Factors that Influence Physical Activity Selection, Frequency and Duration for People with Type II Obese Diabetes

by

Diana Ludwick

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ABSTRACT

Twelve men and women with Type II diabetes, enrolled in a community based eating and exercise behaviour change program, responded to a time series of five questionnaires administered over twenty-two weeks that explored the factors that these people identified as incentives and deterrents to physical activity initiation, selection, duration, frequency, adherence and curtailment. Walking was the main physical activity chosen by participants. The study data suggest that walking as a newly acquired or intensified activity is often perceived as enjoyable by participants. This enjoyment, though interfaced with inclement weather, time constraints and health problems, tended to become stronger over time and overrode the deterrents. Similarly, incentives such as convenience, ease and enjoyment for walking duration and frequency expanded for individuals over time. Whereas perceived obstacles such as inclement weather and time constraints though still significant tended to diminish. Gradually a routine became enmeshed into the participants' life-style. Concurrently, for half of the participants who chose walking their duration, frequency and cumulative walking time for the most part increased over time. In addition, all participants either continued with preexisting activities or started new activities to supplement walking. Incentives and deterrents for these supplemental activities varied.

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and

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DEDICATION

This thesis is dedicated to the study's delightful participants; whose humour, candidness, and enthusiasm was contagious. They touched the hearts of the study organizers, and in so doing will have countless people with Type II diabetes as beneficiaries.

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CHAPTER I: INTRODUCTION

Opening remarks

The high incidence of Type II obese diabetes in middle age and elderly people presents major health challenges. Complications of this disease include cardiovascular, renal, optic, and neuropathic disorders which jeopardize health and well being. Increasing evidence suggests that improved blood glucose control may prevent or delay the onset or progression of these complications (National Diabetes Advisory Board, 1983).

Approximately eighty-five percent of Manitobans with Type II diabetes are obese (Young et al, 1991). Weight loss for these individuals will lower blood glucose levels and increase insulin sensitivity (Down, 1991; Guare, 1989; Wing, 1985). Although it is generally believed that blood glucose improves with weight loss, some studies have indicated improved blood glucose independent of weight loss (Holloszy, 1983) suggesting that body composition and more specifically fat distribution may be the common denominator (Ohlson et al, 1985; Hartz et al, 1983).

It is yet to be determined whether there are any generally acceptable interventions that can improve glucose tolerance, with or without weight loss, for persons with Type II obese diabetes. Although this question has not been

answered definitely, there is some evidence that two interventions may be effective in at least some individuals (Kaplan, 1987). The better researched intervention is decreasing high fat and high calorie foods, which has been shown to be effective in improving glucose and insulin levels in some overweight individuals with Type II obese diabetes (Wheeler, 1983; Perkins, 1977; Rudnick, 1975; Weinseir, 1974). A second intervention that has been advocated is physical activity (Canadian Diabetes Association, 1989). Its role is less clearly understood (Heimrich et al, 19991; Lampman et al, 1990; Ekoe, 1989; Rogers, 1989).

Physical activity research for persons with Type II obese diabetes has primarily focused on the relationship between physical activity and blood glucose regulation. O'Dea (1984) and Bogardas (1984) have demonstrated no benefit from physical activity, whereas Saltin (1979) and Ruderman (1979) showed minimal effect of exercise on improved blood glucose control. Recently, both prospective studies (Yeater et al, 1990; Paternostro-Boyles, 1989; Rogers, 1989; Kaplan, 1987; Takekoshi, 1987; Ronnemaa, 1986; Schneider, 1984) and retrospective studies (Heath, 1987) have demonstrated that exercise significantly improved glucose control in persons with Type II obese diabetes, while less change occurred in more sedentary control groups.

The discrepancy in results may be explained at least partly by the often small number of subjects studied, differences in the frequency, duration, and intensity of exercise, differences in monitoring metabolic control

(glycosylated versus fasting plasma glucose), differences in the characteristics of the subjects in terms of initial degree of obesity and high blood glucose levels, as well as varied strengths and limitations of the individual study design.

To date, research findings are inconsistent. However, recent studies demonstrate improved blood glucose control with increased frequency, duration and/or intensity of exercise, whereas inactivity leads to a deterioration of glycemic control (Ekoe, 1989). These early findings are encouraging since even modest weight loss, attributed to changes in eating and/or physical activity, has demonstrated significant improvement in blood glucose control (Kaplan 1985).

The relationship between physical activity and blood glucose control is becoming more recognized. However, people with Type II diabetes are probably similar to other persons in their middle to late adult years. Initiating and maintaining exercise remains problematic. Available data from supervised and community settings suggest that only twenty-five to fifty percent of intentions to begin and maintain an exercise program translate into sustained action (Dishman, 1988; Center for Disease Control, 1987; Stephens, 1986; Capersen et al, 1985). Behaviour modification techniques have been accredited for ten to fifteen percent of this increase of physical activity. Clearly other determinants for physical activity are at play (Dishman et al, 1985; Martin, 1984).

The 1988 International Conference on Exercise, Fitness and Health formulated a consensus statement as a product of an elaborate process involving many of the world's leading authorities. This group noted that "interventions which focused on knowledge, attitudes, intentions, health beliefs, self-efficacy and expectations about activity outcomes, while helpful in the planning and adoption of physical activity, have only a weak influence upon the maintenance of such behaviour. . . . There is [also] a need to explore how perceptions of and preference for various types and intensities of physical activity are formed, and to decide whether such factors influence [ongoing] participation" (p. 9 - 10).

Research to explore psychosocial, demographic and biometric determinants has yielded inconsistent and inconclusive findings. Furthermore, physical activity type, frequency, intensity, and duration have traditionally been considered exercise descriptors. Physical activity characteristics as determinants of activity has received little attention in exercise research (Dishman, 1990). Preliminary studies suggest that when the person has the flexibility to select different modes of physical activity and can exercise at different times and places, this is more conducive to long-term exercise adherence than structured programs (Stephens, 1988; Epstein, 1985; Thompson, 1980). However, the relationship of physical activity characteristics as determinants to ongoing participation remains largely speculative (Dishman, 1990).

