 46.4% (39 of 84 subjects) with one-half of all dropout occurring within the first 2 months of the 6 month program. Upon entry into the exercise program, a significantly greater

proportion of dropouts (43.6%, n=17) than compliers (8.9%, n=4) were found to be regular smokers. Likewise, a significantly greater proportion of dropouts (82.1%, n=32) than compliers (55.6%, n=25) were found to be inactive in their leisure habits upon entry. Dropouts were also more likely to be blue collar workers (71.8%, n=28), and younger in age ($\bar{x}$ age = 48.4 years) when compared to compliers (37.8%, n=17; $\bar{x}$ age = 54.3 years) upon entry into the exercise program. Upon follow-up, compliers were significantly more likely to report active leisure habits (85.4%, n=35) than were responding dropouts (45.5%, n=10). Compliers were also significantly more likely to report moderate work activity levels upon follow-up (54.8%, n=17) compared to dropouts (22.2%, n=4). Reasons for compliance to and withdrawal from the exercise program provided by respondents centred around psychosocial and personal convenience categories.

Although statistically significant, the greater follow-up activity levels noted among compliers in this study appear to be only temporary, short-term patterns which tend to diminish with time. It is suggested that compliance-improving strategies be developed through further study with the aim of encouraging the long-term maintenance of desired behavior change.

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DEDICATION

To Brian and Dolores

My Parents

"Men's curiosity searches past and future ..."

T.S. Eliot

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CHAPTER I

INTRODUCTION

Noncompliance with medical regimens presents a major problem in health care and acknowledgement of this problem has led to an increase in the number of scientific investigations dealing specifically with compliance to various forms of therapeutic regimens (Haynes, 1979). It is difficult to provide accurate reports of the effects of a treatment in question if noncompliance becomes a problem since it is possible for a person who does not comply with a particular regimen to still attain the treatment goal just as it is possible for a person not to attain the treatment goal despite high compliance (Sackett, 1976). Such observations can be made in situations of over-prescribing or under-prescribing the treatment under investigation.

Exercise programs for cardiac patients frequently have high dropout rates (Wilhelmsen et al., 1975; Bruce et al., 1976; Oldridge et al., 1978; Oldridge, 1979c; Carmody et al., 1980). Through identification of the reasons why people drop out of exercise programs, attempts can be made to improve upon those aspects of the program which are found to contribute to the dropout rate, and specific compliance-improving strategies can be initiated to reduce the rate of dropout. It has been suggested (Wilhelmsen et al., 1975;

Oldridge, 1979c; Andrew et al., 1981) that attempts to reduce the high rate of noncompliance characteristic of cardiac patients enrolled in exercise programs could be furthered through the identification of reasons why people drop out. Alternately, it may prove beneficial to investigate reasons why compliant individuals continue their participation in the exercise program (Andrew et al., 1981). Further, it is conceivable that the likelihood of achieving and maintaining short and/or long-term treatment goals (i.e., changes in lifestyle and increased functional capacity), may be increased through the reduction of noncompliance.

Maintenance of behavior change following participation in an exercise program designed for patients with coronary heart disease (CHD) has not been adequately investigated (Bruce et al., 1976).

The purpose of this study was:

1. To identify reasons why patients chose to dropout of or comply with a supervised program of physical activity; and
2. To identify, on follow-up, differences between compliers and dropouts in areas of:
   a) health;
   b) employment;
   c) smoking;
   d) activity; and
   e) dietary status.

The results of such investigation may provide information regarding the design, implementation and use of appropriate compliance-improving strategies. In this manner, the need to optimize or perhaps improve upon certain aspects of the treatment intervention may become more clear.

Definitions

The following terms are so defined for the purpose of this study.

Compliance. The degree to which subjects adhere to a prescribed therapeutic treatment relative to the time elapsed since inception of the treatment (Sackett, 1976)

Dropout. A subject who is absent from eight or more consecutive supervised exercise sessions (excluding temporary withdrawl due to illness, vacations, etc.).

Complier. A subject who is not classified as a dropout (i.e., all those who were not reported absent from eight or more consecutive supervised exercise sessions for reasons other than illness, vacations, etc.).

Delimitations

1. The subjects of this study were males between the ages of 29 and 69 years who resided in the Hamilton-Wentworth area.

Limitations

1. The population sample may have been biased due to the limited size and the fact that subjects were not randomly selected.
2. The results of the present study are limited by the ability of the subjects to appropriately respond to the research tool.

Assumptions

The following assumptions were made:

1. that the research tool was designed to adequately elicit appropriate responses from all subjects; and
2. that subjects responded freely to the research tool on the basis of their own experience and opinions.

Rationale for the Study

The question of "What happens to dropouts following termination of participation in the exercise program?" remains to be adequately answered. In addition, an attempt to follow-up persons who have graduated from participation in the exercise program would allow for determination of whether or not certain behavioral treatment goals have been achieved, and whether they are being maintained. A follow-up comparison between compliers and dropouts would tell us whether compliance to the exercise program leads to achievement

and maintenance of treatment goals. It may be that dropouts are just as likely to achieve and maintain certain treatment goals. Follow-up would also enable the identification of those patients who, despite high compliance, have not reached the treatment goals and those patients who, despite dropout, have reached the treatment goals; it would also enable the identification of those patients most likely to benefit from compliance-improving strategies.

CHAPTER II

REVIEW OF LITERATURE

The literature reviewed in this chapter is divided into two major sections. The general literature relevant to the present investigation is reviewed in the first section for factors related to dropout from health care. Information pertaining to entry characteristics of potential dropouts, factors related to dropout, and follow-up studies of compliers and dropouts from exercise programs are reviewed in section two.

For the purpose of clarity, the literature reviewed in the second section has been further organized according to whether the studies dealt with primary prevention (i.e., those studies involving subjects who had no documented history of CHD) or secondary prevention (i.e., those involving subjects with documented history of CHD).

The majority of studies reviewed in this chapter involved only male populations. Therefore the male pronoun is used throughout the present review of literature.

I HEALTH CARE

a) Factors Related to Dropout From Health Care

Noncompliance (herein used synonymously with dropout) presents a real threat to the success of any health care program. The potential benefits to be gained by patients receiving a particular medical treatment might not be realized if noncompliance becomes a problem. Further, outcomes of any therapeutic trials investigating the value of a particular treatment will no doubt remain distorted either in favor of or against the treatment.

The study of compliance in health care may be justified from the realization that medical or therapeutic regimens or interventions cannot be fairly evaluated for effectiveness unless they are actually applied. Further support for the study of compliance through the analysis of cost-effectiveness of treatment and prevention programs has been reviewed (Dunbar and Stunkard, 1979). With regard to antihypertensive regimens, Dunbar and Stunkard cite evidence that when equal amounts of money are spent on both compliance-improving programs as well as programs designed for the detection of new cases of hypertension and the initiation of treatment, the programs aimed at improving compliance are more cost-effective in terms of the resulting impact on death and disability.

The basis for the relatively high rate of noncompliance in health care stems, in part, from the fact that it is not

the physician's responsibility to watch his/her patients 24 hours per day. This is particularly true among those receiving treatment on an out-patient basis, and those whose treatments are self-administered (Blackwell, 1976). It is, in fact, the patient's responsibility to both adopt and comply with the recommended treatment. Whether or not these patient responsibilities are met most probably is a function of the degree of supervision and support made available to the patient both in the treatment setting and in the family. The patient's willingness to accept the responsibility to adopt and comply with a prescribed treatment may also be related to the patient's degree of motivation. The level of motivation will likely vary according to the individual's perception of the treatment goal (Becker, 1976).

Certain features of the treatment regimen itself are reported in the general literature to influence compliance. Rates of compliance have been reported to decrease when the treatment regimen: 1) must be carried out over a long-term basis (Marston, 1970; Blackwell, 1976; Dunbar and Stunkard, 1979; Haynes, 1979); 2) is complex, particularly when more than one treatment is required (Marston, 1970; Blackwell, 1976; Dunbar and Stunkard, 1979; Haynes, 1979); and 3) requires a change in lifestyle (Dunbar and Stunkard, 1979). In fact, it has long been suggested that treatment regimens should be designed to fit the lifestyle of the patient in order to optimize the opportunity for improved compliance (Marston, 1970; Blackwell, 1976).

Although it has been a popular belief in the past that noncompliance will result from the presence of unwanted side effects (Blackwell, 1976), the majority of evidence cited in a review by Haynes (1979) indicated the lack of any direct association.

The influence of treatment cost upon compliance has not been thoroughly determined, and a review of studies investigating this factor suggests that although results are conflicting, cost of treatment is not a factor to be ignored (Haynes, 1979).

Various features of the disease under treatment have been reviewed and determined to be comparatively insignificant as determinants of compliance (Haynes, 1979). There is a tendency towards a negative correlation between the number of symptoms and compliance (Haynes, 1979). However, there appears to be no correlation between severity of symptoms and compliance (Marston, 1970; Haynes, 1979). Although the duration of the illness does not appear to influence compliance, a positive relation has been found to exist between degree of disability caused by the disease and compliance (Haynes, 1979).

As suggested by Haynes, the finding of a positive association between increasing degree of disability and increasing compliance is most likely related to the greater level of supervision often found in cases of increasing disability and may not necessarily reflect the severity of the disease.

In determining which features of the clinical setting act to alter compliance, various reviews report that waiting time alters compliance; specifically, longer waiting-times are more frequently reported among noncompliers (Blackwell, 1976; Dunbar and Stunkard, 1979; Haynes, 1979). Other features such as the patient-clinician relationship have received recognition for their potential to influence compliance (Dunbar and Stunkard, 1979; Hulka, 1979). Those features of the patient-clinician relationship relevant to the present review for their potential to influence compliance include the attitudes and behavior of the physician towards the treatment and the patient (Marston, 1970; Blackwell, 1976), as well as patient satisfaction with health care (Marston, 1970; Dunbar and Stunkard, 1979). Negative attitudes held by the physician toward the treatment and the patient, as well as a decrease in patient satisfaction with health care have all been associated with decreased compliance. Further, noncompliance is reportedly greater among patients receiving care in a clinical setting as opposed to those in private practice. Often, patients attending clinics received care from various physicians; a factor reported to decrease compliance. Those attending private practices are more likely to see the same physician with each visit. This may contribute to the development of better patient-physician communication; no doubt a positive influence on compliance to a certain extent.

Summary. A review of the general compliance literature reveals several factors to be associated with dropout from health care. The complexity and duration of the regimen are recognized as important determinants of compliance in health care, as are certain features of the patient-clinician relationship.

II EXERCISE PROGRAMS

The relevance of the preceding observations to the study of compliance with exercise rehabilitation will become clear throughout the following sections. Many exercise conditioning programs are complex by nature and must be carried out over a long-term basis. Rehabilitation exercise programs designed for cardiac patients involve changes in lifestyle. To place the patient in a situation where he is required to participate in exercise training two or more times per week may demand a significant change in that person's lifestyle. Whether or not that person will choose to make that change in lifestyle may depend on such factors as his own degree of motivation which, in turn, may be influenced by the complexity of the change required to comply with the regimen as well as the number of changes required. The physiological training effects of exercise may take some time to become apparent so a regimen of exercise is likely to be of long duration (Ekblom et al., 1968; Saltin, 1969). Further, the regimen must continue to be maintained if the resulting benefits are to be maintained.

Not only must the individual choose whether or not to adopt the exercise regimen; he must also decide whether or not he will continue to maintain such lifestyle changes throughout the remainder of his lifetime. The decision of whether or not to maintain regular exercise habits may necessitate rather large changes in behavior, particularly for those individuals accustomed to leading more sedentary lifestyles. Further, the degree of interpersonal support provided by significant others may serve to influence the individual in his decision to comply with exercise program requirements (Heinzelmann et al., 1970; 1973).

a) Entry Characteristics of Potential Dropouts

A limited number of studies have attempted to deal with the problem of noncompliance to exercise programs designed for cardiac patients. Such studies have been carried out to better understand the dropout phenomenon including identification of characteristics which may be associated with noncompliant behavior.

Secondary Prevention Programs. A comparison of dropouts and active participants enrolled in the Cardiopulmonary Research Institute (CAPRI) exercise program revealed that subjects in both groups were initially homogeneous with respect to physical (age, height, weight) and functional (cardiovascular fitness) entry characteristics (Bruce et al., 1976).

A prospective study (Oldridge et al., 1978) of 163 men with previous myocardial infarction (MI) referred to an exercise program attempted to identify characteristics of early dropouts (i.e., within one month of entry). The results suggested that dropouts were significantly more likely at entry into the study to have been regular smokers, have experienced two or more previous MI's, have been inactive during their leisure time, and exhibited characteristics of the type A behavior pattern (i.e., agressive, competitive, hostile, with sense of time-urgency, achievement oriented). In view of these results, the investigators concluded that those patients who exhibit a greater number of coronary risk factors, and thus who may have a greater likelihood of recurrent MI, are most likely to be dropouts. The need for reducing noncompliance thus becomes clear since it may very well be that the potential dropout is likely to be the high risk individual and lack of compliance may reduce the possibility of achieving at least short-term treatment goals which are often inherent to exercise programs (i.e., weight control, cessation of smoking, increased leisure activity, and improved cardiovascular function). Although evidence as to the effectiveness of these programs remains inconclusive, one non-exercise study reports that the sudden decrease in smoking noted among male CHD patients was maintained during 4 years of follow-up (Weinblatt et al., 1971). However, the decrease in body weight observed in these same CHD patients was not maintained during follow-up (Weinblatt et al., 1971).

Analysis of entry characteristics of the dropouts in the Ontario Exercise Heart Collaborative Study (OEHCS) as a whole (Oldridge, 1979c) indicated that the potential dropout was likely to be a smoker, blue collar worker, with inactive leisure habits, and who had light energy demands in his work. This appeared to hold true for dropouts regardless of whether the withdrawl occured during the early or later months of the exercise program. Those dropouts who withdrew during the early months of the program also were more likely to have had more than one previous MI prior to entry in addition to the other above-mentioned characteristics when compared to compliers.

Kavanagh et al., (1979) and Shephard et al., (1981) reported a high rate of compliance (96.6%) among 610 male post-MI patients enrolled in a 2-year-plus secondary prevention exercise program. Risk factors such as cigarette smoking, and various symptoms indicative of advanced CHD were more frequently observed characteristics among the 3.4% considered as noncompliers (i.e., those who had stopped exercising altogether), than among the compliers (i.e., the 96.6% who continued exercising either at the centre or at home), although these factors were not found to significantly influence exercise compliance. Thus, although a poor prognosis was more frequently related to those who continued to smoke and failed to comply with the exercise program, the favorable prognosis associated with compliance was not found to be related to differences in smoking behavior or disease

severity. The fact that the subject population consisted predominantly of white collar workers has been suggested by Kavanagh and co-workers as being one possible explanation for the high rate of compliance observed in their study.

Summary. Certain results in the CAPRI study failed to identify potential dropouts on the basis of physical and functional entry characteristics such as age, height, weight, and initial cardiovascular fitness. However, findings of the OEHCS study indicate that certain socio-behavioral entry characteristics, when combined, provide important information leading to the early identification of potential dropouts since potential dropouts were shown to have a number of such characteristics in common.

It is possible that the potential dropout may be the individual who is at high risk of recurrent MI. Since exercise is contraindicated for some post-MI patients (Blackburn, 1974), it may be that an undetermined proportion of the dropout rate in exercise programs may occur through the process of self-selection. It has been suggested that noncompliance may reflect a perception of poor prognosis on the part of the patient suffering the more severe stages of CHD (Kavanagh et al., 1979; Oldridge, 1979c). An individual who regards the physical and behavioral demands of the exercise program as likely to exceed his capabilities, may elect to drop out of the program. To date, this speculation lacks

support, as indicated by reports of Kavanagh et al., (1979) and Shephard et al., (1981), who concluded that noncompliance in their study was not due to progress of CHD since the favorable prognosis of compliers in their study was not associated with smoking behavior or disease severity, despite the fact that the subject population was highly self-selected.

Early identification of potential dropouts may lead to a reduction in noncompliance which, in turn, would allow for more conclusive evidence regarding effects of exercise as a treatment intervention.

b) Factors Related to Dropout From Exercise Programs

The majority of studies reviewed in this section deal with factors related to dropout from exercise programs. Additional studies look at factors related to the individual's decision to comply with exercise. Studies involving primary prevention exercise programs are presented and reviewed first, followed by studies which focus on secondary prevention exercise programs.

i) Primary Prevention Programs. Heinzelmann and Bagley (1970) have provided evidence that spouse support may alter compliance. Their study involved 381 middle-aged male volunteers who were considered to be at risk of developing CHD, as determined by various characteristics of their blood pressure readings and cholesterol levels. At the beginning of the 18 month exercise program all participants were asked

to list factors which they felt were most influential in their decision to participate in the exercise program. Participants indicated that the desire to please their wives was among the least important reasons for their initial decision to participate. Following the completion of the 18 month program it was found that the attitudes of the wives towards the exercise program were directly related to the participants' pattern of continued participation over time. More specifically, 80% of the men whose wives' attitudes were positive exhibited good or excellent patterns of compliance compared to only 40% of men whose wives' attitudes were neutral or negative.

As reported by Heinzelmann (1973), factors which may function to motivate participation in the exercise program may include a desire to improve health status, opportunity for recreation, and a change in routine. However, those factors which may act to promote compliance to the exercise program over time appear to include the organization and leadership of the program, the games and social aspects of friendships acquired, and the support of significant others (i.e., spouse and family, friends, co-workers) (Heinzelmann, 1973). Heinzelmann suggests that since program participation and compliance over time may be influenced by the degree of interpersonal support, the exercise program should be designed to allow for the involvement of the participant's spouse/family, friends, and co-workers, in order that the attitudes and reactions of these significant others may serve to reinforce the patient's participation.

The findings of Heinzelmann and colleagues (1970; 1973) should serve to reinforce a possible conclusion of studies investigating factors related to dropout or compliance with exercise programs; the decision to participate in an exercise program may be based upon factors which differ from those factors which influence compliance throughout the duration of the program. In other words, factors influencing an individual's motivation to adopt a particular treatment may differ from those influencing his decision or motivation to maintain or comply with that treatment.

A feasibility study of an 18 month prevention exercise program involving a total of 178 selected volunteer subjects screened for number of coronary risk factors was carried out in Helsinki, Finland (Teraslinna et al., 1971; Oja et al., 1974). Only 8 out of 89 subjects assigned to the exercise group dropped out. Medical reasons represented the most common cause of dropout in this study.

The results of the Helsinki study, as well as those of any study involving either selected or volunteer subjects, should be approached with considerable caution since these types of sample populations may include a built-in compliance bias (Feinstein, 1979). The subjects in the Helsinki study were screened upon their entry into the study for number of coronary risk factors, their accessibility to the exercise centre, and their motivation to participate in the exercise program. It is possible that the compliance results of this and other such studies may have been biased since

motivation coupled with the volunteer factor may act to influence compliance (Becker, 1976). An investigation of volunteer bias in exercise programs conducted by Remington et al., (1978) revealed that subjects who volunteer to participate in exercise programs may not be representative of the population from which they come due to the process of self-selection. It is possible that subjects at high risk of developing CHD are less likely to volunteer to participate in an exercise program. Since individuals considered to be at high risk of recurrent MI tended to drop out during the early stages of an exercise program in at least one study (Oldridge et al., 1978) this process of self-selection may be a factor to consider among early dropouts. The volunteer bias factor renders comparisons between studies difficult.

A second factor which may lead to conflicting results among various studies which provide data on compliance is related to the lack of a universal operational definition for compliance. In the Helsinki study (Teraslinna et al., 1971; Oja et al., 1974) only those individuals who withdrew completely from the study were considered as dropouts for the analysis of compliance. A few additional subjects were reported to have relatively low attendance rates for the duration of the study but were not considered to have withdrawn from the exercise program. It becomes interesting to note, that examination of reasons for low attendance revealed the most common cause to be conflicting work schedules and work trips

followed by illness. These findings tend to confirm the results of secondary prevention studies to be presented in the next sub-section. Similarly, Kavanagh et al., (1979) and Shephard et al., (1981) considered as dropouts only those patients who had stopped exercising altogether. Those who were exercising either at the exercise centre or at home were considered as compliers for the purpose of analysis. Such broad definitions of compliance employed in both studies may account for their very high compliance (low dropout) rates when compared to other studies in the literature.

ii) Secondary Prevention Programs. An investigation into the feasibility of a secondary prevention physical training program for 151 randomly selected post-MI patients in Goteborg, Sweden (Sanne and Rydin, 1973) revealed that medical cardiac reasons represented the most common cause of early dropout. Various cardiac complications observed in these patients would not allow for their continued participation in the exercise study. The second most common cause of dropout in the Goteborg study was observed to be practical difficulties followed by other medical disorders. Practical difficulties altering the rate of compliance included such factors as program accessibility, type of training facilities, cost of transport to the training centre, and the time of training. These results indicate that local factors may have the greatest influence upon the decision to withdraw. Thus, a patient may be more likely to withdraw if various local factors such as

location and time of program sessions are perceived by the patient as being inconvenient. Wilhelmsen et al., (1975), reporting on the same study, suggested that compliance may be improved by increasing accessibility to the training centre and through the provision of training facilities in the home or place of employment.