The workshop on Epidemiologic and Public Health Aspects of Physical Activity and Exercise was sponsored by the United States Department of Health and Human Services, 1984. After review and discussion by a panel of thirty-three experts from the fields of public health and exercise science, the following two recommendations were among nineteen research questions agreed upon as the important ones for future study. This panel encouraged researchers to determine factors that lead to the decision or intention to begin a physical activity program and to examine when and how preferences for types and intensities of activity are formed and how they influence future activity.

Almost a decade later, physical activity characteristics as determinants remain relatively unexplored. As well, it is not known in what ways determinants interact to influence participation over time. Small sample prospective studies of process design are needed to unravel the determinants of physical activity characteristics and to evaluate practical applications for optimizing participation for specific populations (Dishman, 1990).

Statement of the problem

Exercise habits are currently considered one of the primary determinants of blood glucose control. However, physical activity promoters have primarily focused on program components, often neglecting the decision making process of the individual involved in such programs (Leatt et al, 1988; Shephard, 1988;

Song et al, 1982). Of the possible determinants of physical activity participation, the characteristics of physical activity have received the least study (Dishman, 1990). In addition, the reliability and construct validity for measuring the determinants of physical activity type, frequency and duration remain problematic (Laporte, 1985; Powell, 1985). Although a growing body of knowledge indicates that exercise needs to be enjoyable and satisfying to be adopted and sustained over time (Sheppard, 1988; Stones et al, 1987), there still exits a need to explore other factors that act as incentives or inhibitors to start and continue physical activity programs.

Determining whether activity characteristics predispose or impede participation requires the use of repeated measures to examine changes in motivational determinants over time (Dishman, 1990). Traditionally, motivational and adherence exercise research has focused primarily on predictive designs rather than on process designs which enable the examination of the interplay of predictor and criterion variables within the context of growth and change over time. Consequently, no tools of known reliability and construct validity have been developed to track determinants of physical activity over time (Baeke, et al, 1982; Taylor, et al, 1978; Reiff, et al, 1967).

This prospective, qualitative study of process design explores factors that facilitate or inhibit physical activity type, duration, frequency, adherence, and curtailment for people with Type II obese diabetes. Recognizing that participants will change over time, periodic reappraisal of the participants using a series of questionnaires will attempt to unravel the fluid interplay of predictive and criterion variables.

Research questions

Notwithstanding the recognized difficulty of measuring attitudinal and motivational changes, the following research questions will be explored:

What factors do people identify that lead to a decision to become more physically active?

What factors do people identify that enhance or deter physical activity selection over time?

What factors do people identify that enhance or deter physical activity duration over time?

What factors do people identify that enhance or deter physical activity frequency over time?

Is there a relationship between type, frequency, and duration of physical activities on adherence over time?

What factors do people identify that influence physical activity repertoires to expand or shrink?

Study design

This descriptive study used self-administered questionnaires to determine which motivational factors influence physical activity selection, frequency and adherence over five months. Literature reviews failed to uncover any previously developed tools suitably designed to track physical activity determinants over time (Baeke et al, 1982; Taylor et al, 1978; Reiff et al, 1967). Five prototype questionnaires were developed to address the research questions germane to this study, as no validated tools were available. Refer to Appendices A, B, C, D, and E.

This study was encompassed within the auspices of a larger study "Development and Evaluation of a Community Based Eating and Exercise Program to Improve Type II Diabetes Control". The larger study design involved participants taking part in a behavioural program to alter their eating and exercise habits. The sample included volunteers who responded to a needs assessment (Searle, 1989) as well as those who responded to media advertising. The sample was comprised primarily of men and women over forty years of age.

Participants in the larger study received two hour sessions for ten consecutive weeks. During each session, progressively more time was spent walking on the track. However, the participants were encouraged to select their own physical activity type, duration and frequency between sessions. Upon completing the formal educational sessions, participants continued to meet monthly during the three month follow-up period.

As part of the parent study, retrospective data regarding activity type, frequency and duration were obtained from the participants daily exercise logs which they were asked to keep and submit weekly while they were in the ten week program and continued to submit monthly by mail for three months after completion of the program. Refer to Appendices F and G. These exercise logs provided comparison data to determine the reliability of questionnaire responses.

Rationale

Self-administered written questionnaires were selected because they were a time efficient way to gather data quickly and simultaneously for a large group of people, intermittently over time (Henerson et al, 1987).

Importantly, written questionnaires also minimized the potential for judgemental interviewer bias (Henerson et al, 1987). The use of self-administered questionnaires also relinquished the onerous demands from the investigator for recording the data (Henerson et al, 1987). However, the reliability of such reports remains controversial. Bernard et al (1980) collected reports of social interactions and compared those reports to behavioural observations of interactions. Although these researchers concluded that there is no relation between what people say and what they do, more recent studies have shown that self reports closely represent what the reporters usually do (Freeman et al, 1987).

Written responses permitted the respondents to have a considerable amount of time to think about their answers. Respondents also had a comfortable opportunity to add to their previous answers (Polit et al, 1988).

Assumptions

When measuring motivational determinants, there is a need to rely on inference as it is impossible to measure motivational determinants directly. Motivational determinants can only be inferred by the person's words and actions (Henerson et al, 1987). No measurement tools are perfect. Chosen measurement tools may not be sensitive enough to gather the necessary data and detect changes. In particular, unstated motivational factors may be more instrumental to outcomes than identified variables.

Written responses to questionnaires soliciting activity determinants may not be an accurate reflection of reality. Assumptions are made that respondents have the necessary self awareness to recognize their own beliefs or feelings and the ability to articulate them as well as no reason to lie about them (Henerson et al, 1987).

Recognizing the current North American trend towards increasing health and exercise conscientiousness, self reports logs of exercise type, frequency and duration also may not be a portrayal of reality, especially if the person is not comfortable relating the truth. Using self reports, investigators have no alternative but to assume the majority of respondents will be frank (Polit et al,1988).

It is unlikely that motivational determinants will stand still long enough for a one time measurement to be reliable. A volatile and fluctuating motivational determinant may not be able to be revealed by information gathered on one occasion or even if measured intermittently over time (Henerson et al, 1987).

Limitations

Ideally, the measurement instruments selected for this study need to be relevant, unbiased, sensitive, unidimensional, reliable and valid (Polit et al, 1987). These requirements were rather stringent, and a number of notable limitations of this study are highlighted.

Exploration of a wide spectrum of physical activity determinants has demonstrated little uniformity in theory, methods, measurements, sampling and settings (Chubb, 1990). Existing conceptual models used to explore physical activity determinants have not been sufficiently robust to be universally predictive for exercise initiation and maintenance among various settings and populations over time (Consensus Statement, 1988). In view of this notable shortcoming and in keeping with post-modernism critical thinking which encourages one to challenge premises such as the notion that guiding conceptual models always enhance research methodology (Cheryholmes, 1988; Aoki, 1986); no single conceptual model was selected as a benchmark for determining the design of this study.

The motivational determinants of physical activity type, frequency and duration have scarcely been investigated (Dishman, 1990). Past emphasis has been on the measurement and analysis of exercise behaviours controlled primarily by psychological and social variables. Traditionally physical activity characteristics have been viewed solely as descriptors rather than as possible activity determinants. Activity characteristics have also played a minor part of the investigation rather than the main research problem. This is further complicated by the fact that consensus has not been reached as to the most appropriate appraisal tools and procedures to explore any of the physical activity determinants (Dishman, 1990). Consequently, no questionnaires have been developed with known reliability and construct validity to examine physical activity characteristics as determinants of exercise (Dishman, 1990; Durnin, 1990; Montoye, 1990).

Seeking responses to written self-administered questionnaires has several distinct disadvantages when compared to face-to-face or telephone interviews. Perhaps most importantly, people are generally better able to express their views orally than in writing. In addition, written responses do not provide the flexibility of interviews to pursue ideas for further comment. It is also difficult to gage how people are interpreting a question. If questions are interpreted differently from one respondent to another, the validity of the information is jeopardized.

Recognizing the heterogeneous population base of Winnipeg, it is reasonable to predict that some participants will not be sufficiently literate in English to read the questions and/or to respond adequately in writing. Sufficient literacy was not a concern for this study group. However, future investigations may require that the questionnaires be read to some participants and/or recorded. In such circumstances, unequal measurement bias become suspect.

Self-administered activity questionnaire data were compared to weekly behavioural exercise diaries. However, daily logs of exercise type, frequency and duration are usually done in retrospect and depend on the reporters recall and/or opportunity to record the behaviour soon afterward (Weller, 1988). In addition, daily logs can be biased and incomplete. The bias is often unintentional. It is often a natural outcome of the fact that people have mindsets that result in selective recall. Most people are not naturally good self observers and reporters unless they are instructed in advance to look for specific behaviours (Henerson et al, 1987). Validation of recall methods has been limited by the absence of a consensus standard or criterion for comparison (Laporte, 1985), thus the reliability and construct validity of behavioural self reports of physical activity remain unknown (Dishman, 1990; Durnin, 1990; Montoye, 1990).

Many concerns arise as a result of the limited sensitivity of exercise measurement tools. Type, intensity, frequency, and duration of physical activity are important to define and measure. Low level activity may be especially important for persons with Type II obese diabetes who are overweight and over forty years of age. Unfortunately, low level activity is also the category for which current measurement instruments are the least discriminatory (Powell, 1985).

In addition, physical activity measures may be classified in at least nine different ways. These include self-administered questionnaires, exercise diaries, behavioural observations, survey procedures, calorimetry, job classification, physiological markers, mechanical and electronic markers, and indirect dietary measurements. Each class of physical activity captures only a small part of the entire activity behaviour pattern. The reliability and validity of these tests remains uncertain. Accuracy of cross comparisons between measures has received limited study and also remains unknown (Laporte, 1985).

It is problematic in field studies, and even in partially supervised clinical settings, to prevent spill over effects between exercise and food interactions. Measurement tools to detect spill over effects tend to be soft. The change in food intake, either quantitatively or qualitatively, continues to cloud the research findings.

The timelines of this study extend from October to March. Activity selection (Miller Lite Report, 1983), duration and frequency are affected by weather. Discussion of results as well as generalizations drawn from this study need to take into account seasonal influences.

Study samples of participants with Type II diabetes that are exclusive to volunteers responding to either an invitation to be more physically active via a community needs assessment or media advertising, may possess characteristics that are not representative of the general population. These participants perhaps share similar positive attitudes, beliefs, and self perceptions about exercise outcomes. Differential selection bias becomes suspect. Findings from this study may not be predictive of who will adhere to such a program in the general population. As well, results may be more indicative of health corrective rather than health protective motivational determinants.

Studies which confine observations and measurements of physical training to regulated settings, perhaps lend themselves to maximizing internal validity but sacrifice generalizability of findings to man in his natural environment. Whereas, in home exercise and community based exercise programs, activity intensity, duration and frequency may be recorded less rigorously but ultimately may have more practical significance.

Delimitations

The five self-administered questionnaires used open ended questions with minimal structure to provide subjects with opportunities to reveal relevant information in a naturalistic way while not being made uncomfortable by the presence of an interviewer or the group (Polit et al, 1987). As well, open ended questions were selected because they were much more likely then fixed alternative questions to obtain full and accurate responses to complex issues such as motivational determinants. This style of questioning lent itself to probe exercise patterns by concentrating on incentives and inhibitors (Chubb, 1990).