Bruce et al., (1976) reported interim results obtained from the CAPRI program. Causes of dropout among 317 male volunteers were grouped into four categories:

1. Unavoidable (i.e., work conflicts, change in residence, financial reasons);
2. Psychosocial (i.e., lack of motivation and interest, personal family problems);
3. Medical; and
4. Unknown.

The most common causes of dropout among male cardiac patients in the CAPRI exercise program were those categorized as Unavoidable (34%), followed by Unknown (29%), Medical (21%), and Psychosocial (16%).

Using the same classification system employed by Bruce and co-workers, Oldridge et al., (1978) investigated reasons for dropout among the non-selected Hamilton cohort of the OEHCS study. Psychosocial reasons were identified as being the leading causes of dropout within one month. However, among those classified by Oldridge and colleagues as late noncompliers (i.e., those who dropped out sometime

between the first and twelfth month of the program), slightly more dropped out due to unavoidable reasons than for psychosocial reasons.

Oldridge (1979c) reports that the leading causes of dropout among all seven cohorts of the Ontario study were classed under the general category of psychosocial reasons (42%), followed by unavoidable (25%), and medical reasons (22%). The major reasons for dropout from exercise programs tend to centre around the psychosocial and unavoidable categories depending on whether the dropout occurred during the early or later stages of the program. These findings suggest that compliance-improving strategies be developed through consideration of both unavoidable and psychosocial factors.

Andrew and Parker (1979) have prepared the first detailed report dealing with factors related to dropout from organized exercise in cardiac rehabilitation. Three categories of factors were found to demonstrate significant intergroup differences between dropouts and compliers: Program factors; convenience factors; and family/lifestyle factors. Dropouts differed significantly from compliers in their perception of the program in that they lacked enthusiasm for the program and experienced a higher level of fatigue following participation in the exercise sessions. With respect to personal convenience factors, dropouts reported having difficulty arriving on time for the exercise sessions. Also, their jobs were reported to interfere with their ability to attend the program;

similarly, the program was perceived by dropouts as interfering with their jobs. These observations tend to agree with previous findings that program and personal convenience factors may be related to dropout from exercise programs designed for cardiac patients.

Family/lifestyle factors found to be related to dropout included greater difficulty in relaxation, and lower expectation of increase in income since their infarction. In addition to these findings, the wives of the dropouts were less supportive of their participation in the program, and in fact, were more doubtful of the beneficial effects of exercise than were the wives of compliers. These findings provide additional evidence to the previously presented observation that spouse support alters compliance (Heinzelmann and Bagley, 1970; Heinzelmann, 1973).

More recent reports (Andrew et al., 1981) of the Ontario study provide further support to previous findings that local and personal convenience factors may act to determine the extent of compliance. Evidence has also been presented (Andrew et al., 1981) in the Ontario study for the importance of the role played by staff of the exercise program. Further, a lower dropout rate was observed among those who held a strong belief in the value of exercise, supporting the view that such beliefs may act to influence patient compliance (Blackwell, 1976).

Among the results of the study carried out by Kavanagh et al., (1979) and Shephard et al., (1981), reasons listed for the 3.4% dropout rate were, in order of frequency, lack of interest/family opposition, medical reasons, and advice by physicians to stop exercising. It was suggested by the investigators that certain factors may have contributed to the high rate of compliance: 1) physician referral resulting from patient interest; 2) feedback information regarding patient progress; 3) convenience of home exercise program; and 4) prevalence of white collar workers among the subject population.

The reasons provided by these researchers as a possible explanation for the high rate of compliance observed in their study do tend to have some support. The lowest dropout rate among the seven cohorts of the OEHCS study was reported by the one centre in which all patients were admitted into the exercise program by physician referral. In the same study, the highest dropout rate was reported by the only centre in which all subjects were recruited from hospital records (Oldridge, 1979c). This evidence may support Kavanagh and Shephard et al., (1979; 1981) in their speculation that the high compliance rate found in their study may have been partially a result of physician referral resulting from patient interest.

The OEHCS finding of a high number of blue collar workers among dropouts from that study lends support to the postulation of Kavanagh and colleagues (1979) that prevalence

of white collar subjects in their study may explain in part the high compliance rate. The convenience of a home exercise program has been recommended in previous studies (Wilhelmsen et al., 1975) as a possible means of increasing compliance. However, Sackett et al., (1975) have shown that provision of follow-up hypertension care in the work place failed to have an effect on the level of compliance with hypertension care. Due to the conflicting nature of these results, it is difficult to provide conclusive support in favor of the postulation by Kavanagh et al., (1979) that the high rate of compliance found in their study may have been due to the convenience of a home exercise program. More likely, all these factors interacted in some way to produce the high rate of compliance.

Summary. The results of studies investigating reasons why people drop out of exercise programs suggest that there are certain fundamental factors which may act to alter compliance. These factors include program accessibility and other local factors (i.e., type of facilities, type of regimen and exercise, duration of program, time of sessions, cost of transport); degree of motivation or interest; attitude of the patient, his spouse, and his physician toward the treatment intervention.

Further investigation is needed to support the findings of what few studies there are which present data pertaining to the motivation to participate initially, as well as factors related to compliance and dropout. The results of the studies

presented in this section do indicate that motivational factors for joining an exercise program tend to differ from those factors influencing the individual's decision to continue his participation.

c) Follow-up Studies of Compliers and Dropouts From Exercise Programs

Few studies are reported in the compliance literature which deal with follow-up of compliers and dropouts from exercise programs. One major reason for the lack of adequate follow-up may be the difficulty in contacting subjects once they have left the program due to changes in residence, or place of employment. Those reports which do exist are presented and discussed in this section.

i) Primary Prevention Programs. Ilmarinen and Fardy (1977) conducted a 3-year follow-up of 160 subjects considered to be at high risk of developing CHD, and compared the results of those patients who had originally participated in an exercise program to those who had originally served as matched controls. A comparison of physical activity habits (following the original exercise program) between the original control group and the original exercise group indicated that participation in the exercise group did not result in an increase in exercise habits over the 3-year follow-up. In fact, among patients in the original exercise group, a significant decrease in training was observed, while a

significant percentage of the control group was observed to increase their level of training. In addition, there was no difference between the original exercise and control groups with respect to the incidence rate of CHD during the 3-year follow-up. Changes observed to occur during the follow-up with respect to smoking behavior and fatty food intake (lifestyle habits) did so independently from original and follow-up activity levels. The investigators concluded that the original exercise intervention program produced little, if any, long-lasting effect upon health, physical activity, and other lifestyle habits.

In an attempt to determine the long-term effects of an exercise intervention program on "classical" risk factors (i.e., smoking, obesity, physical activity habits, blood pressure, and serum lipid concentrations), Sedgwick et al., (1980) re-examined 370 apparently healthy sedentary males 4 to 6 years following their initial enrollment in a 12-week physical training program. The subsequent follow-up indicated that there was no overall change in smoking behavior or weight, and only one-third of the initial group had remained active to the time of follow-up. Although the inactive group was found to have decreased in level of fitness, while those who remained active had increased their level of fitness over the time of follow-up, the fitness level of the group as a whole remained relatively stable. Overall, CHD risk factors were not significantly influenced through activity or fitness in this study.

It thus becomes apparent that the findings of the primary prevention studies presented in this section do not support the view that participation in a supervised exercise program will result in long-term acceptance of the behavior change, or that CHD risk factors will be positively affected.

ii) Secondary Prevention Programs. In the CAPRI study, Bruce et al., (1976) constructed a follow-up health questionnaire which was designed to gather information regarding present employment, health, and activity status of both dropouts and compliers of the exercise program. Significantly greater employment levels were observed among compliers compared to dropouts upon follow-up. Unfortunately, no data is provided by Bruce and co-workers with respect to employment status of the two groups at the time they first entered the exercise program; thus it is not known whether the difference in employment status between the two groups occured as a result of continued participation in the exercise program. Less than 40% of the male dropouts continued to pursue some form of physical activity after leaving the program. There was no significant difference in mortality rate between compliers and dropouts during follow-up. The findings in relation to health of the subjects are essentially similar to previously discussed findings of primary prevention exercise studies.

Summary. Results of the follow-up studies presented in this section imply that continued participation in an exercise program may be associated with continuing employment

among compliers. However, there appears to be little, if any, subsequent effect upon health, physical activity, and other lifestyle habits.

Existing literature to date does not allow us to determine whether any potentially beneficial effects of exercise are the result of the exercise itself, or factors indirectly related to compliance with the recommended program of exercise. Clearly, further follow-up investigation is required in the area of compliance to exercise programs before any solid conclusions can be drawn.

CHAPTER III

METHODOLOGY

This study was designed to determine the reasons why male cardiac patients comply with or drop out of an exercise program, and to ascertain changes in health, employment, smoking, activity, and dietary status of all subjects from the time of their entry into the program to their completion of (or dropout from) the program.

A follow-up questionnaire was sent by mail to 80 potential subjects and the results were analyzed in order that group comparisons could be made between dropouts and compliers.

The subject selection process, procedures for the design of the questionnaire and collection of data are described in this chapter. Statistical methods used for analysis are also outlined.

Subject Selection

All consecutive male cardiac patients who entered the McMaster Cardiac Rehabilitation Exercise Program between September 1, 1978 and October 31, 1979 (N=84) were considered subjects for this study. Three subjects identified as deceased since their date of entry into the program, and one subject who had moved overseas leaving no forwarding address were immediately excluded from receiving a questionnaire.

The remaining 80 potential subjects were each sent a package complete with an introductory cover letter (Appendix A) outlining the purpose of the study and requesting their participation, a copy of the questionnaire (Appendix B: as received by compliers; Appendix C: as received by dropouts), and a pre-addressed, stamped envelope for return of the questionnaire by mail.

All potential subjects, having been referred to the exercise program by their physicians, were considered to have met the following criteria for inclusion into the exercise program based upon an initial assessment:

a) Documented coronary heart disease as manifested by one or more of the following conditions:

   i) angina pectoris (AP);
   ii) myocardial infarction (MI);
   iii) coronary bypass surgery;

b) Hypertension not greater than 160 mmHg Systolic or 110 mmHg Diastolic at rest;

c) Non-diabetic or, if diabetic, not insulin dependent;

d) Absence of cardiac failure and serious dysrhythmias;

e) Free of any orthopedic disability which would limit progressive physical activity (e.g., loss of leg or osteoarthritis of the hip);

f) Absence of significant airway obstruction in spirometric measurements (i.e., FEV_1/VC of not less than 60%).

The initial assessment consisted of a patient interview and physical examination conducted by the attending physician, as well as a Stage I progressive exercise test on the bicycle ergometer during which heart rate (HR), ventilation

(Ve), blood pressure (BP), and the electrocardiogram (ECG) were monitored both at rest and during exercise (Jones and Campbell, 1981). Resting spirometric measurements of vital capacity (VC), and forced expiratory volume in one second (FEV_1) were also recorded for each patient.

Design of the Questionnaire

The questionnaire used in this investigation was constructed based upon various questionnaires previously employed by Heinzelmann and Bagley (1970); Oldridge (1979c); Andrew and Parker (1979); and the Department of Clinical Epidemiology and Biostatistics of McMaster University Medical Centre in Hamilton, Ontario. Specific questionnaire items were chosen for their relevance to the purpose of the present investigation.

Construction of the Address List

The address list of subjects was constructed from a search of patient charts located in the Cardiorespiratory Unit of the McMaster University Medical Centre.

Procedures for Data Collection

Entry Data. Patient charts were examined for information obtained upon entrance into the exercise program with respect to employment status, activity and smoking habits, medication, height, weight, and date of birth. This information was required in order to ascertain any changes in these areas of investigation following participation in the exercise program.

Follow-up Data. A ten-page questionnaire (Appendices B and C) was sent by mail to all 80 subjects. The first 8 pages of the questionnaire contained questions designed to gather follow-up information pertaining to the areas of health, employment, smoking, activity, and dietary status of each individual and were identical for all 80 potential responding subjects. Pages 9 and 10 received by those classified as compliers (Appendix B) contained a list of statements designed to ascertain reasons for their decision to continue attending the exercise program. Those potentially responding subjects classified as dropouts received pages 9 and 10 (Appendix C) which differed from those received by compliers in that the statements for dropouts were designed to ascertain reasons for the withdrawal from the program.

Subjects were instructed to complete the questionnaire and return it by mail in the enclosed pre-addressed, stamped envelope within 2 or 3 days of having received it.

Follow-up Reminders

First Wave. All individuals whose response to the questionnaire was not received within 2 weeks from the date of posting received either a telephone call or a letter (Appendix D) reminding them that their response was needed.

Second Wave. One week following the date of the first reminders, a second set of reminders was given to all individuals whose response was not received to date. Those

who received their first reminder via the telephone received the letter as their second reminder. Telephone calls were placed to all those individuals who had received their first reminder by mail.

Third Wave. One week following the date of the second wave reminders, non-responding subjects were contacted by phone in order that appointments could be set for the investigator to visit with the subjects at their homes and aid in the completion of the questionnaires. In most all instances, subjects receiving the telephone call indicated that a home visit would be unnecessary and that the effort to complete and send in the questionnaire would be made. When necessary, additional questionnaires were sent out to those subjects who had lost or misplaced theirs.

Further reminder telephone calls were made to those individuals who had indicated their intentions to complete and return their copies of the questionnaires but who had neglected to do so within one week of the third wave reminder telephone calls. In some instances, the questionnaires were completed during these additional telephone calls.

Completion of Missing Data

Some of the questionnaires were returned with certain questions unanswered. Answers to these questions were gained through telephone calls to the respective subjects.

The Exercise Program

Subjects were given the opportunity to participate in the exercise program 2 nights per week for one and a half hours per session (5:30 p.m. to 7:00 p.m.). The exercise sessions consisted of 15 minutes of warm-up followed by 45 minutes of walking and bicycling, 20 minutes of games, and 10 minutes of warm-down/relaxation. During one of the two sessions per week, subjects spent the first half-hour in the swimming pool participating in warm-up and games.

Subjects were re-assessed on a Stage I progressive bicycle ergometer exercise test every three months and whenever the need for re-assessment was indicated by a change in medication or symptoms. Individual exercise prescriptions were updated accordingly.

The exercise program was designed to be of six months duration. Those subjects who met graduation criteria at the end of six months were graduated; while those who could not be graduated were kept in the program.

Statistical Methods

An alpha level of .05 was used to test for statistical significance of all data (except the t-test analysis which is described below). The following SPSS (Statistical Package For The Social Sciences) computer programs were employed for the purpose of data analysis:

Frequencies. A frequency check was run for all data in order to ensure that all data had been correctly coded and transferred from the original questionnaires to computer cards.

Response frequencies for some questionnaire items were used for descriptive purposes.

Crosstabs. The crosstabs analysis was run for all nominal and ordinal data for computation of the Chi-square statistic which was required for the detection of significant differences in proportions of group responses to questionnaire items. The crosstabs analysis also provided descriptive information.

T-test. The criteria for parametric analyses have not been met in the present study due to the use of multiple T-tests which were required in order to determine the significance of differences between group means for continuous data. The alpha level of .05 used in determining statistical significance of all other tests was divided by the number of T-tests carried out.

Mann-Whitney U Test. The Mann-Whitney U test was employed as a check on the results of the T-test and also to determine the extent to which the data differed between groups.

It is recognized by the investigator that the present exploratory study may not have met all the assumptions required for univariate analysis of the data. The univariate approach was used as an exploratory technique to determine whether there were factors, whether correlated or not, which were significantly related to compliance or dropout.

CHAPTER IV

RESULTS

The subjects' initial entry characteristics, the compliance and attendance rate data, and the responses to the questionnaire are presented in this chapter. Only those factors which differentiate ($P < 0.05$) between the compliers and dropouts are presented in detail. Factors found not to be related to compliance or dropout are listed separately (Appendix E) but those considered of some importance are discussed in Chapter V.

I) Entry Characteristics of Entire Sample

Initial entry characteristics for the entire group of 84 subjects appears in Table I. The mean age of the population under investigation was 51.5 years upon entry, the mean entry weight was 79.9 kg., and the mean height was 173.9 cm. Among all 84 subjects, 25.0% were identified as smokers; 53.6% were blue collar workers; 67.8% were inactive during their leisure time (i.e., participated in less than 3 hours of activity per week); and 8.3% had prior history of MI upon their entry into the exercise program.

Table I

Entry Characteristics of Entire Sample

Characteristic	N(out of 84)	%
Smoking Status		
a) Smokers	21	25.0
b) Nonsmokers	63	75.0
Occupational Status		
a) Blue Collar	45	53.6
b) White Collar	39	46.4
Activity Status		
a) Inactive Leisure	57	67.9
b) Active Leisure	27	32.1
MI Status		
a) Previous MI	7	8.3
b) No Previous MI	77	91.7

Mean Age (years) = 51.5 Standard Deviation = 8.7
Range = 29 to 69 years

Mean Weight (kg) = 79.9 Standard Deviation = 10.3
Range = 62.1 to 120.0 kg.

Mean Height (cm) = 173.9 Standard Deviation = 6.1
Range = 158.0 to 191.0 cm.

II) Rates of Compliance and Dropout

Cumulative rates of compliance and dropout are listed in Table II. A graphic illustration of these percentages appears in Figure 1. The dropout curve tends to slope downward at the beginning of the 6-month period, then appears to plateau somewhat. The greatest rate of dropout (15.5%) appeared to have occurred during the first month of the program, with a more gradual decrease in compliance over the following 5 months. Chi-square analysis indicated the lack of any significant difference in dropout rates during the six months observed (Table II).

Fifty per cent of all dropout occurred within the first 2 months of the six month program. Slightly more than one-half of all participants (i.e., 45 of 84, or 53.6%) completed the entire six month exercise program.

III) Attendance

As expected, attendance (determined from log book entries) was significantly higher among compliers than dropouts. Compliers attended an average of 74.8% of the 48 sessions offered during the six month program, while dropouts attended an average of only 23.1% of the total number of sessions.

Table II

Cumulative Rates of Compliance and Dropout

Month	1. Cumulative Compliance Rate		2. Compliance Rate per Time Interval	3. Cumulative Dropout Rate		4. Dropout Rate per 1 Month Time Interval		χ^2
	N	%	%	N	%	N	%	
Base	84	100.00	100.00	0	0.0	0	0.0	
1	71	84.5	71/84 = 84.5	13	15.5	13	15.5	
2	64	76.2	64/71 = 90.1	20	23.8	7	8.3	
3	59	70.2	59/64 = 92.2	25	29.8	5	6.0	8.55 *
4	54	64.3	54/59 = 91.5	30	35.7	5	6.0	
5	50	59.5	50/54 = 92.6	34	40.5	4	4.8	
6	45	53.6	45/50 = 90.0	39	46.4	5	6.0	

*$P > .05$

NOTE:

Column 1. The cumulative rate of compliance during each month expressed as a percentage of the original sample population.

Column 2. The rate of compliance during each month expressed as a percentage of those patients still remaining at the end of the immediately preceding month.

Column 3. The cumulative rate of dropout expressed as a percentage of the original sample population.

Column 4. The dropout rate during each month expressed as a percentage of the original sample size.