To determine questionnaire construct validity, the questionnaires were pilot tested for simplicity and clarity prior to being used in the study (Henerson et al, 1987).

Single subject methodology was used to obtain the descriptive data sought in the study. This approach involved the application of a time-series design using subjects as their own control. Participants were measured at baseline and repeatedly over time as part of the evaluation process. The time-series format was useful to determine behaviour change delays and decays as well as secular and historical influences (Dattilo, 1986; Creswell, 1985; Smith, 1983).

This modest qualitative study may still provide preliminary evidence to confirm, negate, or expand the current body of knowledge about physical activity characteristics as determinants. Such research may open doors to explore previously unidentified knowledge gaps, which may prove fruitful in designing and implementing future physical activity strategies for persons with Type II obese diabetes. As well, it may provide preliminary evidence to assist future research to strengthen existing conceptual models to be more predictive of physical activity hypotheses.

CHAPTER II: LITERATURE REVIEW

Introduction

To effectively encourage physical activity among all segments of the population requires knowledge about the determinants of regular physical activity. It appears that the public health potential of physical activity cannot be defined or fulfilled until the behavioural determinants of participation are defined; yet these determinants remain poorly understood (Dishman et al, 1985).

The term determinant will be used to denote a reproducible association or predictable relationship other than cause and effect (Dishman, 1990). Although the determinants of physical activity are probably conceptually multivariate, the current empirical literature is limited to a univariate perspective.

Proposed determinants have usually been assessed by indirect methods on a cross sectional basis. Their reliability and validity as true behavioural determinants remain undemonstrated (Dishman, 1990). As well, the absence of uniform standards for defining physical activity determinants and the diversity of the variables, population segments and time periods sampled make it difficult to compare results and draw meaningful inferences (Dishman et al, 1985). This diversity of research data hinders clear summation of existing knowledge drawn from epidemiology, behavioural medicine, health psychology and exercise science for the purposes of this literature review.

Type, duration and frequency of activity as exercise determinants

Physical activity type, duration and frequency were traditionally considered exclusively as exercise descriptors. Only recently has attention been drawn to these descriptors as potential determinants of physical activity. Two Canadian generated documents (Exercise, Fitness and Health: A Consensus of Current Knowledge, 1990; The Well-being of Canadians: Highlights of the 1988 Campbell's Survey, 1990) reiterate the earlier 1984 United States Department of Health and Human Services recommendation to explore how perceptions of and preference for certain types and intensities of physical activity are formed and to decide whether such factors influence participation.

And so, of the possible activity participation determinants, physical activity characteristics have received the least study (Dishman, 1990). In a 1990 Canadian survey, sixty-three percent of Canadians participated in some physical activity at least once a week. In order, the most popular activities were walking, gardening, swimming, bicycling and dancing (Stephens et al, 1990). Canadian females preferred to walk or dance, while males were more likely to participate in more vigorous activities and gardening. Bicycling was the only activity in the top five that had equal participation for both genders and all ages among Canadians (Stephens et al, 1990).

The sparsely explored determinants of activity, frequency and duration have yielded inconclusive findings. Duration of physical activity research has focused primarily on its predisposition to injury. Activity durations of forty-five minutes, and frequencies of five days per week, or both have resulted in dropout due to injuries by those previously untrained, (Pollock, 1988).

Physical activity frequency has also received little research attention. Low intensity and frequency activity is preferred by those who perceive their health as poor (Sydney et al, 1986; Morgan, 1984; Lindsay-Reid et al, 1980). As well, low intensity, low frequency activity choices within programs offering strong social support and reinforcement may override self motivation variables (Wankel, 1985). It is noteworthy that behaviour change interventions have shown increased frequency, but not intensity of physical activity (Dishman, 1990).

Some studies of supervised programs for adults do not show an association between exercise intensity and dropout rates (Pollock, 1988, Oldridge et al, 1983). On the other hand, in one large community sample more men (11%) than women (5%) adopted vigorous exercise such as running in a years time. However, a higher proportion of women (33%) than men (26%) initiated moderate activities such as routine walking, stair climbing and gardening. Both genders were much more likely to adopt moderate rather than strenuous activity. The dropout rate

for moderate activities was less than 35%, but 50% for vigorous activities (Sallis et al, 1986). There is also suggestive evidence that when people have the flexibility to select different modes of physical activity and can exercise at different times and places, this is more conducive to long-term exercise adherence than structured programs (Epstein, 1984; Thompson, 1980).

As with other aspects of life, past choices may influence current physical activity predispositions. Although it is suggestive that inactivity begets inactivity, the evidence is not conclusive. A study of post menopausal women participating in a walking program found differences in preprogram self reports of daily stair climbing, number of city blocks walked per day, and daily caloric expenditure between adherents and dropouts (Kriska et al, 1986). As well, inactive leisure time at entry correlates with dropping out from supervised rehabilitative exercise programs (Dishman, 1988; Oldridge, 1982). On the other hand, no correlation between self reported intensity, duration or frequency of pre-enrollment exercise have been noted across a broad spectrum of cardiovascular rehabilitative exercise programs (Dishman, 1981).

Inspite of the discrepancy in research results, the nature of past participation is currently considered the most reliable correlate of current participation in a supervised exercise program (Godin et al, 1991; Godin and Sheppard, 1990). This prediction holds for both men and women and is consistent with observations in treatment programs for persons with coronary heart disease and obesity (Dishman, 1985). The rate of participation typically

drops within the initial three to six months, plateaus and continues to gradually decrease over the next thirty months. Individuals who are still active after six months are likely to remain active one year later (Dishman, 1988; Olderidge, 1982). Findings for free living activity are similar (Dishman et al, 1988; Godin et al, 1987; Sallis et al, 1986).