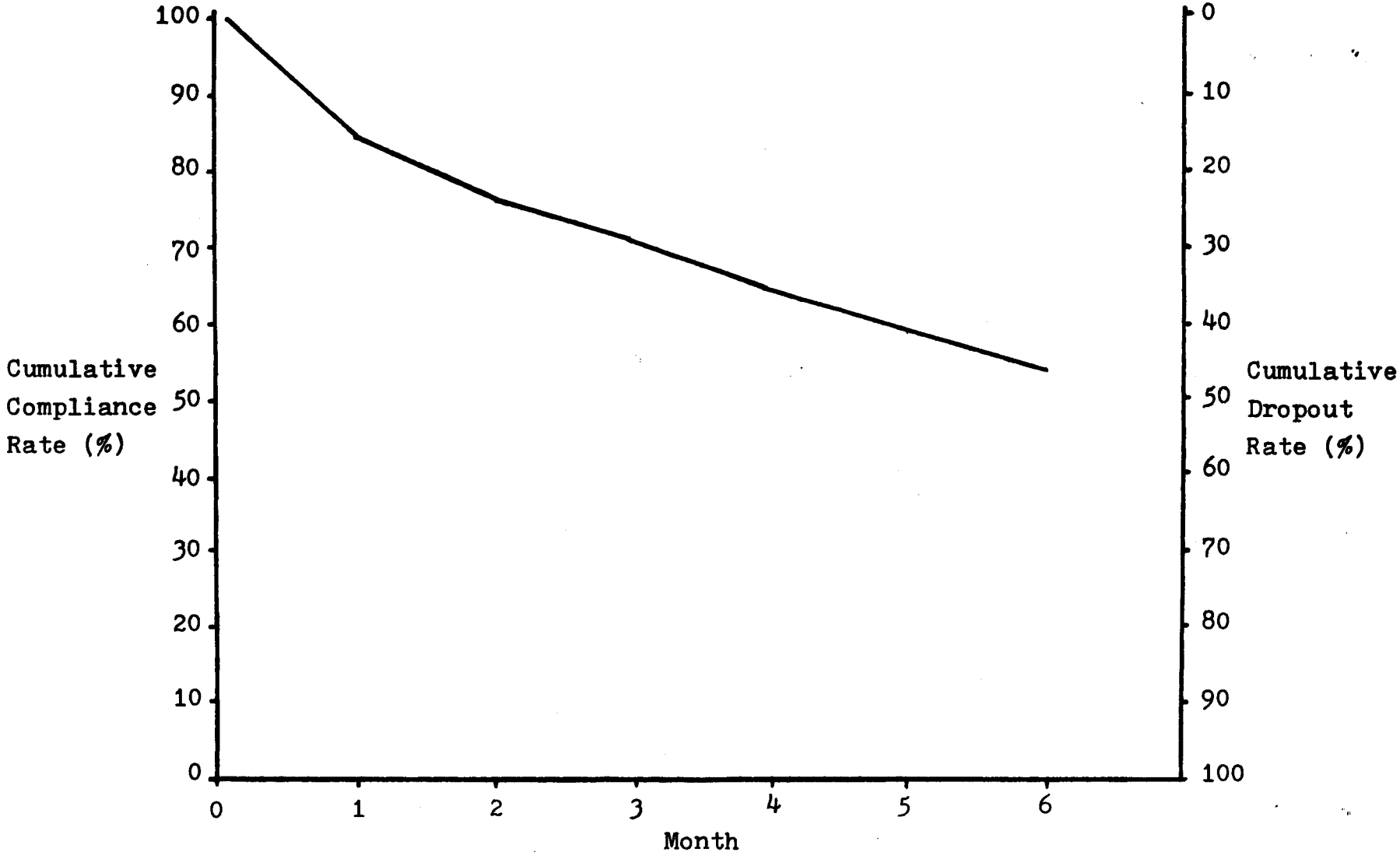

Figure 1 Cumulative Rates of Compliance and Dropout

IV) Entry Characteristics of Compliers and Dropouts

Entry characteristics which demonstrated significant differences between dropouts and compliers in this study using the T-test and Chi-square statistics were age, smoking status, leisure activity status, and occupational status (Table III). Weight, height, and previous history of MI were not found to demonstrate significant differences between compliers and dropouts.

a) Age. The mean age of compliers upon entry was 54.3 years which was significantly greater than the mean age of the dropouts (48.4 years) using the T-test and the Mann-Whitney U test.

b) Smoking Status. Significantly more subjects who were smokers (81% or 17 out of 21) dropped out than non-smokers (35% or 22 out of 63).

c) Leisure Activity Status. Significantly more subjects who were inactive upon entry (56% or 32 out of 57) dropped out compared to those subjects who were active upon entry (26% or 7 out of 27).

d) Occupational Status. Significantly more blue collar workers (62% or 28 out of 45) dropped out than white collar workers (28% or 11 out of 39).

Cluster analysis revealed that 33.3% (n=13) of all dropouts exhibited all three of the above characteristics at entry (i.e., smokers, inactive leisure, blue collar work) compared to only 4.4% (n=2) of the compliers. Any two of the above characteristics were observed among 38.5% (n=15) of

Table III

Entry Characteristics of Dropouts and Compliers

Characteristic	Proportion or Mean for Each Group				χ^2 or t value	P	d.f.
	Dropouts		Compliers				
* Smoking Status	N	%	N	%			
a) Smoker	17	43.6	4	8.9	11.63	.0003	1
b) Nonsmoker	22	56.4	41	91.9			
* Activity Status							
a) Inactive Leisure	32	82.1	25	55.6	5.57	.0183	1
b) Active Leisure	7	17.9	20	44.4			
* Occupational Status							
a) Blue Collar	28	71.8	17	37.8	8.40	.0038	1
b) White Collar	11	28.2	28	62.2			
* MI Status							
a) Previous MI	5	12.8	2	4.4	0.98	.3224	1
b) No Previous MI	34	87.2	43	95.6			
** Age (mean years)	$\bar{x}$ = 48.4		$\bar{x}$ = 54.3		3.22 (pooled)	.002	81 (P<.025)
** Weight (mean kg.)	$\bar{x}$ = 81.1		$\bar{x}$ = 78.9		-0.93 (pooled)	.357	81 (P>.025)

* Using Chi-square statistic

** Using Students' t-test statistic

the dropouts and 22.2% (n=10) of the compliers. Only one of the above entry characteristics was noted for 20.5% (n=8) of the dropouts compared to 44.4% (n=20) of the compliers. Among all dropouts only 7.7% (n=3) were found to exhibit none of the above entry characteristics compared to 28.9% (n=13) of the compliers.

Summary. In the present study, statistic l analysis indicated that dropouts differed significantly with respect to age, smoking status, leisure activity status, and occupational status. No significant difference was observed to exist between groups with respect to weight, height, or prior MI status upon entry into the 6 month program of exercise.

V) Response to the Questionnaire

Of the initial group (n=84), 53.6% were identified as compliers (n=45) and the remaining 46.4% were identified as dropouts (n=39). Six subjects could not be contacted either because they were deceased (n=3), had moved overseas leaving no forwarding address (n=1), or were not able to be traced (n=2). Of the 78 subjects contacted, 63 responded to the questionnaire; 41 out of a possible 44 compliers, and 22 out of a possible 34 dropouts (Figure 2). Three questionnaires were returned due to a change in the patients' addresses. In each instance family physicians were contacted in order to obtain forwarding addresses. A forwarding address was obtained for only one out of the three patients; the remaining two patients did not leave a forwarding address with their physicians. Attempts to gather this information from the subjects' employers were not successful.

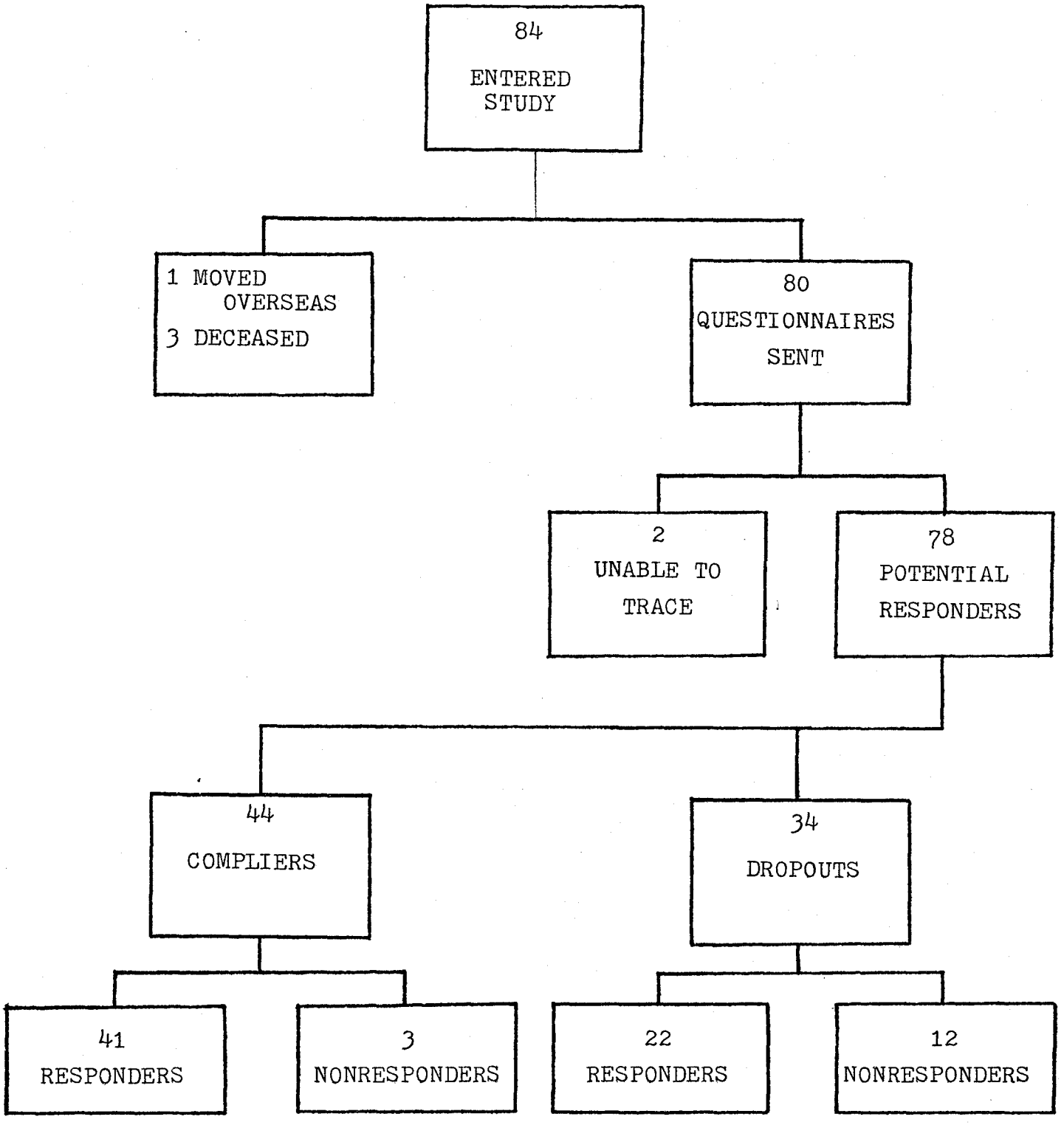

Figure 2 Response to the Questionnaire

When contacted by phone, nonresponders indicated that they chose not to respond to the questionnaire for the following reasons:

1. Lack of time and/or interest (60% of all nonresponders);
2. Medical reasons (i.e., in hospital or just released from hospital), (20% of all nonresponders);
3. Some nonresponders (20%) felt that the amount of time they had spent attending the program was not adequate enough to answer the questions or to provide a fair evaluation of the exercise program.

The mean time elapsed from the time of entry into the program to time of follow-up was 8.51 months for responding compliers (n=41); 12.70 months for responding dropouts (n=22); and 9.96 months for all respondents combined (n=63)(Table IV). A total of 14 subjects from the entire group of 44 compliers were still attending the program at the time the questionnaires were distributed because they were clinically not ready to be graduated.

Two possible sources of bias may have existed in the present study. First, those who did not respond to the questionnaire were mostly dropouts. In fact, 35% of all dropouts in this study were nonresponders. This posed a possible source of bias since it is not known whether the nonresponding dropouts would have responded similarly to the

Table IV

Mean Time (in Months) Elapsed From Time of Departure

To Time of Follow-up For All Respondents

Group	N	Total # months elapsed For Group	Mean # months elapsed For Group
Responding Compliers - including those still attending the program at time of follow-up (n=14)	41	349	8.51
Responding Compliers - excluding those still attending the program at time of follow-up (n=14)	27	349	12.55
All Responding Dropouts	22	279	12.70
All Respondents Combined (i.e., both Compliers and Dropouts)	63	628	9.96
Responding Compliers and Responding Dropouts combined (excluding compliers still attending program at time of follow-up)	49	628	12.81

responding dropouts had they, in fact, responded.

Because 35% of all dropouts did not respond to the questionnaire, the entry characteristics of responding and nonresponding dropouts were compared using a Chi-square analysis (Appendix F). Responding dropouts did not differ significantly from nonresponding dropouts with respect to entry characteristics. However, since the difference in response rates between compliers and dropouts is highly significant, the data obtained from the questionnaires that were returned is potentially biased and must be interpreted with caution. The fact that the entry characteristics of responding and nonresponding dropouts are similar is reassuring but not convincing.

The second possible source of bias in the present study centres around the 16 subjects among the complier group who were still attending the program at the time the questionnaires were distributed. These 16 subjects continued to attend the exercise program for more than 6 months and it was not known whether the differences found in this study were due to a time effect or perhaps the group of 16 subjects displayed "super-compliant" behavior. The primary concern here was the possible effect of such ongoing program participation upon the responses of the respective subjects. To control for this possible source of bias, statistical analysis was repeated on all factors found to be significant in the primary analysis including data from only those subjects who

had graduated or dropped out of the program prior to the time of questionnaire distribution (i.e., excluding all data from the 16 subjects who may have been "super-compliers") (Appendix G).

The results were the same with all significant differences previously observed remaining significant with the exception of perceived increased recreation activity since time of entry/withdrawl, physical activity at work, and duration of exercise sessions upon follow-up. Thus, with the exception of these 3 factors, the overall results do not appear to be biased by the responses of those individuals who were still attending the program at the time the questionnaire was distributed.

Therefore, the results presented in this chapter are based upon the statistical analysis of all responding compliers (n=41) and dropouts (n=22).

a) Health Status

Although many factors (Appendix E) were considered in the investigation of the area of health status, not one factor was found to be significantly different when comparing the responses of dropouts and compliers.

b) Activity Status

Significant differences between dropouts and compliers were found to exist for follow-up activity habits, mean number of months per year spent participating in regular exercise, and occupational activity levels (Table V).

Table V

Follow-up Activity Status of All Responding Compliers and Dropouts

Factor	Proportion or Mean for Each Group				χ^2/t	P	d.f.
	Dropouts		Compliers				
	N	%/$\bar{x}$	N	%/$\bar{x}$			
Activity Habits							
a) Regular Exercise	10	45.5%	35	85.4%	9.31 (corr. χ^2)	.0023	1
b) No Regular Exercise	12	54.5%	6	14.6%			
Physical Activity at Work							
a) A Great Deal	6	33.3%	3	9.7%			
b) Some	4	22.2%	17	54.8%	6.53 (corr. χ^2)	.0382	2
c) Very Little	8	44.4%	11	35.5%			
Duration of Exercise							
(mean number of minutes)	22	27.5 min.	41	55.9 min.	2.17 (pooled t)	N.S.	61
Months Per Year of Exercise							
(mean number of months)	22	5.0 mos.	41	9.8 mos.	3.75 (pooled t)	.000	61
Organizations							
(mean number ever involved with)	22	.36 org.	41	1.4 org.	2.40 (pooled t)	N.S.	61

i) Follow-up Activity Habits. Participation in regular exercise at the time of follow-up was reported by 85.4% of responding compliers compared to only 45.5% of responding dropouts. Dropouts reported that they were less active than the compliers in this study regardless of when the compliers graduated from the program (Table VI; Figure 3).

ii) Months Per Year Spent Exercising. Compliers who reported participating in regular exercise also reported that they did so for a mean of 9.8 months per year (Table V). This was found to differ significantly from the mean of 5.0 months per year reported by exercising dropouts. Only the actual number of months were reported by respondents, therefore it is not known whether there is a seasonal influence upon the months of exercise reported.

iii) Physical Activity at Work. Responding dropouts differed significantly from responding compliers only in the proportions reporting moderate levels of occupational activity upon follow-up with 22.2% of responding dropouts reporting moderate work activity levels compared to 54.8% of responding compliers. Other figures appear in Table V.

iv) Number of Organizations Ever Involved With. Although not statistically significant, there was a trend for dropouts to report involvement with fewer different organizations (0.4) compared to responding compliers (1.4) (Table V).

Table VI

Proportion of Responding Subjects Active Upon Follow-up in Relation to Time After Departure to Time of Questionnaire Distribution

Group	Time Elapsed From Departure To Questionnaire (in months)		% of Respondents Active Upon Follow-up	
	total # mos.	mean # mos.	%	N
All Compliers still attending program (n=16)	0	0.00		
Responding Compliers still attending program (n=14)	0	0.00	100.0%	14/14
All Compliers who graduated after March 1, 1980 (n=12)	8	0.67		
Responding Compliers who graduated after March 1, 1980 (n=12)	8	0.67	83.3%	12/12
All Compliers who graduated before March 1, 1980 (n=17)	112	6.59		
Responding Compliers who graduated before March 1, 1980 (n=15)	95	6.33	73.3%	11/15
All Dropouts * (n=39)	467	11.97		
Responding Dropouts only (n=22)	231	10.50	45.5%	10/22

* Note: All dropout occurred prior to March 1, 1980 in the present study.

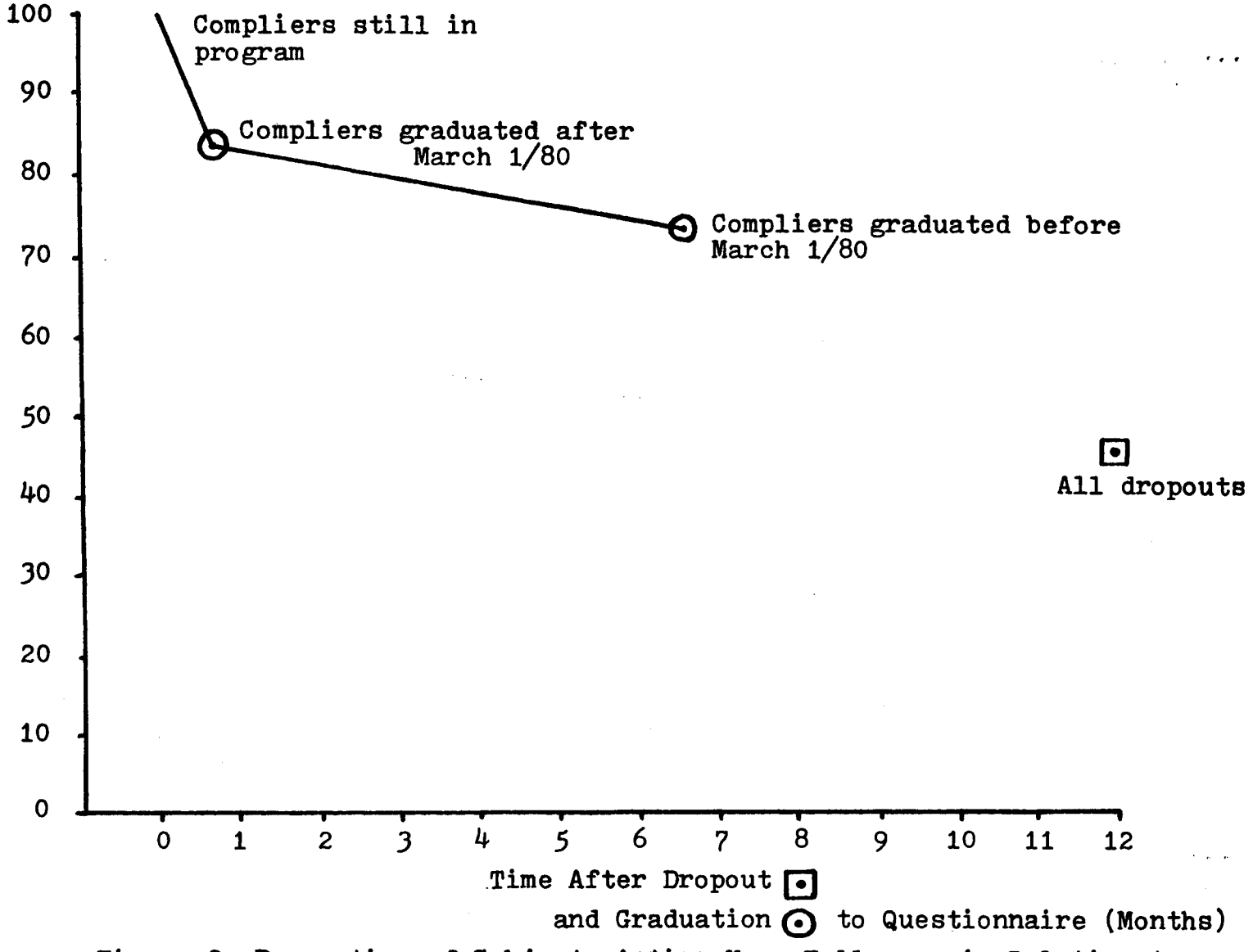

Figure 3 Proportion of Subjects Active Upon Follow-up in Relation to Time After Departure to Time of Questionnaire Distribution

c) Dietary Status

No significant differences were found with respect to the proportions of compliers and dropouts who reported being on a special diet at either time of entry or time of follow-up. Further, no significant difference was found to exist between the mean follow-up weight of responding compliers (78.82 kg.), and that of responding dropouts (80.63 kg.).

Summary. In the present study, significant differences were found to exist between responding dropouts and compliers with respect to follow-up activity habits, mean number of months per year spent participating in regular exercise, and the amount of moderate physical activity incurred while at work. In addition, there was a tendency for responding compliers to be involved with a greater mean number of organizations throughout their lifetimes than were the dropouts in this study. However, this finding was not significant.

No significant differences were found to exist between compliers and dropouts in this study with respect to health status or dietary status either at time of entry or time of follow-up.

d) Reasons for Joining the Exercise Program

In the present study, the two most popular reasons for joining the program indicated by respondents was a strong belief in the value of exercise and direct medical advice from their family physician. More than 80% of respondents in

each group indicated that a strong belief in the value of exercise acted as the major motivating factor in their decision to join the program.

e) Feelings Toward the Exercise Program

The majority of respondents in both groups (75.5% of compliers; 63.6% of dropouts) did not find accessibility to be a problem in attending the exercise sessions. Although not significantly different, more dropouts (45%) experienced more fatigue following the exercise sessions than did compliers (27%). Over 90% of respondents in each group agreed that the facilities at the exercise centre were adequate for their needs and interests indicating that inadequate facilities were not contributing factors to dropout in the present study.

f) Spouse Support

At least 90% of respondents in each group indicated that their family/wife approved of their involvement in the exercise program. Similarly, more than 90% of respondents in each group agreed that their family/wife felt that physical activity was of benefit to them. These findings indicate that there was no lack of family/spouse support as reported by respondents, and therefore this factor did not appear to contribute to dropout in this study.

g) Benefits Achieved by Compliers (Since Entry) and Dropouts (Since Withdrawl)

A significantly greater proportion of compliers reported increased energy levels (85.4%) compared to responding dropouts (40.9%) upon follow-up (Table VII). Likewise, 92.7% of responding compliers reported feelings of better health upon follow-up compared to 36.4% of dropouts. Of all responding compliers, 81.3% reported increased work performance, and 78.1% reported feeling more positive about their work in comparison to 43.8% and 37.5% of dropouts respectively.

When the six categories of "strongly agree" through to "strongly disagree" were collapsed into two categories of "agree" and "disagree", the results of the Chi-square analysis indicated that in addition to the above findings, increased recreation was reported by 68.3% of responding compliers compared to only 36.4% of dropouts, and likewise 65.9% of the compliers reported getting more adequate rest and sleep since their entry compared to 36.4% of responding dropouts. These differences were found to be significant.

h) Factors Contributing to Compliance

The most popular reasons for compliance listed by responding compliers were as follows:

1. A strong belief in the value of exercise (95.2%);
2. Direct benefits derived from the exercise (95.1%);
3. Information provided by regular testing (92.6%);

Table VII

Benefits Achieved By Compliers (Since Entry) and Dropouts (Since Withdrawl)

Benefit	Proportion in Each Group				χ^2 (collapsed)	d.f.	P
	Compliers		Dropouts				
	N	%	N	%			
* ** Increased Energy							
a) Agree	35	85.4	9	40.9			
b) Disagree	6	14.6	13	59.1	11.41 (corr.)	1	.0007
* ** Feelings of Better Health							
a) Agree	38	92.7	8	36.4			
b) Disagree	3	7.3	14	63.6	20.28 (corr.)	1	.0000
* ** Increased Work Performance							
a) Agree	26	81.3	7	43.8			
b) Disagree	6	18.8	9	56.3	5.35 (corr.)	1	.0208
* ** More Positive About Work							
a) Agree	25	78.1	6	37.5			
b) Disagree	7	21.9	10	62.5	6.02 (corr.)	1	.0141
* Increased Recreation Activity							
a) Agree	28	68.3	8	36.4			
b) Disagree	13	31.7	14	63.6	4.73 (corr.)	1	.0297
* More Adequate Sleep & Rest							
a) Agree	27	65.9	8	36.4			
b) Disagree	14	34.1	14	63.6	3.92 (corr.)	1	.0477

(cont'd page 58)

Table VII(cont'd)

Benefits Achieved By Compliers (Since Entry) and Dropouts (Since Withdrawl)

Benefit	Proportion in Each Group				χ^2(collapsed)	d.f.	P
	Compliers		Dropouts				
	N	%	N	%			
Under Less Stress/Tension							
a) Agree	31	75.6	11	50.0			
b) Disagree	10	24.4	11	50.0	3.15 (corr.)	1	.0758
Decreased Amount of Food Eaten							
a) Agree	20	48.8	7	31.8			
b) Disagree	21	51.2	15	68.2	1.06 (corr.)	1	.3030

* $P < .05$ (Agree/Disagree categories collapsed)

** $P < .05$ (All 6 Agree/Disagree categories considered in chi-square analysis)

4. Felt better (90.3%);
5. Social aspects of the group activity (53.6%); and
6. Fear of another heart attack (48.8%).

i) Factors Contributing to Dropout

The most popular reasons indicated by responding dropouts as contributing to their decision to withdraw from the exercise program were:

1. It was too inconvenient to attend (59.1%);
2. Didn't enjoy/lost interest in the program (54.4%);
3. Program was too time consuming (36.3%);
4. Felt much better (27.2%);
5. Medical advice (22.7%); and
6. Doubts about the value of exercise (18.1%).

Summary. Results of the present study indicated that a variety of factors influenced the individual's decision to join the program, and to comply with or dropout of the program. In addition, certain benefits were reportedly achieved by compliers that were not reportedly achieved by a comparable proportion of dropouts. Responding subjects in both groups appeared to have similar feelings towards the exercise program in general, and there did not appear to be any difference in level of spouse/family support between the two groups.

VI) Entry/Follow-up Comparisons

Comparisons of entry and follow-up status with respect to employment, activity, medication, dietary, and smoking habits were made using a Chi-square analysis for each group (i.e., compliers and dropouts) separately (Tables VIII and IX). While data pertaining to entry characteristics (i.e., employment, activity, medication, and smoking status) were obtained for all 84 subjects, follow-up information could only be obtained from those compliers (n=41) and dropouts (n=22) who responded to the questionnaire.

Among responding compliers (Table VIII), significant differences occurred with respect to employment status from entry to follow-up with more compliers employed and fewer unemployed upon follow-up. No significant differences were observed with respect to entry to follow-up employment status among responding dropouts (Table IX).

Respondents from both groups (i.e., compliers and dropouts) demonstrated significant changes in reported activity status from entry to follow-up, with respondents reporting increasing activity habits and decreasing inactivity. While the highest level of physical activity that respondents perceived themselves as capable of carrying out increased significantly for responding compliers upon follow-up, no change was reported by responding dropouts.

No significant changes were observed to occur in smoking habits, medication, or dietary status from entry to follow-up for respondents in either group.

Table VIII

Follow-up Comparisons - Time of Entry to Follow-up:

Responding Compliers Only

Factor	Proportion of Responding Compliers				χ^2	d.f.	P
	Entry		Follow-up				
	N	%	N	%			
Employment							
a) employed	25	64.10	31	88.86			
b) unemployed	14	35.90	4	11.43	6.10	1	<.05
Activity							
a) active	18	43.90	35	85.37			
b) inactive	23	56.10	6	14.63	15.48	1	<.05
Highest Level of Physical Activity							
a) strenuous	5	12.20	9	21.95			
b) moderate	13	31.71	19	46.34			
c) light	10	24.39	11	26.83	10.60	3	<.05
d) restricted	13	31.71	2	4.88			

Table IX

Follow-up Comparisons - Time of Entry to Follow-up

Responding Dropouts Only

Factor	Proportion of Responding Dropouts						
	Entry		Follow-up		χ^2	d.f.	P
	N	%	N	%			
Activity							
a) Active	3	13.64	10	45.45			
b) Inactive	19	86.36	12	54.55	5.46	1	$<.05$

Summary. Significant changes in employment status were observed to occur from entry to follow-up among responding compliers, but not among responding dropouts. The proportion of respondents reporting active leisure habits increased significantly for both compliers and dropouts upon follow-up, with a corresponding decrease in those reporting inactive leisure habits. In addition, the entry/follow-up comparisons revealed a significant change in highest level of physical activity reportedly perceived by responding compliers, but no change was found to occur among responding dropouts. No significant changes were found to occur in smoking, medication, or dietary status of either group upon comparison of entry and follow-up data.

CHAPTER V

DISCUSSION

The present investigation was carried out in order to identify factors contributing to compliance with and dropout from an organized program of exercise for 84 male cardiac patients from the Hamilton-Wentworth area. Entry characteristics were determined for all 84 subjects. Follow-up information was gathered with respect to areas of health, employment, smoking, activity, and dietary status from subjects (n=63) who responded to a questionnaire by mail. Reasons for joining the program, perceived benefits achieved, and factors contributing to compliance with or dropout from the exercise program were determined through analysis of responses received from 41 compliers and 22 dropouts.

It is recognized that the findings of this study may be limited for a number of reasons. The questionnaire method of data collection employed in this study obviously has both advantages and disadvantages which require consideration for appropriate interpretation of the obtained results. Though a great deal of information can be gathered through the use of questionnaires, the representative accuracy of obtained results depends to a large extent on sample size and the ability and willingness of the subjects to respond to the

questions. The problem of differing group response rates must also be acknowledged since the large proportion of questionnaire nonresponders were from the dropout group; a difficulty which could have led to distortion of the obtained results. In addition, items on the questionnaire may have different meanings for different people. For these reasons, it is important that the wording of items included on the questionnaire be simple, concrete, and direct. While every effort was made to ensure clarity of the questionnaire and obtain a large response rate from both dropouts and compliers, it is possible that the results are not truly representative of the population being investigated. The sample size of the present study was limited to begin with, and no measure was obtained to account for the subjects' ability to appropriately respond to questionnaire items. It is suggested that the accuracy of obtained questionnaire information could be enhanced through contacting other family members for confirmation of information pertaining to such items as medication, employment, activity, and dietary status. The information obtained from family members could then be compared to that information supplied by respondents and some degree of accuracy could then be confirmed.

Compliant and noncompliant behavior can be observed, whereas much of the information provided by respondents was not directly observed by the investigator. Comparisons of observed and unobserved behavior may have led to erroneous conclusions.

Further, while entry data was obtained for all 84 subjects, collection of follow-up information was incomplete. Thus, it is possible that results obtained would have been different had follow-up information been obtained for all subjects. However, entry characteristics of nonresponding dropouts were compared to those of responding dropouts in consideration of this limitation (Appendix F), and no significant differences were found to exist between nonresponding and responding dropouts with respect to entry characteristics suggesting that the outcome of the present study may have remained the same had nonresponding dropouts responded to the questionnaire. While attempts were made to control for nonresponse, this is not sufficient evidence for similarity.

Some questionnaire items were exposed to multiple comparisons during statistical analysis which increases the risk of Type I error. In fact, many of the significant differences observed in the present investigation may have been due to multiple comparison. Although multiple regression or discriminate function would have been the appropriate statistical tools to use to overcome this, an alternative would have been to divide the alpha level 0.05 by the number of statistical tests done and accept as "real" only those comparisons that gave a p value less than this. For example, if 10 statistical tests were done, then only tests giving a p value of less than 0.05/10 or 0.005 would be regarded as significant. This alternative method was employed in the

statistical analysis of follow-up activity status of all responding compliers and dropouts (Table V).

Ideally, it is hoped that any differences observed between responding compliers and dropouts in the present study were truly due to differences in levels of compliance between groups. However, constant and random error may limit the conclusions of this study. Observed differences in responses may have been due to differences in other relatively stable characteristics of the respondents such as intelligence or ability to interpret the questions (systematic error). It is also possible that the observed results are due to differences in transient personal factors (random error) if mood, state of awareness, fatigue or health of the subjects were found to influence their response to the questionnaire. Even differences in situational factors can result in random error if individual responses are differentially affected by environmental distractions or comfort of setting during completion of questionnaire items. Observed differences may also have been due to weaknesses in the design of the questionnaire (i.e., variations in wording, sampling of questionnaire items, lack of clarity, and mechanical factors such as presentation of items, size of print, and spacing provided for answers).

It is difficult to control for all sources of error in survey research, specifically systematic and random error. It is therefore important that this discussion provides for consideration of the limitations which may have been caused

by the presence of such error. In this manner, proper interpretation of the results will lead to the development of appropriate conclusions, implications, and recommendations for further research.

The present investigation yielded the following results:

Psychosocial factors were more frequently indicated as being important factors in the decision to complete the entire 6 month exercise program. In contrast, factors related to both psychosocial and personal convenience factors were important in the decision to dropout. Dropouts were found to differ from compliers upon follow-up with respect to activity habits, although this difference appears to diminish somewhat with increasing time since leaving the program. Follow-up information also revealed that compliers were more likely than dropouts to report increased energy levels, feelings of better health, increased recreation activity, more adequate rest and sleep, increased work performance and more positive feelings about their work. However, it is not known whether or not this difference is actually due to continued participation in the exercise program or some other factor(s).

Dropouts in this study were younger, and significantly more likely to be regular smokers, blue collar workers, and inactive in their leisure habits upon entry.

Due to the large number of factors considered in this study, each major area of investigation will be discussed separately in the present chapter. A list of conclusions and recommendations based upon the findings of this study is presented in the following chapter. The present discussion centres around two main aspects:

1. Predictors of dropout from entry data (including dropout rates); and
2. Consequences of dropout/compliance as determined from questionnaire responses.

I) Predictors of Dropout From Entry Data

a) Rates of Dropout and Compliance

The dropout rate in the present study (Figure 1) tends to agree with previous studies of compliance with cardiac rehabilitation exercise programs. As observed by Carmody et al., (1980), the trend toward a plateau in the dropout curve resembles the behavioral relapse curves found to occur within various lifestyle treatment programs (i.e., drug, alcohol, and tobacco addiction) (Hunt and Matarazzo, 1970; 1973; Hunt et al., 1971). Carmody et al., (1980) further suggest that certain factors which are thought to contribute to behavioral relapse curves, such as reinforcement and associative learning, may possibly hold some significance for the development and implementation of compliance-improving strategies for the cardiac patient enrolled in an exercise

program. Suggestions for such strategies are discussed later in the following chapter.

The 53.6% compliance rate (Table II) in this study is similar to rates reported in previous studies of compliance in exercise rehabilitation programs for CHD patients. The Goteborg study (Sanne and Rydin, 1973; Wilhelmsen et al., 1975) reported a 6 month compliance rate of 53%; this increased to 67% when those patients who were reportedly still training by themselves were considered. Investigators in the 4-year Goteborg study concluded that the highest rate of dropout among 112 male patients who had begun exercise training occurred during the first 6 months of training. In the present study which lasted 6 months, the greatest dropout rate occurred within the first two months by which time 51% of the overall dropout had occurred.

A dropout rate of 44.6% was observed to occur over a mean participation time of 23 months among 751 post-MI patients enrolled in the four-year Ontario Exercise Heart Collaborative Study as a whole (i.e., among all seven cohorts); the highest dropout rate reported among the seven centres involved was 52%; the lowest was 34% (Oldridge, 1979c). The Hamilton cohort of the Ontario study (Oldridge et al., 1978) reported a dropout rate of 43% among 153 male post-MI patients considered able to continue training at the end of 12 months. At 1 month, the dropout rate was observed to be 19%; at 6 months the dropout was approximately 30%.

Both the Goteborg study and the OEHCS study were clinical trials involving exercise programs specifically designed for research purposes. Thus the designs of these two studies were probably more scientifically controlled than were the service program studies which will be discussed below. Service program studies involving self-selected subjects differ from clinical trials not only in the randomization of groups, but also in that the basic orientation of the exercise program tends to centre around servicing the needs of the participants rather than the scientific investigation into the feasibility of exercise programs.

Compared to the 53.6% compliance observed in the present study at 6 months, extrapolations of data reported in similar service-oriented programs by Bruce et al., (1976) suggest a 65% compliance rate at 6 months, with Carmody et al., (1980) reporting 70% compliance at 4 months and 54.2% at 8 months. The results of these previous studies are reasonably comparable to those observed in the present study, with the majority of dropout tending to occur during the early stages of the exercise program involving post-MI patients. However, one study which reported a much higher compliance rate in a service program was carried out by Kavanagh et al., (1979). These investigators reported a compliance rate of more than 80% at the end of a 2-year exercise program involving 610 male post-MI patients. It was reported that 82.8% were exercising at least 3 times per week, and 96.6% were exercising at least twice per week. Only 3.4% were reportedly

not exercising at all. Factors provided by Kavanagh et al., (1979) for the high rate of compliance included:

1. Physician referral resulting from patient interest;
2. Feedback of information provided by log sheets and regular testing;
3. Lower frequency of supervised exercise sessions;
4. Predominantly white collar population; and
5. Successful completion of popular marathons by some highly motivated patients.

Although Kavanagh et al., (1979) do not provide figures on the proportion of physician referral resulting from patient interest, in the present study 57.1% (n=36) of all responding subjects indicated that they had asked their physicians to refer them to the program. Whether or not these current figures differ from those of Kavanagh et al., is not known. Oldridge (1979c) has reported that the observations of the OEHCS study indicated that the highest rate of dropout (52%) was reported by the centre which screened potentially eligible subjects from hospital records. The lowest rate of dropout (34%) was reported by the centre in which all participants were referred by their physician. These findings will be further discussed separately in this chapter.

If feedback were an important factor to the rate of compliance, the present study should have a lower dropout rate since subjects in the present study received such feedback more frequently. Participation in the McMaster

Exercise Program involved the maintenance of log book entries at every attended exercise session along with repeat exercise tests every 3 months. The Kavanagh study involved repeat evaluation only once every six months with some additional measurements (i.e., body composition and serum cholesterol). This factor was not likely to be the source of difference in compliance rates between the two studies.

While the McMaster program involved participation in two supervised exercise sessions per week, Kavanagh's study only involved one supervised session per week. This may have been a factor in the difference in compliance rates since the present study and others (Sanne and Rydin, 1973; Wilhelmsen et al., 1975; Andrew and Parker, 1979; Andrew et al., 1981) have shown personal convenience factors as contributing to dropout from exercise programs. Perhaps the decision to withdraw from the McMaster program would have been based upon different factors had the frequency of supervised exercise sessions been reduced to once per week.

The exact proportion of white collar workers who participated in Kavanagh's study was not reported, however he does state that the population was predominantly white collar. The majority of all 84 subjects in the present study were identified upon entry as blue collar workers (n=45, or 53.6%). It is possible that the difference in proportions of white collar workers could have contributed to the difference in compliance rates between the two studies. The results of

Oldridge et al., (1978) and Oldridge (1979c) lend support to this possible explanation since dropouts in those reports were found to be blue collar workers, although other factors were also found to be characteristic of dropouts in those reports (i.e., smoking, more than one previous MI, light energy demands at work, inactive leisure habits).

The connection between a high proportion of blue collar workers found in this and other studies (Oldridge et al., 1978; Oldridge, 1979c) is not clearly understood. Hackett and Cassem (1976) have speculated that information provided by the medical profession may be more thorough for white collar workers than that offered to blue collar workers. Alternatively, they suggest that if the information provided is the same regardless of occupational status, it may be that the blue collar workers understand or retain less of this information. There is, however, a lack of adequate evidence in the existing literature which would support the speculations of Hackett and Cassem (1976) due to the lack of follow-up studies.

Hackett and Cassem (1976) also speculate that perhaps blue collar workers are more likely to "know less about the process of repair following MI, and avoid asking questions about future limitations and activities" than white collar workers. Any lack of this information among blue collar workers might lessen the impact of the importance of compliance to the exercise program, providing of course that the findings

of Hackett and Cassem were factors in the present study. Such possible factors more likely stem from lack of adequate communication which highlights the importance of the role of patient/physician communication and the need to improve upon such communication.

Since patients enrolled in the McMaster exercise program were not particularly encouraged to participate in any marathons, it is not known what effect, if any, such participation would have had on the overall compliance rate in the present study. There is no doubt that those few individuals (approximately 2%) the Kavanagh's study who did participate in marathon runs would have had to comply strictly with the program in order to be in adequate physical condition for such extended exercise bouts. Thus, among those few individuals, compliance was probably very high. However, it is only speculation on the part of Kavanagh and co-workers (1979) that this factor could have affected the compliance rate of the entire population.