Incentives and deterrents for physical activity characteristics

Physical activity type, frequency and duration appear to be closely linked to considerations such as enjoyment, time, convenience and climate. Feelings of enjoyment and well-being attributed to physical activity have been reported to be strong motives for continued participation in worksite exercise programs (Shephard, 1988), as well as exercise programs for the elderly (Stones et al, 1987). However, the association of well-being and participation in worksite activity programs has been refuted (Gauvin, 1989).

Incongruities also exist between perceived and actual time barriers that are associated with physical activity. A lack of time is the principal and most prevalent reason given for dropping out of clinical and community exercise programs (Stephens et al, 1990; Dishman et al, 1985; Martin et al, 1985; Dishman, 1982; Oldridge, 1982) and for inactive life-styles (Dishman et al, 1985; Gallup Organization, 1985; General Mills Report, 1979; Perrier Study, 1979). However, population surveys indicate that regular exercisers are as

likely as those that are sedentary to view time as an activity barrier (Gallup Organization, 1985; Canada Fitness, 1983; General Mills Report, 1979; Perrier Study, 1979) In one survey of the U.S. population, the already active were twice as likely as the inactive to believe that a four day work week or more flexibility in the work schedule would lead to an increased likelihood of physical activity. Furthermore, working women were more likely than nonworking women to be regular exercisers. Notably, half of the single parents in this survey were regularly active whereas only a third of parents were regularly active (Perrier Study, 1979).

As well, facility convenience is perceived in the population as an important activity participation influence (Stephens et al, 1990; Perrier Study, 1979), particularly among the elderly (Shephard, 1987). Both perceived convenience of the exercise setting (Gettman, 1983; Andrew et al, 1981) and actual proximity to home or place of employment (Gettman, 1983; Hanson, 1977; Teraslinna, 1969), are consistent discriminators between those who choose to enter, adhere, or drop out in supervised exercise programs. Yet in one supervised exercise program, those most likely to drop out lived closer to the chosen activity setting, but they perceived inconvenience as a factor to return to inactivity (Gettman, 1983). As well, a population study indicated that the already active are paradoxically twice as likely as the inactive to feel that greater availability of facilities would increase their participation (Perrier Study, 1979).

Climate clearly influences outdoor leisure activity choices (Miller Lite Report, 1983). Again paradoxically, one U.S. survey indicated that twice as many active people than inactive people stated that nicer weather would likely increase their physical activity (Perrier Study, 1979).

Other explored determinants of physical activity

Physical activity type, duration and frequency as potential exercise determinants are probably influenced by many personal considerations which may predispose, facilitate or reinforce physical activity initiation and adherence. Psychological traits, knowledge, beliefs, intentions, self-efficacy, demographic variables, gender, and body weight have been investigated as possible physical activity determinants.

Conflicting results have been reported regarding the role of psychological traits influencing physical activity. Extroversion, ego strength, and Type A personality have been independently examined in the research and have positively correlated with either free living activity or adherence with supervised activity programs (Wysocki, 1989; Rejeski, 1984; Lobstein et al, 1983; Blumenthal et al, 1982). However, these findings have been contradicted by other studies (Oldridge, 1983; Dishman, 1981; Massie, 1971).

As well, the role of self motivation traits remains unclear. Self motivation measures have discriminated between adherence and dropouts across a wide variety of settings; including athletic conditioning, preventive medicine, cardiac rehabilitation, commercial spas, corporate fitness and free living among college students (Dishman, 1988; Knapp, 1988; Sonstroem, 1988). On the other hand, other studies have shown no differences of self motivation traits between adherents and dropouts in dance exercise and interscholastic sports (Knapp, 1988; Sonstroem, 1988).

Knowledge and belief in the health benefits of physical activity may influence initial involvement and return to activity following relapse. However, it remains unclear whether knowledge is an antecedent or consequence of physical activity (Dishman, 1990). Knowledge of exercise induced health benefits has demonstrated to be related to but insufficient to be a predictor of physical activity participation (Sallis, 1986). Similarly, positive attitudes, subjective norms as well as intentions (Andrew et al, 1981; Dishman, 1981) have been shown to be related to exercise but not sufficient to be predictive of physical activity involvement (Godin et al, 1986; Godin et al, 1983).

Offering more promise, specific efficacy beliefs have shown to be predictive of physical activity participation for people with heart and/or lung disease (Ewart et al, 1986; Kaplan, 1984; Ewart et al, 1983) and in a population based study (Salis, 1986). However, these findings are not universal. Exceptions have been most notably demonstrated among young healthy adults for both free living and supervised activities (Dishman et al, 1984).

Personal demographics have also been explored as potential physical activity determinants. Cross-sectional comparison population studies suggest concomitant associations for low activity with fewer years of education and low income (Stephens et al, 1990; Stephens, 1986; Stephens, 1985). The association with income and education has been supported by considerable investigation of subgroups in preventive medicine programs (Willmar et al, 1983; Oldridge, 1982), as well as with free living physical activity (Chubb, 1981). These demographic disparities in Canada have become less pronounced in recent years (Stephens et al, 1990).

As well, age, gender and body composition have been reported to influence physical activity. Prospective comparisons of age effects on activity between birth cohorts (Powell et al, 1987), cross-sectional age groups in Harvard alumni (Powell et al, 1985), as well as users of an aerobic centre (Blair et al, 1987) suggests that age is probably a selection bias rather than a determinant of inactivity. A community study revealed that women were more likely than men to adopt and maintain moderate activity such as walking (Stephens et al, 1990; Sallis et al, 1986). Similar, but more modest prospects have been observed for obese women. Overweight women are less likely to stay with a vigorous fitness program (Sheppard, 1988; Dishman et al, 1985; Mirotznik, 1985; Green, 1984; Dishman, 1981; Young, 1977; Massie, 1971). Obese women and children respond better to moderate walking routines than vigorous fitness programs (Epstein et al, 1984; Gwinup, 1975). Even so, excess weight presents activity barriers, and those who are overweight remain less responsive

to walking and stair climbing than are inactive individuals of ideal body weight (Brownell, 1980). Even in gentle walking programs, approximately seventy-five percent of obese women and children will stop within six to twelve months (Epstein et al, 1984).