The varying lengths of programs incorporated in all these previous studies limits further comparisons of dropout and compliance rates.

b) Patient Request For Referral

A slightly greater proportion of responding compliers (63.4%) reported that they had requested their physicians' referral to the exercise program compared to responding

dropouts (45.4%). Similar observations were reported in the Ontario study (Oldridge, 1979c) where the highest compliance rate was reported by the centre that accepted all patients following referral by a physician, whereas the highest rate of dropout was reported by the centre which recruited all participants from hospital records.

The compliance rate in the present study could have been affected to some extent by those individuals voluntarily seeking a referral to the program (Oldridge, 1979c; Kavanagh et al., 1979). It is these individuals who are most likely to be interested in participating in a program of supervised exercise. It is also possible that these same "volunteer" individuals may be less likely to self-select themselves out of joining such a program if they feel they are capable of physically handling such a program of exercise. Those who did not ask their physician to refer them to the program might be those less likely to comply with the program requirements over time.

The volunteer factor may present a bias to any study which, by design, requires that human subjects comply with a treatment regimen of some sort. In their report on the experimental modification of smoking behavior, Hunt and Matarazzo (1973) suggest that the motivated individual is most likely to search for treatment of a health problem. However, these researchers point out that in spite of such motivational factors, a large majority (approximately 80%)

of individuals who seek treatment for addictions to tobacco, drugs, and alcohol eventually dropout of treatment programs. In their review of adherence to diet and drug regimens, Dunbar and Stunkard (1979) have provided information which implies that adherence may be affected by the beliefs one holds regarding one's health. Perhaps the individual's level of motivation to volunteer to participate in a specific treatment program (be it exercise rehabilitation, smoking, drug, or alcohol withdrawal, medication or dietary adherence) and to comply with that treatment is in some way related to his health beliefs. Although motivation and health belief factors were not investigated in the present study, the possible relation between these factors and compliance to exercise rehabilitation would provide for interesting investigation in the future.

It must be understood that a serious, albeit unavoidable source of bias in this and other such studies concerns the presence of the volunteer factor. In the present study this factor must be considered with respect to all those responding subjects (57%, n=36 of 63) who indicated that they had requested program referral from their physicians.

c) Entry Characteristics of Dropouts and Compliers

In the present study, the mean age of the dropouts was nearly 6 years less than that of the compliers (Table III), disagreeing with the findings of Bruce et al., (1976) who were

unable to find any difference in age between dropouts and compliers upon their entry into the CAPRI exercise program.

It could be speculated that the younger participants are still devoting a great deal of their leisure hours to family life and have a more difficult time fitting the additional obligations of an exercise program into their weekly lifestyle pattern. It is also possible that the younger participants are more likely to deny the seriousness of their illness due to their younger age, although there is a lack of evidence in the general compliance literature in support of this speculation. Part of this denial may include a decision to ignore the importance of the rehabilitative process. It could also be speculated that the younger participants differ from older participants with respect to their perception of their physical limitations and abilities. If this were true, the younger participants would probably perceive their own abilities as being greater than their older counterparts and would thus perceive their time spent participating as being wasted, particularly if they felt that they were not exercising to their potential. In any case, it should be emphasized that these are merely speculations based upon results of the present study which require confirmation through further study.

Results of this study also indicated that there was a greater proportion of blue collar workers, smokers, and men with inactive leisure habits among dropouts compared to

compliers at the time of entry into the exercise program (Table III). These findings are in general agreement with those of the Ontario study (Oldridge et al., 1978; Oldridge, 1979c) which indicated that dropouts are more likely to be blue collar workers who smoke and have inactive leisure habits, more than one previous MI, and who have light energy demands in their work. Among the Hamilton cohort of the Ontario study, dropouts also tended to display characteristics of the type-A personality more frequently than the compliers (Oldridge et al., 1978). In addition, the multivariate analysis employed in the Ontario study indicated a synergistic effect of smoking habits, blue collar work, and low levels of both recreational and occupational physical activity in the dropouts, whereas the present study considered the probability of each characteristic separately. Therefore, the comparison between the present study and the Ontario findings are somewhat limited with respect to entry characteristics of dropouts and compliers, but the results of the two studies are consistent in at least three factors; blue collar workers, smokers, and inactive leisure habits were found to be more prevalent entry characteristics among dropouts in both studies.

A greater proportion of dropouts in this study were regular smokers upon their entry into the exercise program. Since regular smokers are often encouraged to quit smoking by those who run the exercise program, participants who smoke are not only attempting to alter their lifestyle with respect to diet and exercise, but also smoking. Any changes in

lifestyle habits are difficult to attain and maintain, and by increasing the number of changes in lifestyle required, one risks an increase in the complexity of the therapeutic regimen (Dunbar and Stunkard, 1979) which may contribute to an increased risk of noncompliance.

A greater proportion of dropouts reported inactive leisure habits compared to compliers upon entry into the exercise program. This finding is also in agreement with the findings of the Hamilton cohort of the Ontario study (Oldridge et al., 1978) and the Ontario study in total (Oldridge, 1979c). For the individual to change his activity pattern from inactive to active would, again, require a considerable change in lifestyle. Those individuals for whom regular exercise may represent a large change in lifestyle may be more likely to dropout. This may account in part for the finding of a large proportion of blue collar workers among dropouts.
Since blue collar dropouts have also been found to be inactive during their leisure time in a previous study (Oldridge, 1979c), it may be that those individuals who are blue collar workers with inactive leisure habits are less likely to comply with the exercise program over time due to change in lifestyle activity habits required by such participation. Perhaps these individuals should be gradually introduced to the exercise program on a more progressive basis. In this manner, the individual may be better able to cope with such lifestyle change. Admittedly, this suggestion is made in consideration

of behavioral aspects only. One session of exercise per week would not benefit the physiological fitness levels of participants, however this suggestion infers that the initial stages of the program could be designed to encourage behavioral change via a more gradual adoption and maintenance of a change in lifestyle (i.e., regular exercise). Once the individual becomes accustomed to devoting some of his leisure time to participating in regular exercise, perhaps an increase in the number of sessions per week could then be gradually introduced in consideration of the physical goals of the exercise program (i.e., increased functional capacity). In short, it is suggested that the priorities of the initial stages of the exercise program should be to accomodate the participants' needs from a behavioral aspect in an attempt to help the participants to accept regular exercise as a part of their lifestyle. It is conceivable that chances for adoption and maintenance of regular exercise habits may be improved as reflected by increased levels of compliance, through a more gradual introduction to major lifestyle changes. A shift in priorities toward the physical aspects of the exercise program would occur gradually as the participants indicate behavioral acceptance of the lifestyle change.

The incidence of dropout in the present study cannot be attributed to irregular working hours of the large proportion of blue collar workers (i.e., shift work). Although the proportion of those working rotating shifts was somewhat higher

among dropouts (53.8%) than among compliers (46.2%), this difference was not statistically significant. In fact, the majority of subjects in both groups worked the day shift while they were attending the evening program.

The results of the analysis of entry characteristics of participants in the present study indicate that there was a greater proportion of blue collar workers, smokers, and individuals with inactive leisure habits among the dropouts upon their entry into the exercise program than among compliers. However, these characteristics were analyzed separately using the chi-square statistic and thus did not necessarily occur in combination, and indeed may have exerted separate influence upon the rate of dropout.

II) Consequences of Dropout/Compliance

a) Follow-up of Dropouts and Compliers

Although many factors considered in the present study were not found to be statistically significant (Appendix E), some factors have clinical/design implications and thus require discussion.

i) Health. It may be speculated that those individuals who believe in taking their own responsibility for their health would feel in greater control over their state of health and thus would be more likely to comply with the exercise program if they believe exercise to be of value (Becker, 1976; Oldridge, 1979a). However, as this study only looked at

follow-up beliefs, it is not known whether the groups differed at entry with respect to such beliefs, or whether any change in these beliefs occurred as a result of compliance with or dropout from the exercise program. Further, differences in group response rates (i.e., the small percentage of responding dropouts compared to responding compliers) also limit the conclusions to be drawn from the findings of the present study. It would be of interest to study the beliefs people hold regarding their health both at entry and at exit from an exercise program in order to determine whether any change occurs during their participation in the program. Although studies are now being carried out in order to investigate this problem (Private communication from "Dr. Neil Oldridge et al."), nothing has been published to date which deals with this speculation in exercise rehabilitation.

When asked to rate their health in comparison to people of their own age, more responding compliers rated their health as good or excellent than dropouts, suggesting that compliers may have a somewhat more positive perception of their health than dropouts.

This finding was supported by the responses of the two groups when they were asked to compare their present state of health at the time of their entry into the program with more of the compliers reporting feeling a little bit healthier or much healthier upon follow-up than dropouts.

Durbeck et al., (1972) found more positive attitudes towards state of health among the 237 apparently healthy males who volunteered and completed a one-year exercise training program compared to those males who chose not to participate. The application of Durbeck's observations to the present study become limited upon consideration of the difference in subject populations of the two studies. It becomes clear at this point in time that the need for further study into the health beliefs of cardiac patients enrolled in exercise rehabilitation programs should not be underestimated.

Although more compliers (73.2%) than dropouts (59.1%) sometimes worry about their health, more responding dropouts reported that they worry frequently about their health compared to compliers. Although not statistically significant, it appears that dropouts reported considerable concern for their health upon follow-up; the reasons for their concern are unknown, and should perhaps be examined in any future study.

There was no significant difference between groups with respect to satisfaction with general medical care received suggesting that dissatisfaction with general medical care was not a contributing factor to the overall dropout in this study. Although it was expected that dropouts may have expressed some dissatisfaction with health care (Marston, 1970; Dunbar and Stunkard, 1979), the fact that the responses were very similar between the two groups indicates that the vast majority of respondents in this study have, to some extent, been satisfied with the care they have received when seeking medical help.

The two groups did not differ with respect to the cardiac-related problems they reported experiencing upon follow-up. Nor did they differ in their reported experiences of hospitalization since leaving the program (i.e., incidence, reasons for, or length of hospitalization). These results indicate that there was no short-term difference in the apparent effect of the exercise program on the state of coronary health of the subjects. Any beneficial effects resulting from the exercise program may have been achieved regardless of whether the individual continued participation in the program or dropped out. The exercise program per se may have had no effect on perception of cardiac problems or need for rehospitalization.

It was originally thought that dropouts in this study may have been taking a greater number of medications upon their entry into the program compared to compliers, and that this, combined with the exercise program may have led to an increase in the complexity of their total coronary-care program. As pointed out by various authors (Marston, 1970; Blackwell, 1976; Dunbar and Stunkard, 1979; Haynes, 1979), an increase in the complexity of the total treatment regimen might increase the probability of noncompliance. However, the number of cardiac medications taken by participants did not differ between the two groups either at entry or upon follow-up. The same results were found for tranquilizers or any other medications such as those used to treat acute bouts of illness (e.g., penicillin or antibiotics).

Entry to follow-up comparisons (Tables VIII and IX) indicated that there were no significant changes in medication status for either compliers or dropouts. The lack of any significant changes in medication status for either group from time of entry to time of follow-up suggests that neither continued participation nor withdrawal from the exercise program had any significant effect upon the medication requirements of the subjects in the present study.

ii) Employment. Although the percentage of patients who were unemployed decreased somewhat for both groups from the time of entry until follow-up, this change in entry to follow-up employment status was significant for compliers only (Tables VIII and IX). Bruce et al., (1976) reported greater employment levels among compliers compared to dropouts upon follow-up of participants in the CAPRI study. Findings of the present study appear similar to findings of the CAPRI study in that significant change was observed to occur in the employment status of compliers from entry to follow-up, but not dropouts. There is clearly a lack of information in the existing literature regarding the effect of continued participation in a supervised program of exercise upon return to work for post-MI patients. Further study is required before any definite conclusions can be drawn with respect to the results of the present study and the CAPRI study.

iii) Smoking Status. Although those smoking on entry were more likely to dropout (Table III), there was no difference in follow-up smoking status between groups (Appendix E). No one reported smoking more than they were at the time they had left the program, and about 40% reported a reduction in smoking habits upon follow-up. However, care must be taken before claiming that participation in the exercise program had any real effect upon the smoking habits of those involved, since 94% of respondents who reported that they had stopped smoking had done so before they even entered the program. Those who were regular smokers upon their entry into the program may have found it easier to stop or reduce their smoking once they withdrew from the program which required the additional lifestyle change of increased physical activity.

In a review of psychosocial aspects of recovery from CHD, Doehrman (1977) refers to one empirical study (Weinblatt et al., 1971) which reports evidence that the dramatic decrease in smoking habits among CHD patients has been found to be maintained for more than four years. As with exercise, changes in smoking habits require a change in the lifestyle of the individual. Follow-up studies are necessary for determining which individuals may require additional help in their attempts to maintain these lifestyle changes.

Data compiled by Kavanagh et al., (1979) and Shephard et al., (1981) provide indication of a more favorable prognosis among exercise-compliant individuals who

continued, reduced, or stopped smoking while attending the exercise program. However, both papers do refer to a "trend" between smoking and dropout. Although smoking habits were not found to be significantly related to exercise compliance, those patients who exercised while continuing to smoke demonstrated a more favorable prognosis than those non-exercising patients who continued to smoke. The investigators concluded that while exercise-compliant patients who continued to smoke demonstrated smaller gains in prognosis than non-smoking exercise-compliant patients, their prognosis was observed to be more favorable than that of non-exercising patients. Thus, the gain in prognosis observed among those who complied with the exercise program cannot be clearly explained by such health habits as smoking behavior.

It would be of interest to conduct further follow-up study in future years of the same patients involved in the present study to determine whether the observed decrease in smoking is maintained over a period of years, and to assess any potential interaction effect between the maintenance of these smoking behavior changes and continued exercise habits upon prognosis.

iv) Activity Habits. As pointed out earlier, a significant difference was found between activity levels of the compliers and dropouts upon entry into the exercise program. Upon follow-up, nearly twice as many compliers

reported regular exercise habits compared to dropouts (Table V). In addition, the number of months per year were reported by compliers to be twice that reported by the dropouts.

It is tempting to interpret these results in such a way as to assume that continued participation in the exercise program may have had a greater carry-over effect in the activity lifestyle of the compliers in this study compared to the dropouts. However, one must recall that compared to dropouts upon entry, a significantly greater proportion of the compliers were considered active during their leisure time. Since there was a significant difference in activity habits of the two groups to begin with, the finding of a significant difference in the follow-up activity habits of the two groups must be interpreted with caution.

In order to form a more accurate interpretation of the impact of the exercise program on continued exercise habits of participants in the present study, a secondary analysis was carried out (Figure 3; Table VI). The chi-square test was repeated but the independent variable was considered to be the time of either graduation or withdrawal from the program. On this basis, the subjects were divided into 4 groups:

1. Those who had graduated before March 1, 1980 (i.e., those who had received the questionnaire at least 2.5 months after graduation from the program);

2. Those who had graduated sometime between March 1, 1980 and May 20, 1980 (i.e., those who had received the questionnaire shortly after the time of their graduation);

3. Those who were still in the program at the time they received the questionnaire; and

4. Those who withdrew from the program sometime before March 1, 1980 (i.e., those who had received the questionnaire at least 2.5 months after withdrawal).

No one had dropped out between March 1, 1980 and the time the questionnaire was filled out, thus each subject was grouped into 1 of the 4 categories with all responding dropouts included in the fourth category. This additional analysis was considered necessary because it was felt that those individuals who were still attending the program (n=14) might respond differently to questions concerning activity habits than would those who had discontinued their participation at some time before they had received the questionnaire.

Pre-entry activity levels were similar in all groups. While all of those attending the regular sessions reported exercising, there was a decreasing proportion of subjects who reported regular exercise as time to follow-up increased (Figure 3). Since there does appear to be a short-term effect upon subsequent activity levels, the problem is one of lengthening such short-term effects into long-term effects.

These results substantiate the earlier observations that compliers were more likely than dropouts to be participating in regular exercise at the time of follow-up (Table V). Further, the results indicate that any carry-over effect of participation in changing the individuals' activity patterns diminishes with time. Although more information about the

effect of program participation on long-term activity habits could have been obtained through the inclusion of a non-participant control group in the present investigation, these findings tend to confirm earlier reports that acceptance of long-term behavior change in physical activity habits is not likely to be increased through participation in a supervised program of physical activity (Bruce et al., 1976; Ilmarinen and Fardy, 1977; Sedgwick et al., 1980). The challenge remains to find a way to ensure that such behavioral change is maintained over time.

Compliers and dropouts reported similar levels of participation in regular exercise upon follow-up with respect to the frequency of their exercise sessions and the types of activity in which they participated (Appendix E). Most reported that they participated mainly in a combination of cycling and walking activities. Since these were the principal activities undertaken in the exercise program, it may be reasonable to suggest that these were activities that the participants learned to feel most comfortable with and which could be carried out at home, in their own time, with a minimal amount of expense and equipment. The majority of individuals still exercising did so on their own or with someone other than their spouse, relative, or friend, most commonly a co-worker.

It has been reported by Pollock (1973) that the optimal frequency of exercise is 3 to 5 exercise sessions per week in order to produce the optimal training effects, and

almost half of the exercising respondents in this study reported exercising for 3 to 7 sessions per week. Perhaps through follow-up counselling, those patients exercising less than 3 times per week could be identified and counselled in the setting up of a home exercise program.

There was a nonsignificant trend for responding compliers to report being involved with twice as many organizations as dropouts. Further study is necessary before any definite conclusions can be drawn with respect to this observation, however it is conceivable that provision of home exercise programs may serve to meet the needs of those individuals who prefer to remain at home during their free time.

Comparisons of entry and follow-up activity status revealed a significant increase in follow-up activity habits for both compliers and dropouts (Tables VIII and IX). This finding suggests that although a change in activity habits is not necessarily maintained over time (Table VI; Figure 3), significant changes in physical activity habits may not necessarily require participation in six months of supervised exercise. The implications of this observation reinforce the importance of behavior maintenance rather than only behavior change. The long-term goals of exercise rehabilitation for cardiac patients includes various physiological and behavioral benefits which can neither be achieved nor maintained without long-term change in activity lifestyle. The salient point

is the recommendation that more emphasis be placed upon maintaining exercise-induced benefits by developing strategies which will not only improve compliance but which will also improve the individual's chances of maintaining the change in behavior. Professionals in this and other medical areas must find ways of both achieving and maintaining desired behavior or else the issue of compliance with medical regimens becomes insignificant.

Compliers perceived themselves as being capable of participating in significantly higher levels of activity upon follow-up, whereas no significant change was observed to occur in the highest level of physical activity perceived by dropouts upon follow-up. This tends to suggest that completion of the exercise program may lead to a subjective increase in the level of physical activity the patient feels he is physically capable of carrying out. Results of the Goteborg study (Sanne and Rydin, 1973) revealed that the percentage of positive statements regarding changes in perception of physical exertion was somewhat lower, although not significantly so, among dropouts compared to compliers, confirming to some extent the influence of regular exercise upon changes in subjective measurement of perceived exertion. It is highly possible that these findings are in some way linked to other observations in the present study of increased feelings of better health and well-being in general as reported by responding compliers. It is in fact reasonable

to suggest that these two separate findings may act to complement each other. Therefore, the individual who perceives himself to have increased his feelings of better health and well-being may be more likely to perceive himself as being capable of engaging in a higher level of physical activity. The importance of qualitative improvements has been suggested through the observations of one other study (Oldridge, LaSalle, and Jones, 1980) in which female CHD patients reported feeling better able to carry out daily activities following participation in a supervised program of exercise compared to the time of their entry. In view of such results, the overall rehabilitation of the CHD patient may possibly be enhanced by improvements in both quantitative and qualitative areas of concern.

v) Dietary Status. The decision to diet was not a major focus of the McMaster exercise program. However, as with exercise, diet is a life-long lifestyle change for those who need be concerned. While the majority of patients in both groups reported that they were not on any special diet at entry or follow-up, three times as many compliers than dropouts on a special diet at time of follow-up claimed to be following it. This difference, although perhaps supporting the observation on entry smoking status, was not found to be significant. Further, no significant changes were observed to occur in dietary status of either group upon comparison of entry and follow-up dietary information.

Summary. There is a lack of published reports in the compliance literature which deal with follow-up of compliers and dropouts from exercise programs. Those follow-up reports which do exist deal mainly with follow-up mortality and morbidity, and activity levels (Bruce et al., 1976; Ilmarinen and Fardy, 1977; Sedgwick et al., 1980), although some efforts have been made to determine reasons for dropout in an attempt to design compliance-improving strategies (Andrew et al., 1979; 1981). Therefore the follow-up findings of the present study need confirmation and modification by future investigation.

b) Reasons for Joining, Compliance With and Dropout From an Exercise Program

Heinzelmann (1973) found that an individual's motivation to participate in an exercise program may include the desire to improve health status, increased opportunity for recreation and a change in routine. In the present study, more than 80% of the respondents in each group gave a strong belief in the value of exercise as the major reason for joining the program in the first place, closely followed by direct medical advice from the family physician. The reasons for joining the present study are in agreement with observations made by Durbeck et al., (1972) in that a major motivating factor for joining an exercise program in both studies tended to revolve around the individual's perception of his need for physical activity.