Behaviour modification interventions

The findings of this study are possibly modulated by behaviour modification techniques used by the parent study. Behavioural approaches, including written agreements (Oldrigde et al, 1983; Epstein et al, 1980; Wysocki, 1979; Vance, 1976), cues (Owen et al, 1987; Keefe et al, 1980; Kau et al, 1974) and self-rewards (Perkins et al, 1986; Allen et al, 1980; Kau, 1974,) have been used successfully to increase physical activity in case control studies. Self-monitoring (Owen et al, 1987; Martin et al, 1984; Oldridge et al, 1983), goal setting (Owen et al, 1987; Perkins et al, 1986; Martin et al, 1984) and pre-planning (Wankel, 1984; Hoyt et al, 1975) appear effective to increase exercise when used alone or in combination. The usefulness of these skills for maintaining activity involvement has been demonstrated for periods of four to ten weeks among those already motivated to adopt activity. Such behaviour modification techniques are collectively associated with an increase of ten to twenty-five percent in frequency of activity, but their impact on changes in duration of activity remain unclear (Dishman, 1990). Disappointingly, follow-up studies show that increases in physical activity are short-lived after the intervention is removed (Dishman, 1990). However, when social support is offered the results are modestly more optimistic (Martin et al, 1984; Wankel, 1984; Stalonas et al, 1978).

Even among the habitually active, unexpected disruptions such as relocation, medical events and travel can interrupt or end a previously continuous exercise program (Martin et al, 1985; Dishman, 1982; Oldridge, 1982). The impact of disruptions may be diminished if the person anticipates their occurrence, recognizes them as only temporary impediments, and develops skills for preventing and dealing with relapses to inactivity (Knapp, 1988; Belisle et al, 1987; Marlatt et al, 1985; King et al, 1984; Martin et al, 1984).

Conceptual and operational research considerations

Research exploring activity type, duration and frequency for both exercise descriptors and determinants is hampered by a number of noteworthy conceptual and operational limitations. There is insufficiently convincing evidence that existing conceptual models predict physical activity initiation and sustenance (Consensus Statement, 1988). Psychological models that have been used in exercise behaviour research include the health belief model (Morgan et al, 1984; Lindsay-Reid et al, 1980; Becker et al, 1975), the theory of reasoned action (Godin et al, 1987; Godin et al, 1986; Dishman et al, 1981; Fishbein et al, 1975,), and locus of control (Dishman et al, 1988; Dishman et al, 1981; Strickland, 1978; Wallston et al, 1978), theory of planned behaviour (Godin et al, 1991; Valois et al, 1988; Godin et al, 1986; Ajzen, 1985; Riddle, 1980), expectancy-value decision theory (Kendzierski, 1988; Desharnis, 1986; Bandura, 1977) and self-regulatory theory (Heiby, 1987; Martin et al, 1984; Kirschenbaum et al, 1982).

As well, motivational variables such as self esteem (Sonstroem, 1988; Dishman et al, 1981; Folkins et al, 1981) and self-efficacy (Ewart et al, 1986; Sallis et al, 1986; Kaplan, 1984; Ewart et al, 1983; Ryckman et al, 1982) specifically related to physical activity have been explored and also have not demonstrated universal predictive ability.

Two models generated specifically for the prediction of exercise behaviour include the psychobiological model (Dishman and Gettman, 1980) and the psychological model for physical activity participation (Dishman, 1981; Sonstroem, 1978). The former model has not been formerly utilized in the research, whereas the latter has not been sufficiently studied to determine its predictive value, but preliminary evidence suggests that it has inherent limitations that preclude universal predictability.

In addition, research methods have traditionally been limited to static investigatory designs (Dishman, 1990). Investigating motivational determinants only once, generally at the beginning of the program, fails to consider how these determinants will interact with other personal and setting variables during the process of change (Sonstorem, 1988). Health psychology is gradually recognizing that people make behaviour changes sequentially rather than an all or none response.

Adults with Type II obese diabetes in a sixteen week weight control study, attempted to make a variety of life-style changes (Wierenga et al, 1990). Narrative responses to open ended questions depicted their behaviour

change process through the stages of starting point, introspection, questioning change, mental preparation (plans, progress, continuation) as well as helps and hindrances. Similarly, different psychological and biological factors influence adherence over the course of a thirty-two week program (Ward et al, 1984). Although improvement of health is often sighted as a reason for beginning exercise (Olson et al, 1982), factors such as choice of activities (Thompson et al, 1980), goal attainment (Danielson and Wanzel, 1977), or previous program experience (Dishman et al, 1985) appeared to relate better to adherence.

Observations of smoking relapsers suggest that behaviour change may be better represented as cyclical rather than linear (Prochaska et al, 1983; Horn, 1976). Similarly, studies have shown that approximately half of exercise program participants have experienced failures in exercise maintenance (Dishman, 1987; Fitness Ontario, 1982). Other research indicates that many dropouts from organized programs continue to exercise on their own (Wilhelmsen et al, 1975). Dropouts appear to represent several subsets of people of whom some intend to and do return to exercise.

Initial positive attitudes may decline as the exercise participant interacts with barriers over time. Delineating how change occurs is required of a process model. This implies the initial use of a relatively complete model that can predict relationships among activity, personal, and programmatic variables. Furthermore, process models also need to involve the use of repeated measures to examine changes in motivational determinants over time.

Therefore the study of exercise in the future should deviate from a reliance on predictive designs characterized only by initial measures to process designs that examine the interplay of predictor and criterion variables within a process of change over time (Sonstroem, 1988).