Factors influencing the individual's decision to join an exercise program have been demonstrated to differ from those factors influencing compliance over time (Heinzelmann and Bagley, 1970; Heinzelmann, 1973). It may be that the individual is motivated to join the program based upon his expectations of what the program has to offer, whereas his decision to continue (or not to continue) may be based upon the realities of the program (i.e., what benefits he feels he is actually achieving from the program). In the present study, the majority of subjects joined the McMaster program because of a strong belief in the value of exercise and this finding was observed to coincide with reasons for compliance and dropout listed by respondents in the present study. Whether discrepancy between the individual's expectations and the actual benefits of the program leads to dropout is not known for certain; however, the results of the present study tend to suggest that the individual's motivation for joining the exercise program should be considered in the development of compliance-improving strategies.

Sanne and Rydin (1973) found that practical difficulties, specifically program accessibility and type of training facilities, represented a common cause of dropout among participants in the Goteborg study. These factors were found to present more of a problem to participants in the Goteborg study than in the present study.

Dropouts from the Ontario study (Andrew and Parker, 1979; Andrew et al., 1981) reportedly experienced more fatigue than compliers following the exercise sessions. Although more dropouts in the present study experienced fatigue following participation in the exercise sessions, this was not a significant factor contributing to dropout. However, it does point out the need to consider such program design factors as the time of day exercise sessions are offered.

Heinzelmann (1973) found that the level of spouse support may act to influence compliance over time. These observations have been confirmed in a recent report (Andrew et al., 1981) which details the reasons for dropout from the OEHCS study. The dropout rate was observed to be three times greater among OEHCS participants who received little or no spouse support compared to those participants who reported positive spouse/family support. Although the role of spouse support was not a contributing factor in the dropout rate in the present study, the potential significance of this factor should not be overlooked and should be considered in the design of compliance-improving strategies by creating opportunity for family involvement in various program-related activities.

Increased energy levels, feelings of better health, increased work performance, and more positive feelings about work were benefits reported to have been achieved by a significantly larger proportion of responding compliers compared

to responding dropouts in the present study. Other factors such as more adequate sleep, and less tension were reported but were not as statistically important.

There are certain psychological benefits that appear more likely to be attained by those who continue to participate in a supervised program of exercise rehabilitation. However, caution needs to be taken because of the potential ambiguity of the wording of the statements provided on the questionnaire. The dropouts were responding to the benefit statements from the time of their withdrawal, whereas the compliers responded to the benefit statements from the time of their entry into the program. It is recognized by the investigator that this may present room for argument that the responses of the two groups cannot be compared due to differences in the time-frame reference. However, it is argued that this is a legitimate comparison between compliers and dropouts since it is the effects of continued participation in the exercise program compared to the effects of withdrawal from the program which are being investigated in this study.

Results of previous studies (Ilmarinen and Fardy, 1977) have suggested that participation in regular exercise may promote positive psychological feelings toward state of health and physical fitness of individuals. Beneficial effects reported by the exercise group in the study by Heinzelmann (1973) were increased work performance, more positive attitudes towards work, increased stamina, feelings of better health,

weight reduction, reduced stress and tension, decreased food intake, increased recreation, and more adequate sleep and rest which compare favorably with the observations made in the present study despite population differences.

The most important factors for continued compliance found in the present study appeared to be a strong belief in the value of exercise, the physical benefits derived from the exercise, positive feedback resulting from testing sessions, and a subjective interpretation on the part of the patients that they just felt better.

Heinzelmann (1973) found that factors which influenced compliance differed from those factors observed to motivate participants to join the program in the first place. Factors found by Heinzelmann (1973) to influence compliance included program organization and leadership, games and social aspects of friendships acquired, and support of significant others. Although Heinzelmann concluded that the motivational factors underlying the individual's decision to adopt a particular treatment regimen may differ from those factors which motivate him to maintain compliance with that regimen, the results of the present study fail to demonstrate such a distinct difference in motivational factors. The strongest motivational factor found in the present study appears to be a strong belief in the value of exercise, regardless of whether the decision concerns adoption or maintenance. Andrew et al., (1981) observed a significantly higher dropout rate among those

participants in the OEHCS study who were lacking a strong belief in the value of exercise. The results of the present study tend to support those reported by Andrew et al., (1981).

Another factor which appeared to influence the decision to maintain participation in the present study involved the social aspects of the group activity. Although these social aspects were not the most popular reasons listed by responding compliers, many respondents commented that the social camaraderie among the participants, and between the leaders and the participants, was one particular aspect of the program from which they derived great enjoyment. The friendships acquired during participation in the program gave many compliers the opportunity to share their thoughts and feelings about their experiences with their illness with others "who had been there". The respondents' comments provided include valuable information which support Heinzelmann's findings that the role of social camaraderie is important and should be examined for its potential influence on compliance.

Social camaraderie is just one example of an aspect of the exercise rehabilitation program which could be optimized; perhaps through the organization of voluntary encounter-type groups where interested patients are provided with the opportunity to exchange their experiences, thoughts, and ideas of mechanisms for coping with CHD.

No single overwhelming factor was found to contribute to the dropout in this study. The results obtained appear to indicate that there was a variety of reasons for withdrawal

from the exercise program. However, the influence of personal convenience factors may be clearly observed since more than 50% of responding dropouts agreed that they withdrew from the exercise program because it was too inconvenient for them to attend, and because they didn't enjoy or lost interest in the program. One-third of responding dropouts found the program too time-consuming. While some of the responding dropouts provided only one major reason for their decision to withdraw, others indicated two or more reasons.

Some responding dropouts volunteered additional information pertaining to reasons for dropout. Those other factors agreed upon as leading to dropout included medical advice, doubts about the value of exercise, and the frustration of driving to the exercise centre during rush hour; a factor which should perhaps be considered to be related to the inconvenience factors discussed above.

Sanne and Rydin (1973) found that local factors such as program accessibility, type of facilities and regimen, duration of program, time of sessions, and cost of transport appeared to influence the individuals' decision to withdraw from an exercise program. Results of the CAPRI study (Bruce et al., 1976) indicated that the decision to dropout was based upon unavoidable and psychosocial reasons; findings similar to those obtained in the Ontario study (Oldridge et al., 1978; Oldridge, 1979c; Andrew and Parker, 1979; Andrew et al., 1981).

Those factors found to contribute to dropout in the present study tend to agree with the findings of the Goteborg, CAPRI, and Ontario studies referenced above. The major factors contributing to dropout from the McMaster exercise program appear to have centred around the psycho-social and personal convenience categories.

Slightly more than 25% of responding dropouts agreed that they withdrew because they felt much better; a finding which is not explained by any difference in age or time of dropout between dropouts who reported feeling better and those who did not. This is very positive and encouraging information which should not be overlooked since it indicates that these people had reached a certain point in the program where they felt they had achieved all that they could from the program. We must not underestimate the significance of this type of response because once the individual begins to feel better able to cope with their illness and no longer finds it necessary to attend the exercise sessions, we must ask ourselves if this perhaps suggests that the exercise program has done its job. These particular individuals may have needs which differ somewhat from the remaining dropouts or compliers, or needs which may be met in a shorter period of time. This finding suggests that it may prove beneficial to future compliance research to develop a method for early identification of certain individuals who, despite withdrawal, have still attained these particular treatment goals of the exercise

program. As previously discussed, it is possible for some individuals to attain treatment goals even if they have failed to comply with the prescribed treatment regimen, just as some highly compliant individuals may fail to achieve the treatment goals (Sackett, 1976). This situation may have led to a distortion in the results of the present study since there were some individuals who reported gaining desired benefits despite the fact that they withdrew from the program prior to their 6-month graduation date. It is difficult to formulate final conclusions based upon these findings due to the difference in response rates between compliers and dropouts in this study. The implications for future research now becomes a matter of formulating a method for identification of these noncompliant individuals who still attain treatment goals and subsequently finding a means of classifying them accordingly in order to provide a more accurate report of the rate of compliance and the effects of the treatment under investigation. Clearly, it is not enough that compliance-improving strategies be developed and researched; we must also work to develop ways to assist the patient in his attempt to maintain the lifestyle changes he adopted during his participation in the exercise program once he leaves.

CHAPTER VI

SUMMARY, IMPLICATIONS RECOMMENDATIONS, AND CONCLUSIONS

Questionnaire information gathered from 63 responding subjects (41 compliers, 22 dropouts) was used to identify factors contributing to their decision to either comply with or dropout of the McMaster Cardiac Rehabilitation Exercise Program. Follow-up information provided by respondents allowed for determination of entry to follow-up changes within each group, and follow-up differences between groups in areas of health status, employment, smoking, activity and dietary status.

Analysis of entry characteristics indicated that compared to compliers upon entry, dropouts in this study were younger, and significantly more likely to be regular smokers, blue collar workers, and inactive in their leisure habits. These results are in agreement with previous studies (Oldridge et al., 1978; Oldridge, 1979c) and further support the suggestion that the implementation of compliance-improving strategies should be directed at a target group of potential dropouts who may be identified upon entry on the basis of these characteristics.

While a strong belief in the value of exercise was found among the majority of all respondents to be a major

influence in their decision to join the program, no single factor was identified as the main motivating factor leading to compliance or dropout in this study. Rather, a combination of psychosocial and personal convenience factors appear to have influenced the individuals' decision to comply or withdraw. These findings are in general agreement with previous studies (Sanne and Rydin, 1973; Bruce et al., 1976; Oldridge et al., 1978; Oldridge, 1979c; Andrew and Parker, 1979; Andrew et al., 1981) which report a variety of psychosocial and personal convenience factors as contributing to dropout from rehabilitation exercise programs.

Earlier studies (Heinzelmann, 1973; Andrew et al., 1981) have documented the influence of spouse and family support upon compliance. While these previous reports provide evidence of a lower level of spouse support among those who chose to withdraw from exercise, in the present study the role of spouse support did not appear to have influenced the dropout rate. Despite the findings of the present study, the role of spouse/family support is a potentially important one which should be considered in the design of compliance-improving strategies by encouraging family involvement in various program-related activities.

Increased energy levels, feelings of better health, increased work performance, and more positive feelings about work were among the list of psychological benefits reportedly achieved by those respondents who completed the 6-month

program of exercise. While significantly fewer dropouts reported attaining these same benefits in the time since their withdrawal, it is not certain whether these benefits achieved by compliers were strictly due to continued participation in the exercise program. It is possible that the perceived achievement of these benefits may have been confounded by variables other than continued participation.

Follow-up investigation of health status suggested that compliers may perceive their state of health in a somewhat more positive light than dropouts. Further, dropouts tended to reveal a somewhat greater degree of concern over their status of health compared to compliers. However, both groups expressed general satisfaction with the health care they have received, indicating that dissatisfaction with health care was not a contributing factor to the dropout in this study.

When employment status upon entry was compared to follow-up, significant changes were observed to have occurred in the employment status of compliers but not dropouts. However, there were no significant differences in employment status between groups either at entry or upon follow-up indicating that although compliers experienced a significant increase in employment levels upon follow-up, this change was not necessarily due to exercise-compliance.

Compliers in the present study were found to be significantly more active during leisure time than dropouts

both upon entry and upon follow-up. This difference was also observed upon follow-up with respect to mean number of months per year spent participating in a regular program of exercise. However, while compliers do appear to be more active upon follow-up than dropouts, this effect tends to diminish gradually as the amount of time since leaving the exercise program increases. Further, since both compliers and dropouts demonstrated significant changes in activity status from time of entry to time of follow-up, the achievement of increased follow-up activity levels may not necessarily require participation in the entire 6 months of supervised exercise.

The obtained results suggest that strategies must be developed with the aim of encouraging the long-term maintenance of behavior change. Chances of maintaining increased activity habits may be improved through counselling of individual participants on the setting up of home exercise programs since exercising respondents tended to participate in activities which are easily carried out at home, on their own time, with a minimal amount of equipment and expense (i.e., walking and bicycling).

Implications for Program Design:

It is suggested that the following program maneuvers be tested as a result of improved understandings arising from the findings of this study:

1. Certain voluntary behavioral factors should be considered at time of entry. For example, those who have voluntarily stopped smoking, or increased their leisure activity habits, have already demonstrated compliant behavior to some extent. It is possible that smoking and leisure activity habits upon entry are strong indicators of subsequent compliant behavior, and the younger, blue-collar worker who does not voluntarily stop smoking and change his leisure activity patterns may be less likely than his older counterpart to continue/complete the program. Determination of such entry characteristics may allow for identification of a high risk, highly resistant group of potential noncompliers. Those individuals identified upon entry as being at high risk of dropping out of the exercise program (i.e., smokers, blue collar workers, those with inactive leisure habits) present the greatest challenge to compliance-improving strategies, but must be considered a likely target group for compliance-improving strategies such as reward systems, home training programs, car pools for transportation to the exercise centre, and choice of program times.

2. An alternate strategy for improving compliance may be to choose to work only with those individuals who give a high probability of complying with the exercise program based on

their entry characteristics. This type of system may be most practical for programs which are operating within strict budgets, and which may not be able to afford the expense of implementing other suggested strategies.

3. Compliance-improving strategies should be designed to optimize factors found to contribute to compliance (e.g., social camaraderie, spouse support, and provision of feedback from testing sessions), while minimizing those factors found to contribute to dropout (e.g., inconvenient program times, lack of education regarding the value of exercise).

4. In terms of practicality, it may be desireable to exclude potential dropouts from clinical trials of exercise rehabilitation. Potential dropouts could be included for participation in service programs. However, this suggestion carries with it the danger of excluding potential compliers from such clinical trials.

5. A simple, more direct method of predicting compliance would be to ask each patient upon their entry whether or not they intend to comply with the program requirements.

6. Exercise programs which involve activities that are easily carried out at home with a minimum of equipment and expense may help to encourage the maintenance of regular activity habits once the participants have left the supervised exercise program. Home programs may also benefit those individuals who find it inconvenient or difficult to attend the supervised sessions.

7. Personal inconvenience factors may be eliminated or reduced by offering a choice of program times both during the day and in the evening. A choice in program times may also enable other family members to occasionally attend exercise sessions, thus becoming more involved while increasing their knowledge of the rehabilitative process. This, in turn, may lead to a greater level of family/spouse support which could promote compliance.

8. Communication between participants and program leaders should be encouraged. A high level of communication may serve to enhance feelings of social camaraderie among program participants and leaders. This may promote a higher level of compliance since participants appreciate the opportunity to share their feelings and experiences with others who are capable of understanding their situation.

Recommendations for Further Research

The following recommendations are made in view of the findings of the present study:

1. Further study is needed with respect to follow-up of dropouts and compliers from exercise programs designed for cardiac patients in order to determine the long-range effects of continued participation in such programs.

2. Reminders by mail and telephone proved to be an efficient means of gathering the required information from individuals who may not respond to written reminders. In certain instances, delayed response may be quickly remedied by simply sending a second copy of the questionnaire to those individuals who fail to return their response within the first week following distribution. In addition, reasons for total lack of response from unwilling individuals can be quickly determined through reminder telephone calls. The recommendation to be made is one of placing reminder telephone calls in an attempt to increase the questionnaire response rate and/or to gather information pertaining to lack of response.

3. Future study is needed in order to determine the nature of any possible relationship which may exist between individual health beliefs and compliance. At present it remains unknown whether compliance levels are affected by health beliefs, or whether changes in health beliefs can occur through participation in and compliance with a supervised program of exercise. In fact, the existing literature contains no evidence of a definite relationship between health beliefs and exercise compliance, let along direction of that relationship. This is a potentially promising area of research which could be investigated through the collection and examination of entry and follow-up health beliefs.

4. Clinical characteristics (i.e., EKG, functional capacity, morbidity, mortality rates) of participants should be examined upon entry and follow-up in order to provide a more objective

measure of the patients' health status. A more objective measure of treatment outcome should be included in compliance research in order to strengthen potential conclusions regarding the effect of exercise compliance upon follow-up health status.

5. Frequent contact with former program participants should be maintained whenever possible in order to update mailing lists for future research and follow-up. Continued contact would also better enable the researcher to determine whether or not the desired behavioral lifestyle changes (i.e., increased activity, reduced smoking, dietary considerations) are being maintained over time.

6. The results of the present study may not be truly representative of the population under investigation due to the small sample size and limitations imposed by constant and random error. Further study is needed involving a much larger sample size, and control over constant and random sources of error should be improved.

7. The present study did not involve a multivariate analysis. However, a multivariate analysis would have provided more conclusive results because of possible correlations and interactions between various factors and characteristics.

Conclusions

The results of the present study allow for the following conclusions to be made:

1. Upon entry, dropouts differed from compliers in this study with respect to age, smoking status, leisure activity status, and occupational status.

2. Upon follow-up, dropouts differed significantly from compliers with respect to activity habits, specifically activity status, months per year spent participating in regular exercise, physical activity at work; however, differences tend to diminish with time since leaving the program.

3. Upon follow-up, compliers were significantly more likely than dropouts to report increased energy levels, feelings of better health, increased work performance, more positive feelings about their work, and to a lesser degree more adequate rest and sleep, less stress and tension, and increased recreation activity. However, these differences may or may not be due to continued participation in the exercise program.

4. A variety of factors were found to contribute to compliance and dropout in this study. Factors influencing compliance tended to centre around the psychosocial category, while reasons for dropout centred around psychosocial and personal convenience categories.

5. Significant improvements occurred among compliers from time of entry to follow-up in the areas of employment and

activity. Among dropouts, significant follow-up improvements were observed only with respect to leisure activity status.

6. The results of the entry/follow-up comparisons between compliers and dropouts indicate that any improvements in follow-up status among compliers may be only temporary, short-term improvements which tend to diminish over time. Some improvement in follow-up status may be gained by individuals in both groups regardless of whether they continued participating in the program or withdrew. The problem to be dealt with concerns the maintenance of any lifestyle changes.

7. It remains to be determined whether any beneficial effects perceived by compliers following continued participation in an exercise program are the direct result of regular participation in physical activity or are actually related to more indirect factors connected with the compliant behavior itself.

8. It is possible that those differences observed to occur in the present study between responses of compliers and dropouts are not true differences, but rather differences due to lack of control over such sources of constant and random error as the respondents' ability to interpret the questionnaire items as intended, transient personal factors, situational factors, potential weaknesses in questionnaire design, and multiple comparisons in data analysis.

APPENDIX A

Cover Letter

McMASTER UNIVERSITY
School of Physical Education and Athletics
1280 Main Street West, Hamilton, Ontario L8S 4K1
Telephone: 525-9140 Ext. 4464, 4465, 4468 or 4640

May 20, 1980

McMASTER EXERCISE REHABILITATION SURVEY

I am a graduate student in the Department of Physical Education of McMaster University. I am conducting a mail survey to learn more about the McMaster Exercise Rehabilitation Program. Specifically, I wish to know:

- Why people join the McMaster program?
- Why people withdraw from the program? or
  Why people continue their involvement with the program?
- What happens to individuals after they stop attending the program?

I am asking you to help me in this research by answering the questions in the enclosed pages, putting them in the stamped, preaddressed envelope and dropping it in the mail within the next 2 or 3 days. By doing so you will help to provide all those involved in conducting the McMaster program with valuable information regarding the various strengths and weaknesses of the program so that the program can be improved.

You were selected because you entered the program sometime between September 1, 1978 and October 31, 1979, REGARDLESS OF HOW LONG YOU CONTINUED TO PARTICIPATE IN THE PROGRAM. In order for this research project to be completed, it is important that each questionnaire be filled out and returned.

YOUR ANSWERS TO THESE QUESTIONS WILL BE KEPT STRICTLY CONFIDENTIAL. NO NAMES WILL BE RELEASED SHOULD THE RESULTS BE PUBLISHED.

I would be most happy to answer any questions you might have. Please feel free to write or call. The telephone number is 525-9140 extension 4625 (days), or 523-6434 (evenings or weekends).

Thank you very much for your help.

Sincerely yours,

Janis Spencer

(Ms.) Janis Spencer, B.H.K.
Graduate Student

Enclosure

APPENDIX B

Questionnaire For Compliers

code
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McMASTER EXERCISE REHABILITATION SURVEY

SECTION I

Some of the questions in this first section are the yes/no type of question; others require you to check (✓) one of the answers or fill in the necessary information. These are indicated.

A) HEALTH

A.1 Did you ask your physicism to refer you to this program?

- ☐ No
- ☐ Yes

A.2 Have you experienced any cardiac problems since you left the program? (e.g. angina, etc.)

- ☐ No (go to A.3)
- ☐ Yes

A.2.1 IF YES, please explain the problem:

_____

_____

A.3 Have you been hospitalized since you left the program?

- ☐ No (go to A.4)
- ☐ Yes

A.3.1 If your answer to question A.3 was YES, please indicate the reason for hospitalization:

_____

_____

A.3.2 What was the length of your hospitalization?

_____

A.3.3 What was the date of your hospitalization?

_____
day month year

A.3.4 Name of hospital?

_____

A.4 Compared with people your own age, how would you rate your health?

- ☐ Poor
- ☐ Fair
- ☐ Good
- ☐ Excellent

A.5 Thinking about your present state of health compared to your state of health at the time you first entered the program, would you say you are:

- ☐ Much healthier now
- ☐ A little bit healthier now
- ☐ As healthy now
- ☐ A little bit sicker now
- ☐ Much sicker now
- ☐ Don't know

A.6 Thinking about your health, do you think you can do:

- ☐ Much for it
- ☐ Something for it
- ☐ Nothing for it
- ☐ Don't know

A.7 Do you think your health depends:

- ☐ Mostly on you
- ☐ Partly on you
- ☐ Mostly on luck (fate)
- ☐ Don't know

A.8 How much do you worry about your health?

- ☐ Never
- ☐ Sometimes
- ☐ Frequently

A.9 In general, how satisfied have you been with the care you have received when seeking medical help?

- ☐ Very satisfied
- ☐ Somewhat satisfied
- ☐ Somewhat dissatisfied
- ☐ Very dissatisfied
- ☐ Undecided

A.10 Are you currently taking any medication(s)?

- ☐ No (go to B.1)
- ☐ Yes

A.10.1 If you answered YES to question A.10, please indicate which medication(s) you are currently taking, the dosage, and the number of times you are required to take each medication daily.

Name of medication(s)	Dosage (mg)	Number prescribed/day

A.10.2 People often have difficulty taking their pills for various reasons. We are interested in finding out any problems which occur so that we can understand them better.

Have you had any difficulty in taking your pills?

☐ No

☐ Yes

A.10.3 Have you ever missed taking any of these pills?

☐ No (go to B.1)

☐ Yes

A.10.4 If you answered YES to question A.10.3, which pills did you miss taking, and what was the average number missed?

Name of medication(s)	Average number missed per day	per week	per month

B) WORK STATUS

B.1 Are you (check one):

☐ Currently employed (go to B.1.2)

☐ Retired (go to B.2)

☐ Currently unemployed - temporary ☐

- permanent ☐

If you are currently unemployed, please explain (e.g. laid-off, medical reasons, etc.) then go to B.2

_____

_____

B.1.1 Has your job changed since you left the program?

☐ No (go to B.1.3)

☐ Yes; How? _____

_____

B.1.2 Date of job change:

_____

day month year

B.1.3 How much physical activity do you get in your work?

- ☐ A great deal of physical activity
- ☐ Some physical activity
- ☐ Very little physical activity

B.2 What shifts did you work while you were in the program?

- ☐ Rotating
- ☐ All days
- ☐ All evenings
- ☐ All nights
- ☐ Other - please specify: _____

_____

- ☐ Unemployed while in program

C) SMOKING STATUS

C.1 Please indicate which of the following best describes your present smoking habits.

- ☐ Never smoked (go to D.1)
- ☐ Regular smoker at present; no attempts made to quit (answer C.1.1 then go to D.1)
- ☐ Previous attempts to quit failed; presently smoking (answer C.1.1 and C.1.2)
- ☐ Quit (go to C.1.2)

C.1.1 Amount presently smoked is:

- ☐ More than amount smoked at the time you left the program
- ☐ Same as the amount smoked at the time you left the program
- ☐ Less than amount smoked at the time you left the program

C.1.2 Attempt to quit was made:

- ☐ Before entering the exercise program
- ☐ While attending the exercise program
- ☐ After leaving the program

D) ACTIVITY HABITS

D.1 Have you been taking any regular exercise since you left the program?

- ☐ No (go to D.1.1 a & c; then to D.2)
- ☐ Yes

D.1.1 Does somebody participate in your exercise program with you?

	Yes	No
a) While you were in the McMaster program?	☐	☐
b) Now?	☐	☐

c) Who?
- ☐ Spouse
- ☐ Relative
- ☐ Friend
- ☐ Other

D.1.2 What types of exercise do you participate in?

_____

_____

D.1.3 How <u>often</u> do you take this exercise? Please indicate number in space provided.

- ☐ No specific regimen
- ☐ Times per day
- ☐ Times per week

D.1.4 How <u>much</u> exercise do you take each day? Please indicate number in space provided.

☐ Hours ☐☐ Minutes

D.1.5 How many months of the year do you exercise? Please indicate number in space provided.

☐☐ Months

D.2 In your spare time (free time) do you generally prefer:

- ☐ To be on the go
- ☐ To stay at home
- ☐ Other - please specify: _____

_____

D.3 Which of the following statements best describes the <u>highest</u> level of physical activity you are currently able to carry out. Please read each statement and place a check (✓) beside the one that fits you best.

<u>Level</u>

- ☐ I am able to do strenuous work around the house, and take part in active sports such as hand ball, soccer, tennis or other sports which require alot of exercise.
- ☐ I am able to walk fast, do moderate work around the house, climb stairs.
- ☐ I am able to do light work around the house, walk at a regular pace, climb stairs.
- ☐ I must walk at a slow pace, and have to restrict my work, household or recreational activities.

D.4 Now, try to recall which of those statements would best describe the highest level of physical activity you were able to carry out at the time you first entered the McMaster program. Please place a check (✓) beside the one statement that fit you best at that time.

Level

☐ I was able to do strenuous work around the house, and take part in active sports such as hand ball, soccer, tennis or other sports which require alot of exercise.

☐ I was able to walk fast, do moderate work around the house, climb stairs.

☐ I was able to do light work around the house, walk at a regular pace, climb stairs.

☐ I had to walk at a slow pace, and restrict my work, household or recreational activities.

D.5 The next few questions refer to the 2 weeks ending this past Sunday.

Here is a list of activities people do. In the past TWO WEEKS, how many times have you done each of these? Please WRITE THE NUMBER OF TIMES YOU HAVE DONE EACH ACTIVITY during the past two weeks in the space provided.

a)	Read the newspaper	☐☐ number of times	☐ never
b)	Played at a team sport	☐☐ number of times	☐ never
c)	Helped with the housework	☐☐ number of times	☐ never
d)	Gone out and visited with friends or relatives	☐☐ number of times	☐ never
e)	Played table games, e.g. cards, bingo	☐☐ number of times	☐ never
f)	Worked on a hobby	☐☐ number of times	☐ never
g)	Sat quietly alone and relaxed	☐☐ number of times	☐ never
h)	Gone to church	☐☐ number of times	☐ never
i)	Listened to the radio or watched television	☐☐ number of times	☐ never
j)	Gone shopping	☐☐ number of times	☐ never
k)	Played with children	☐☐ number of times	☐ never
l)	Had friends or relatives over to your house	☐☐ number of times	☐ never
m)	Played at non-team sports, e.g. swimming, hiking, cycling, jogging, fishing	☐☐ number of times	☐ never
n)	Gone out with friends for the evening	☐☐ number of times	☐ never
o)	Read books or magazines	☐☐ number of times	☐ never
p)	Worked in the yard or garden	☐☐ number of times	☐ never
q)	Gone out with friends or family for a day trip, e.g. drive, picnic, sightseeing	☐☐ number of times	☐ never

r) Sat around and talked with friends ☐☐ number of times ☐ never

s) Worked on a church or community activity ☐☐ number of times ☐ never

D.6 Have you ever belonged to any organizations in your community (e.g. church, service clubs, school groups, unions, etc.) If so, please indicate these organizations, approximate dates that you belonged and any particular role you assumed in each organization.

	Organization	Date	Role (office)
1.			
2.			
3.			
4.			
5.			
6.			

E) DIET

E.1 Were you on a special diet at the time you first entered the program?

☐ No
☐ Yes

E.2 Are you currently on a special diet?

☐ No (go to E.3)
☐ Yes

E.2.1 If you answered YES to question E.2, do you stick to your diet?

☐ No
☐ Yes

E.3 Do you consider yourself overweight?

☐ No
☐ Yes

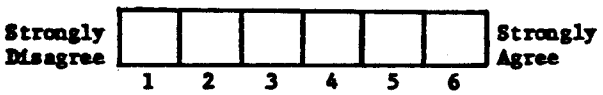
E.4 What is your present weight? Please indicate number of pounds in space provided.

☐☐☐ Pounds

SECTION II

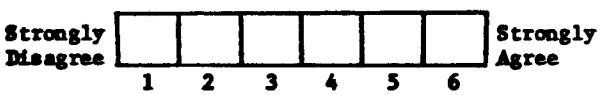
The questions in this section require you to indicate whether or not you personally agree or disagree with each statement by placing a check (✓) in the appropriate box on a scale from 1 to 6. The 1 end of the scale is used when you strongly disagree with the statement. The right side, 6, is used when you strongly agree with the statement.

e.g., I do not like warm, sunny days.

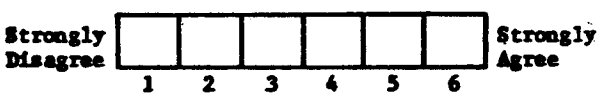


If you do like warm, sunny days then you would check 1, as you strongly disagree with the statement. Please make sure you answer every item by checking one, and only one, box for each statement. There are no right or wrong answers.

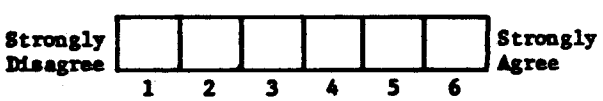
1. The exercise centre is readily accessible.



2. I rarely felt "worn out" after I attended an exercise session.



3. I felt that the facilities at the exercise centre were adequate for my needs and interests.

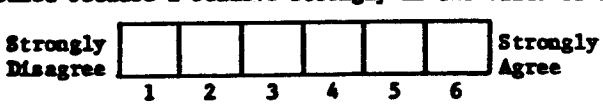


If you disagree, what facilities were inadequate?

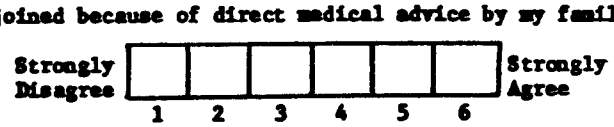
_____

_____

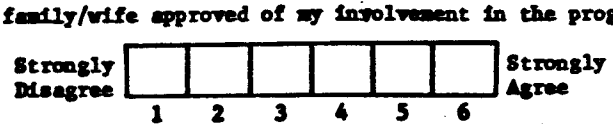
4. I joined because I believe strongly in the value of exercise.



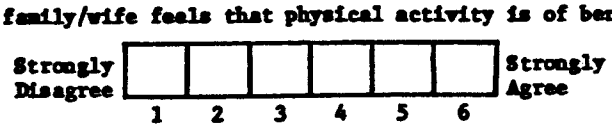
5. I joined because of direct medical advice by my family physician.



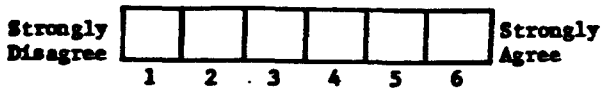
6. My family/wife approved of my involvement in the program.



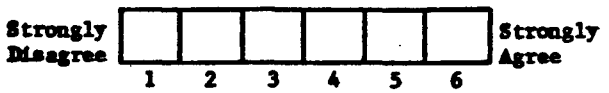
7. My family/wife feels that physical activity is of benefit to me.



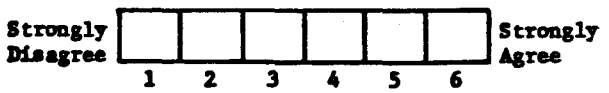
8. I have increased energy since my entry into the program.



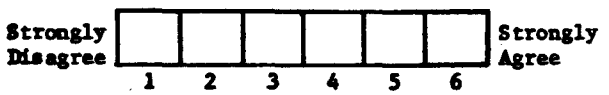
9. I have feelings of better health since my entry into the program.



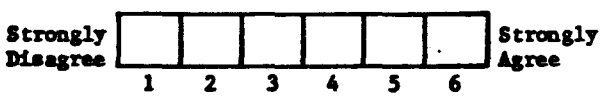
10. I am under less stress/tension since my entry into the program.



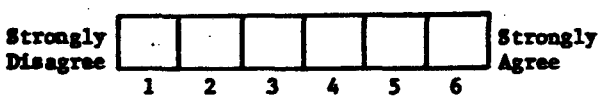
11. I have decreased the amount of food I eat since my entry into the program.



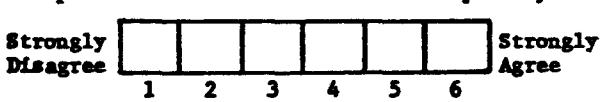
12. I have increased my recreation activity since my entry into the program.



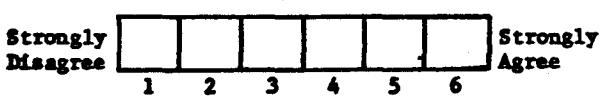
13. I get more adequate sleep and rest since my entry into the program.



14. My work performance has increased since my entry into the program.

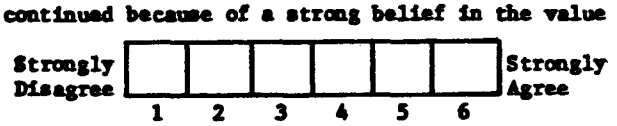


15. I am more positive about my work since my entry into the program.

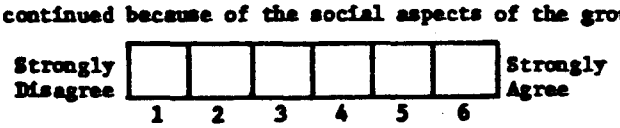


People continue to participate in exercise programs such as this one for a variety of reasons. Please indicate your reasons for continuing by answering all the questions below.

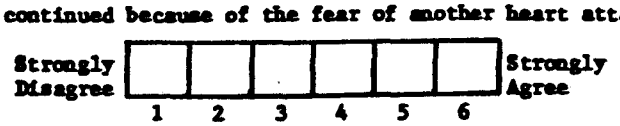
16. I continued because of a strong belief in the value of exercise.



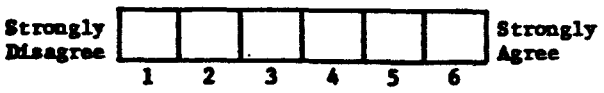
17. I continued because of the social aspects of the group activity.



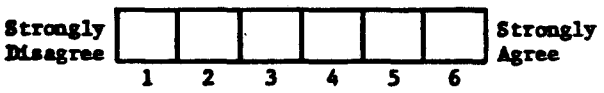
18. I continued because of the fear of another heart attack.



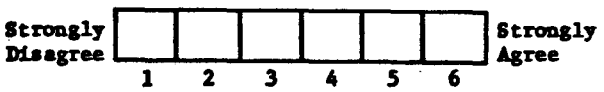
19. I continued because the information provided by the testing made me feel as if I were making progress.



20. I continued because it made me feel better.



21. I continued because of the direct benefits I felt I was deriving from the exercise.



If you agree, please indicate those benefits you felt you derived:

_____

_____

22. Other reasons why you continued to participate - please indicate below:

_____

_____

_____

APPENDIX C

Questionnaire For Dropouts

code
129

McMASTER EXERCISE REHABILITATION SURVEY

SECTION I

Some of the questions in this first section are the yes/no type of question; others require you to check (✓) one of the answers or fill in the necessary information. These are indicated.

A) HEALTH

A.1 Did you ask your physician to refer you to this program?

- ☐ No
- ☐ Yes

A.2 Have you experienced any cardiac problems since you left the program? (e.g. angina, etc.)

- ☐ No (go to A.3)
- ☐ Yes

A.2.1 IF YES, please explain the problem:

_____

_____

A.3 Have you been hospitalized since you left the program?

- ☐ No (go to A.4)
- ☐ Yes

A.3.1 If your answer to question A.3 was YES, please indicate the reason for hospitalization:

_____

_____

A.3.2 What was the length of your hospitalization?

_____

A.3.3 What was the date of your hospitalization?

_____
day month year

A.3.4 Name of hospital?

_____

A.4 Compared with people your own age, how would you rate your health?

- ☐ Poor
- ☐ Fair
- ☐ Good
- ☐ Excellent

A.5 Thinking about your present state of health compared to your state of health at the time you first entered the program, would you say you are:

- ☐ Much healthier now
- ☐ A little bit healthier now
- ☐ As healthy now
- ☐ A little bit sicker now
- ☐ Much sicker now
- ☐ Don't know

A.6 Thinking about your health, do you think you can do:

- ☐ Much for it
- ☐ Something for it
- ☐ Nothing for it
- ☐ Don't know

A.7 Do you think your health depends:

- ☐ Mostly on you
- ☐ Partly on you
- ☐ Mostly on luck (fate)
- ☐ Don't know

A.8 How much do you worry about your health?

- ☐ Never
- ☐ Sometimes
- ☐ Frequently

A.9 In general, how satisfied have you been with the care you have received when seeking medical help?

- ☐ Very satisfied
- ☐ Somewhat satisfied
- ☐ Somewhat dissatisfied
- ☐ Very dissatisfied
- ☐ Undecided

A.10 Are you currently taking any medication(s)?

- ☐ No (go to B.1)
- ☐ Yes

A.10.1 If you answered YES to question A.10, please indicate which medication(s) you are currently taking, the dosage, and the number of times you are required to take each medication daily.

Name of medication(s)	Dosage (mg)	Number prescribed/day

A.10.2 People often have difficulty taking their pills for various reasons. We are interested in finding out any problems which occur so that we can understand them better.

Have you had any difficulty in taking your pills?

☐ No

☐ Yes

A.10.3 Have you ever missed taking any of these pills?

☐ No (go to B.1)

☐ Yes

A.10.4 If you answered YES to question A.10.3, which pills did you miss taking, and what was the average number missed?

Name of medication(s)	Average number missed per day	per week	per month

B) WORK STATUS

B.1 Are you (check one):

☐ Currently employed (go to B.1.2)

☐ Retired (go to B.2)

☐ Currently unemployed - temporary ☐

- permanent ☐

If you are currently unemployed, please explain (e.g. laid-off, medical reasons, etc.) then go to B.2

B.1.1 Has your job changed since you left the program?

☐ No (go to B.1.3)

☐ Yes; How?

B.1.2 Date of job change:

_____

day month year

B.1.3 How much physical activity do you get in your work?

- ☐ A great deal of physical activity
- ☐ Some physical activity
- ☐ Very little physical activity

B.2 What shifts did you work while you were in the program?

- ☐ Rotating
- ☐ All days
- ☐ All evenings
- ☐ All nights
- ☐ Other - please specify: _____

_____

- ☐ Unemployed while in program

C) SMOKING STATUS

C.1 Please indicate which of the following best describes your present smoking habits.

- ☐ Never smoked (go to D.1)
- ☐ Regular smoker at present; no attempts made to quit (answer C.1.1 then go to D.1)
- ☐ Previous attempts to quit failed; presently smoking (answer C.1.1 and C.1.2)
- ☐ Quit (go to C.1.2)

C.1.1 Amount presently smoked is:

- ☐ More than amount smoked at the time you left the program
- ☐ Same as the amount smoked at the time you left the program
- ☐ Less than amount smoked at the time you left the program

C.1.2 Attempt to quit was made:

- ☐ Before entering the exercise program
- ☐ While attending the exercise program
- ☐ After leaving the program

D) ACTIVITY HABITS

D.1 Have you been taking any regular exercise since you left the program?

- ☐ No (go to D.1.1 a & c; then to D.2)
- ☐ Yes

D.1.1 Does somebody participate in your exercise program with you?

	Yes	No
a) While you were in the McMaster program?	☐	☐
b) Now?	☐	☐

c) Who?
- ☐ Spouse
- ☐ Relative
- ☐ Friend
- ☐ Other

D.1.2 What types of exercise do you participate in?

_____

_____

D.1.3 How <u>often</u> do you take this exercise? Please indicate number in space provided.

- ☐ No specific regimen
- ☐ Times per day
- ☐ Times per week

D.1.4 How <u>much</u> exercise do you take each day? Please indicate number in space provided.

☐ Hours ☐☐ Minutes

D.1.5 How many months of the year do you exercise? Please indicate number in space provided.