Closing remarks

Of the possible determinants of physical activity participation, the characteristics of physical activity have received the least study. However, it remains important to determine whether activity characteristics predispose or impede participation (Dishman, 1990). The workshop on Epidemiologic and Public Health Aspects of Physical Activity and Exercise was sponsored by the United States Department of Health and Human Services in 1984. After review and discussion by a panel of thirty-three experts from the fields of public health and exercise science, the following two recommendations were among nineteen research questions agreed upon as the important ones for future study. This panel encouraged researchers to determine factors that lead to the decision or intention to begin a physical activity program and to examine when and how preferences for types and intensities of activity are formed and how they influence future activity.

The Well-being of Canadians: Highlights of the 1988 Campbell's Survey and The Exercise, Fitness and Health: A Consensus of Current Knowledge (1990) are two recent landmark documents which again beckon researchers to investigate the

relationship between choice of an activity, its characteristics and adherence or resistance to exercise. However to date, physical activity characteristics as determinants remain relatively unexplored. It remains unknown in what ways physical activity characteristics may potentially interact to influence participation over time. Small sample prospective studies of process design are needed to unravel the interplay of physical activity characteristics as determinants and to evaluate practical applications for optimizing participation for specific populations (Dishman, 1990).

CHAPTER III: METHODOLOGY

Overview of procedures

Determinants of exercise type, frequency and duration as well as its impact on adherence must ultimately be translated into phenomena that can be observed and recorded. Selecting and developing appropriate methods for data collection is germane to the research process if its conclusions are to be accurate and robust (Polit et al, 1987).

However, the task of measuring determinants was not an easy one. Attempting to measure attitudinal changes is probably among the most difficult of all evaluation tasks (Henerson et all, 1987). Isolating determinants serves a human need to see order and consistency in what people say, think, and do; so that eventually predictions can be made about future behaviours. Unfortunately, determinants can not be directly examined and measured; they can only be inferred by words and actions.

Questionnaire construction

This descriptive study used questionnaires to determine which motivational factors influence physical activity selection, duration, frequency and adherence over five months. Written questionnaires were selected because

they were a time efficient way to gather data quickly and simultaneously for a large group of people, intermittently over time. Importantly, written questionnaires also minimized the potential for judgemental interviewer bias (Henerson et al, 1987). The use of self-administered questionnaires also relinquished from the investigator the onerous demands for recording the data (Henerson et al, 1987). However, the reliability of such reports remain controversial. Bernard et al (1980) collected reports of social interactions and compared those reports to behavioural observations of interactions. Although these researchers concluded that there is no relationship between what people say and what they do, more recent studies have shown that self reports closely represent what the reporters usually do (Freeman et al, 1987).

Literature reviews failed to uncover any previously developed tools suitably designed to track the determinants of physical activity type, duration and frequency over time (Baeke et al, 1982; Taylor et al, 1978; Reiff et al, 1967). Five prototype questionnaires were developed to address the research questions germane to this study (refer to Appendices A, B, C, D, and E).

Five questionnaires (refer to Appendices A - E) were developed to ascertain how motivational determinants for physical activity type, duration and frequency evolved over time for people with Type II diabetes. The first questionnaire (refer to Appendix A) asked individuals to record their baseline physical activity as well as the reasons for wanting to increase physical activity at this time. The second questionnaire (refer to Appendix B)

requested individuals to record the incentives and deterrents for the type, duration and frequency of physical activities that they plan to do in the next week. The third, fourth and fifth questionnaires (refer to Appendices C, D and E) were identical and asked respondents to document the inducements and obstacles for the type, duration and frequency of their physical activities for the previous week. These last three questionnaires also requested individuals to record their reasons for initiating and abandoning supplemental activities. The relationship between the research questions and the questionnaires is illustrated in Table 1.

Questionnaire validation

To determine questionnaire construct validity, the questionnaires were pilot tested for simplicity and clarity prior to being used in the study (Henerson et al, 1987). Open ended questions with minimal structure were chosen to provide subjects with opportunities to reveal relevant information in a naturalistic way while not being made uncomfortable by the presence of an interviewer or the group (Polit et al, 1987). Open ended questions also were selected because they were much more likely then fixed alternative questions to obtain full and accurate responses to complex issues such as incentives and inhibitors for activity type, duration and frequency (Chubb, 1990).

TABLE 1

DATA COLLECTION

Research Questions:	Questionnaires				
	# 1	# 2	# 3	# 4	# 5
1: What factors do people identify that lead to a decision to become more physically active?					
Participant resposes to the following queries are collected in the questinnaires as indicated					
Why did you decide to increase your physical activity at this time?	X				
Why did you choose this program?	X				
# 2: What factors do people identify that enhance or deter physical activity selection over time?					
Participant responses to the following queries are collected in the questionnaires as indicated:					
Name the activity.	X	X	X	X	X
Why did you choose this activity?		X			
What problems do you expect?		X			
Why do you want to continue this activity?			X	X	X
Why is it hard to continue this activity?			X	X	X
# 3: What factors do people identify that enhance or deter physical activity duration over time?					
Participant responses to the following queries are collected in the questionnaires as indicated:					
How many minutes?	X	X	X	X	X
Why did you choose this?		X			
What problems do you expect?		X			
What makes this easy for you?			X	X	X
What makes this hard for you?			X	X	X

TABLE 1 (cont'd)

DATA COLLECTION

Research Questions:	Questionnaires # 1	# 2	# 3	# 4	# 5
# 4: What factors do people identify that enhance or deter physical activity frequency over time?					
Participant responses to the following queries are collected in the questionnaires as indicated:					
How many times a week?	X	X	X	X	X
Why did you choose this?		X			
What problems do you expect?		X			
What makes this easy for you?			X	X	X
What makes this hard for you?			X	X	X
# 5: Is there a relationship between type, frequency, and duration of physical activities on adherence over time?					
Participant responses to the following queries are collected in the questionnaires as indicated:					
Name the activity.	X	X	X	X	X
How many minutes?	X	X	X	X	X
How many times a week?	X	X	X	X	X
# 6: What factors do people identify that influence physical activity repertoires to expand or shrink?					
Participant responses to the following queries are collected in the questionnaires as indicated:					
What activity did you try that you are no longer doing?			X	X	X
What attracted you to this activity?			X	X	X
Why were you not able to continue this activity?			X	X	X

The questionnaires were pilot tested using a tester not affiliated with the parent study. A convenience sample of five middle aged adults of varying educational and occupational backgrounds were asked:

- Are the questions clear or difficult to understand?
- Does the layout of the questionnaire make it easy or difficult to answer the questions?
- Do you have any questions that would improve the questionnaire?