☐☐ Months

D.2 In your spare time (free time) do you generally prefer:

- ☐ To be on the go
- ☐ To stay at home
- ☐ Other - please specify: _____

_____

D.3 Which of the following statements best describes the <u>highest</u> level of physical activity you are currently able to carry out. Please read each statement and place a check (✓) beside the one that fits you best.

<u>Level</u>

- ☐ I am able to do strenuous work around the house, and take part in active sports such as hand ball, soccer, tennis or other sports which require alot of exercise.
- ☐ I am able to walk fast, do moderate work around the house, climb stairs.
- ☐ I am able to do light work around the house, walk at a regular pace, climb stairs.
- ☐ I must walk at a slow pace, and have to restrict my work, household or recreational activities.

D.4 Now, try to recall which of those statements would best describe the highest level of physical activity you were able to carry out at the time you first entered the McMaster program. Please place a check (✓) beside the one statement that fit you best at that time.

Level

- ☐ I was able to do strenuous work around the house, and take part in active sports such as hand ball, soccer, tennis or other sports which require alot of exercise.
- ☐ I was able to walk fast, do moderate work around the house, climb stairs.
- ☐ I was able to do light work around the house, walk at a regular pace, climb stairs.
- ☐ I had to walk at a slow pace, and restrict my work, household or recreational activities.

D.5 The next few questions refer to the 2 weeks ending this past Sunday.

Here is a list of activities people do. In the past TWO WEEKS, how many times have you done each of these? Please WRITE THE NUMBER OF TIMES YOU HAVE DONE EACH ACTIVITY during the past two weeks in the space provided.

a)	Read the newspaper	☐☐ number of times	☐ never
b)	Played at a team sport	☐☐ number of times	☐ never
c)	Helped with the housework	☐☐ number of times	☐ never
d)	Gone out and visited with friends or relatives	☐☐ number of times	☐ never
e)	Played table games, e.g. cards, bingo	☐☐ number of times	☐ never
f)	Worked on a hobby	☐☐ number of times	☐ never
g)	Sat quietly alone and relaxed	☐☐ number of times	☐ never
h)	Gone to church	☐☐ number of times	☐ never
i)	Listened to the radio or watched television	☐☐ number of times	☐ never
j)	Gone shopping	☐☐ number of times	☐ never
k)	Played with children	☐☐ number of times	☐ never
l)	Had friends or relatives over to your house	☐☐ number of times	☐ never
m)	Played at non-team sports, e.g. swimming, hiking, cycling, jogging, fishing	☐☐ number of times	☐ never
n)	Gone out with friends for the evening	☐☐ number of times	☐ never
o)	Read books or magazines	☐☐ number of times	☐ never
p)	Worked in the yard or garden	☐☐ number of times	☐ never
q)	Gone out with friends or family for a day trip, e.g. drive, picnic, sightseeing	☐☐ number of times	☐ never

r) Sat around and talked with friends ☐☐ number of times ☐ never

s) Worked on a church or community activity ☐☐ number of times ☐ never

D.6 Have you ever belonged to any organizations in your community (e.g. church, service clubs, school groups, unions, etc.) If so, please indicate these organizations, approximate dates that you belonged and any particular role you assumed in each organization.

	Organization	Date	Role (office)
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____

E) DIET

E.1 Were you on a special diet at the time you first entered the program?

☐ No
☐ Yes

E.2 Are you currently on a special diet?

☐ No (go to E.3)
☐ Yes

E.2.1 If you answered YES to question E.2, do you stick to your diet?

☐ No
☐ Yes

E.3 Do you consider yourself overweight?

☐ No
☐ Yes

E.4 What is your present weight? Please indicate number of pounds in space provided.

☐☐☐ Pounds

SECTION II

The questions in this section require you to indicate whether or not you personally agree or disagree with each statement by placing a check (✓) in the appropriate box on a scale from 1 to 6. The 1 end of the scale is used when you strongly disagree with the statement. The right side, 6, is used when you strongly agree with the statement.

e.g., I do not like warm, sunny days.

Strongly Disagree							Strongly Agree
	1	2	3	4	5	6	

If you do like warm, sunny days then you would check 1, as you strongly disagree with the statement. Please make sure you answer every item by checking one, and only one, box for each statement. There are no right or wrong answers.

1. The exercise centre is readily accessible.

Strongly Disagree							Strongly Agree
	1	2	3	4	5	6	

2. I rarely felt "worn out" after I attended an exercise session.

Strongly Disagree							Strongly Agree
	1	2	3	4	5	6	

3. I felt that the facilities at the exercise centre were adequate for my needs and interests.

Strongly Disagree							Strongly Agree
	1	2	3	4	5	6	

If you disagree, what facilities were inadequate?

_____

_____

4. I joined because I believe strongly in the value of exercise.

Strongly Disagree							Strongly Agree
	1	2	3	4	5	6	

5. I joined because of direct medical advice by my family physician.

Strongly Disagree							Strongly Agree
	1	2	3	4	5	6	

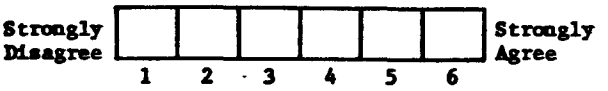
6. My family/wife approved of my involvement in the program.

Strongly Disagree							Strongly Agree
	1	2	3	4	5	6	

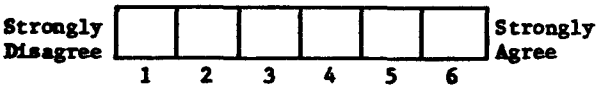
7. My family/wife feels that physical activity is of benefit to me.

Strongly Disagree							Strongly Agree
	1	2	3	4	5	6	

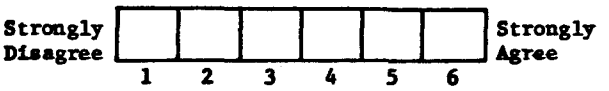
8. I have increased energy since my withdrawl from the program.



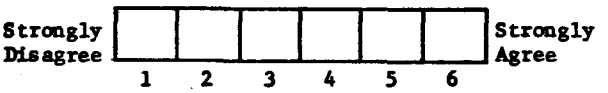
9. I have feelings of better health since my withdrawl from the program.



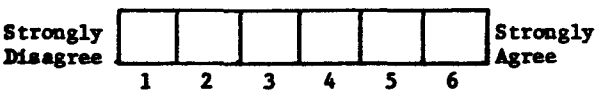
10. I am under less stress/tension since my withdrawl from the program.



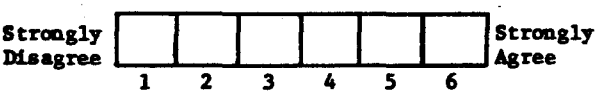
11. I have decreased the amount of food I eat since my withdrawl from the program.



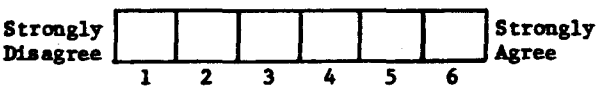
12. I have increased my recreational activities since my withdrawl from the program.



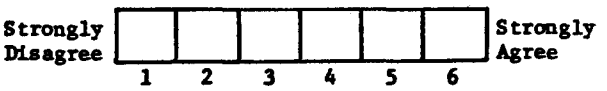
13. I get more adequate sleep and rest since my withdrawl from the program.



14. My work performance has increased since my withdrawl from the program.

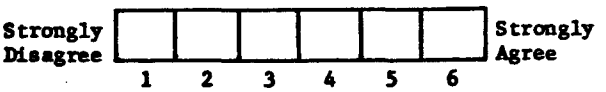


15. I am more positive about my work since my withdrawl from the program.

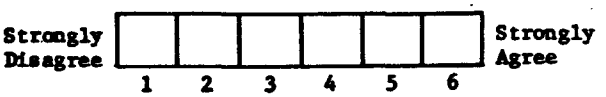


People choose to withdraw from exercise programs such as this one for a variety of reasons. Please indicate your reasons for withdrawing by answering all the questions below.

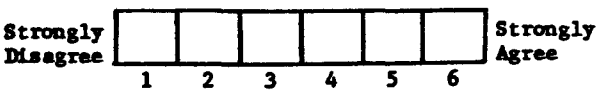
16. I stopped because of doubts about the value of exercise.



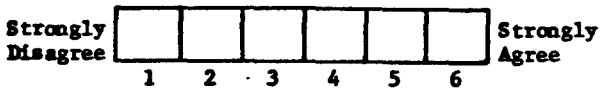
17. I stopped because I felt much better.



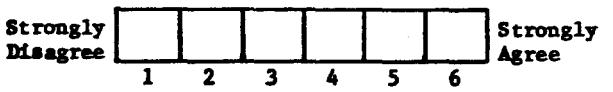
18. I stopped because of medical advice.



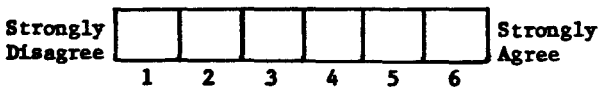
19. I stopped because I lost interest in the program.



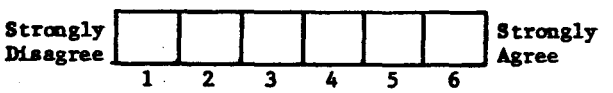
20. I stopped because the program was too time consuming.



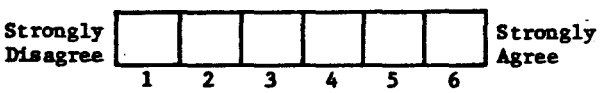
21. I stopped because of the pressure from my job.



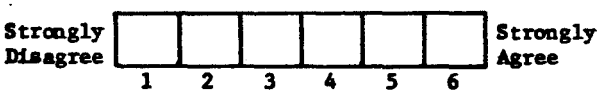
22. I stopped because of the leadership of the program.



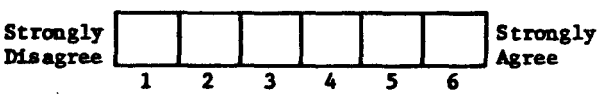
23. I stopped because I didn't get feedback about my progress.



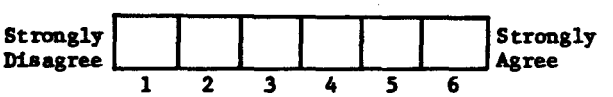
24. I stopped because it was too inconvenient for me to attend the program.



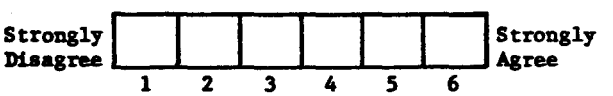
25. I stopped because my family/wife complained about the time commitment.



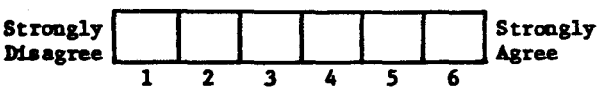
26. I stopped because I didn't enjoy the program.



27. I stopped because I found another program to replace it (or have made up my own, etc.).



28. I stopped because I felt I was not gaining any direct benefits from the exercise.



29. Please indicate below the benefits you had <u>expected</u> to gain from the exercise: _____

_____

30. Other reasons for withdrawing from the program - please indicate below:

_____

_____

APPENDIX D

Letter Of Reminder

McMASTER UNIVERSITY
School of Physical Education and Athletics
1280 Main Street West, Hamilton, Ontario L8S 4K1
Telephone: 525-9140 Ext. 4464, 4465, 4468 or 4640

June 18, 1980

McMASTER EXERCISE REHABILITATION SURVEY

A few weeks ago, you received a letter and questionnaire requesting your participation in the McMaster Exercise Rehabilitation Survey being conducted by a graduate student in the Department of Physical Education of McMaster University.

To date, your response to the survey has not been received.

I would like to remind you that unless each questionnaire is filled out and returned, this research cannot be completed. The completion of this study is of utmost importance to the improvement of the McMaster program.

Once again, I ask you to please help me to complete this study by spending a few moments of your time filling out the questionnaire, putting it in the stamped, pre-addressed envelope and dropping it in the mail within the next 2 or 3 days. Your help will be greatly appreciated.

If you have lost or misplaced the questionnaire, please contact me. I would be most happy to send you another copy. In addition, I would gladly answer any questions you might have. Please feel free to write, call or leave a message. The telephone number is 525-9140 extension 4625, or 523-6434.

If you have already filled out and returned your copy of the questionnaire, please disregard this reminder.

Thank you for your help.

Sincerely,

Janis Spencer

(Ms.) Janis Spencer, B.H.K.
Graduate Student

APPENDIX E

Table I

Nonsignificant Factors

Appendix E - Table I

Factors Found to be Nonsignificant

Compliers vs. Dropouts (P>.05)

Area of Concern	Factor or Question	
1. Health	a) Follow-up:	- cardiac-related problems - hospitalization - length of hospitalization
	b) Beliefs:	- rating of health - follow-up state of health compared to entry - patient can do for his health - patient thinks his health depends upon ... - patient worries about his health - patient satisfaction with health care
	c) Medication	- taking medication upon entry? - taking medication upon follow-up? - # cardiac related medications being taken upon entry - # tranquilizer medications being taken upon entry - # other medications being taken upon entry - # cardiac related medications taken upon follow-up - # tranquilizer medications taken upon follow-up - # other medications taken upon follow-up - difficulty taking medications - noncompliance with cardiac medications - noncompliance with tranquilizer medications
2. Employment	a) Entry:	- work status - shifts worked while attending program
	b) Follow-up	- work status - change in type of job since leaving program

(cont'd)

Appendix E - Table I (cont'd)

Factors Found to be Nonsignificant

Compliers vs. Dropouts (P>.05)

Area of Concern	Factor or Question	
3. Smoking	a) Follow-up:	- smoking habits - amount smoked - time of quitting smoking
4. Activity	a) Follow-up:	- participated with someone while in program? - participated with someone upon follow-up? - who is this participant? - duration of exercise sessions - types of exercise - frequency of exercise - highest level of physical activity - entry - highest level of physical activity - follow-up - # of organizations ever involved with
5. Diet	a) Entry:	- on special diet?
	b) Follow-up:	- on special diet? - compliance with diet? - considers self overweight? - present weight?
6. Entry Characteristics		- height - weight - # of previous myocardial infarctions
7. Other		- patient request for physician referral to program

(cont'd ...)

Appendix E - Table I (cont'd)

Factors Found to be Nonsignificant

Compliers vs. Dropouts (P>.05)

Area of Concern	Factor or Question	
7. Other (cont'd)	a) feelings toward program:	- accessibility - fatigue following sessions - adequacy of facilities
	b) reasons for joining:	- belief in value of exercise - medical advice
	c) spouse support:	- approval of participation - belief in benefits
	d) perceived benefits:	- decreased food intake

Area of Concern	Compliers	Dropouts
8. Entry/Follow-up Comparisons within each group (P >.05)	- medication	- employment
	- diet	- highest level of physical activity
	- smoking	- medication
		- diet
		- smoking

APPENDIX F

Table I

Entry Characteristics of Dropout Responders and Dropout Nonresponders

Appendix F - Table I

Entry Characteristics of Dropout Responders and Dropout Nonresponders

Characteristic	Proportion in Each Group				χ^2	d.f.	P
	Dropout Responders		Dropout Nonresponders				
	N	%	N	%			
Smoking							
a) Smokers	7	31.82	7	50.00			
b) Nonsmokers	15	68.18	7	50.00	1.28	1	>.05
* Occupation							
a) Blue Collar	15	68.18	10	71.43			
b) White Collar	7	31.82	4	28.57	0.20	1	>.05
* Activity							
a) Inactive Leisure	19	86.36	11	78.57			
b) Active Leisure	3	13.64	3	21.43	0.50	1	>.05
* MI History							
a) Previous MI	4	18.18	1	7.14			
b) No Previous MI	18	81.82	13	92.86	1.26	1	>.05

* Note: In chi-square analysis, fe was less than 5 in more than 20% of chi-square cells.

APPENDIX G

Table I

Entry Characteristics of All Dropouts and Those Compliers Who Had Graduated Prior to Time of Questionnaire (All Responding and Nonresponding S's Included)

------***------

Table II

Follow-up Activity Status of All Dropouts and Those Compliers Who Had Graduated Prior to Time of Questionnaire (Responding S's Only)

------***------

Table III

Benefits Achieved by Compliers (Since Entry) Not in Program at Time of Questionnaire and Dropouts (Since Withdrawal) - Responding S's Only

Appendix G - Table I

Entry Characteristics of All Dropouts and Those Compliers Who Had Graduated Prior To Time Of Questionnaire

(All Responding and Nonresponding S's Included)

Characteristic	Proportion or Mean for Each Group				χ^2/t	d.f.	P
	Dropouts		Compliers				
	N	%/$\bar{x}$	N	%/$\bar{x}$			
Smoking Status							
a) Smoker	17	46.3%	1	3.6%			
b) Nonsmoker	22	56.4%	27	96.4%	13.49	1	$<.05$
Activity Status							
a) Inactive Leisure	32	82.1%	14	50.0%			
b) Active Leisure	7	19.9%	14	50.0%	7.74	1	$<.05$
Occupational Status							
a) Blue Collar	28	71.8%	9	32.1%			
b) White Collar	11	28.2%	19	67.9%	10.93	1	$<.05$
MI Status							
a) Previous MI	5	12.8%	1	3.6%			
b) No Previous MI	34	87.2%	27	96.4%	2.05	1	N/S
Age (mean years)	39	48.44 years	28	53.79 yrs.	2.51 (pooled)	65	$<.05$
Weight (mean kg.)	39	81.07 kg.	28	79.70 kg.	-.52 (pooled)	65	N/S

Appendix G - Table II

Follow-up Activity Status of All Dropouts and Those Compliers Who Had Graduated Prior to Time of Questionnaire (Responding S's Only)

Factor	Proportion or Mean for Each Group				χ^2/t	d.f.	P
	Dropouts		Compliers				
	N	%/$\bar{x}$	N	%/$\bar{x}$			
Activity Habits							
a) Regular Exercise	10	45.5%	21	77.8%			
b) No Regular Exercise	12	54.5%	6	22.2%	5.5	1	N/S
Duration of Exercise (mean number of minutes)	22	27.5 min.	27	51.9 min	1.61 (pooled)	47	N/S
* Months Per Year of Exercise (mean number of months)	22	5.0 mos.	27	9.0 mos.	2.63 (pooled)	47	.011
Physical Activity at Work							
a) A Great Deal	6	33.3%	3	13.0%			
b) Some	4	22.2%	12	52.2%	4.49	2	N/S
c) Very Little	8	44.4%	8	34.8%			
Organizations (mean number ever involved with)	22	0.36 org.	27	1.48 org.	2.38 (pooled)	47	N/S

* $P < .05$

Appendix G - Table III

Benefits Achieved by Compliers (Since Entry) Not in Program At Time of Questionnaire and Dropouts (Since Withdrawal) - Responding S's Only

	Benefit	Proportion in Each Group				χ^2 (collapsed)	d.f.	P
		Compliers		Dropouts				
		N	%	N	%			
* **	Increased Energy							
	a) Agree	25	92.6	9	40.9	12.91 (corr.)	1	.0003
	b) Disagree	2	7.4	13	59.1			
* **	Feelings of Better Health							
	a) Agree	26	96.3	8	36.4	17.77 (corr.)	1	.0000
	b) Disagree	1	3.7	14	63.6			
* **	Increased Work Performance							
	a) Agree	20	83.3	7	43.8	5.17 (corr.)	1	.0230
	b) Disagree	4	16.7	9	56.3			
* **	More Positive About Work							
	a) Agree	18	75.0	6	37.5	4.17 (corr.)	1	.0411
	b) Disagree	6	25.0	10	62.5			
	Increased Recreation Activity							
	a) Agree	17	63.0	8	36.4	2.45 (corr.)	1	N/S
	b) Disagree	10	37.0	14	63.6			
*	More Adequate Sleep & Rest							
	a) Agree	20	74.1	8	63.6	5.58 (corr.)	1	.0181
	b) Disagree	7	25.9	14	36.4			

(cont'd next page)

Appendix G - Table III (cont'd)

Benefits Achieved by Compliers (Since Entry) Not in Program At Time of Questionnaire and Dropouts (Since Withdrawal) - Responding S's Only

Benefit	Proportion in Each Group				χ^2(collapsed)	d.f.	P
	Compliers		Dropouts				
	N	%	N	%			
* Under Less Stress/Tension							
a) Agree	23	85.2	11	50.0	5.51 (corr.)	1	.0190
b) Disagree	4	14.8	11	50.0			
Decreased Amount of Food Eaten							
a) Agree	12	44.4	7	31.8	0.37 (corr.)	1	N/S
b) Disagree	15	55.6	15	68.2			

Note:

* $P < .05$ (Agree/Disagree categories collapsed)

** $P < .05$ (All six Agree/Disagree categories considered in chi-square analysis)

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