All the comments from the respondents were favourable. They considered the wording explicit and found the format easy to complete. No recommendations were offered. The prototype questionnaires were retained unaltered for use in the study.

Study context

This study was encompassed within the auspices of a larger study "Development and Evaluation of a Community Based Eating and Exercise Program to Improve Type II Diabetes Control". The larger study design involved participants taking part in a behaviour program to alter their eating and exercise habits. The sample included twelve volunteers who responded to either a needs assessment (Searle, 1989) or to media advertising. The sample was comprised primarily of men and women over forty years of age. A letter of invitation informed prospective participants about the number of sessions, time

frames, and evaluation procedures. Informed consent was obtained. These individuals also completed a physical appraisal form prior to the program to determine exercise limitations to ensure participants chose life-style physical activities that were safe for them.

In the larger study participants received two hour sessions for ten consecutive weeks. During each session, approximately an hour and a half was spent for information sharing and discussion. In addition, walking time on the track gradually progressed from ten to forty minutes by the seventh week, and was maintained at this duration for subsequent sessions. However, the participants were encouraged to select their own physical activity type, duration and frequency between sessions.

As part of the parent study, retrospective data regarding activity type, frequency and duration were obtained from the participants daily exercise logs. At the third educational session, participants were asked to start keeping and submitting exercise diaries (Appendix F) each week for the remainder of the educational sessions. They also continued to submit monthly diaries (Appendix G) by mail for three months after completion of the program. These exercise logs provided comparison data to determine the reliability of responses to questionnaires 3, 4 and 5 (refer to Appendices C, D and E.)

Questionnaire administration

Written consent from participants acknowledging their willingness to answer the five questionnaires was obtained as part of the larger study consent form protocol. This consent form was approved by both the Committee for Research Involving Human Subjects, Faculty of Physical Education and Recreation Studies, and the Faculty of Education Ethics Review Committee, University of Manitoba (refer to Appendix H).

Single subject methodology was used to obtain the descriptive data sought in the study. This approach involved the application of a time-series design using subjects as their own control. Participants were measured at baseline and repeatedly over time as part of the evaluation process. The time-series format was useful to determine behaviour change delays and decays as well as secular and historical influences (Dattilo, 1986; Creswell, 1985; Smith, 1983).

The first questionnaire (refer to Appendix A) asked individuals to record their baseline physical activity as well as the reasons for wanting to increase physical activity at this time. The second questionnaire (refer to Appendix B) requested individuals to record the incentives and deterrents for the type, duration and frequency of physical activities that they plan to do in the next week. The third, fourth and fifth questionnaires (refer to Appendices C, D and E) were identical and asked respondents to document the inducements and obstacles for the type, duration and frequency of their physical activities for

the previous week. These last three questionnaires also requested individuals to record their reasons for initiating and abandoning supplemental activities. The relationship between the research questions and the questionnaires is illustrated in Table 1.

The above questionnaires were administered periodically over twenty-one weeks using the following timetable:

Questionnaire 1: week prior to start of parent study educational sessions

Questionnaire 2: initial goal setting for activity type, duration and frequency

Questionnaire 3: midway through educational sessions

Questionnaire 4: end of educational sessions

Questionnaire 5: at three month follow-up

Questionnaire 1 was administered as part of several questionnaires and physiologic measurements to gather baseline data for the parent study prior to the initiation of the sessions. Several considerations framed the context for administration of the questionnaires. Firstly, participants needed to feel that their responses were of value. At both the baseline data interview and the initial education session the importance of all data collection to the parent study was discussed. The purpose of this study's questionnaires was described as the need to better understand people's reasons for choosing

certain activities and what helps them to continue or abandon their efforts over time. It was highlighted that these questions had been relatively unexplored and this information would be useful for future program planning. The need to carefully complete questionnaires and promptly respond to follow-up phone calls or letters requesting questionnaire completion was also emphasized.

Secondly, the close links between this study and the parent study professionals would influence participants' willingness and effort to respond to the thesis questionnaires. The relationship between the facilitators and the participants was generally congenial and relaxed. Friendly, humourous banter was not uncommon even at the start of the parent study. These group dynamics continued throughout the 20 weeks.

Questionnaires 2 to 5 (Appendices B, C, D and E) were administered following the educational session, but prior to the actual exercise component of the parent study. This natural break in the session was selected to provide sufficient time for the participants to carefully reflect and answer the questionnaires, to add to their previous answers and to avoid hurried responses from latecomers to the session.

Retrieval of missing data for the thesis was accommodated within the larger study data collection protocol. Participants who were absent from sessions in which questionnaires were administered, were mailed these questionnaires the next day. This was accompanied by a phone call alerting

them to the importance of the mailed items, and requesting their prompt response. A second phone call reminder was made to those respondents who failed to submit their questionnaires in the mail within one week, or did not return them at the subsequent session.

Data collection, recording, analysis and reporting

In this study, qualitative data on the determinants of physical activity type, duration and frequency needed to be gathered in such a way that rendered it quantifiable and subject to analysis.

The first research question probed the factors that people identify as leading them to a decision to become more active. As part of the baseline data, the first questionnaire (Appendix A) asked participants to respond to these two questions. "Why did you decide to increase your physical activity at this time?" "Why did you choose this program?" For both queries, self reported data were obtained, recorded and reported for each participant. In addition, a group sum was calculated for each unique answer.

The second, third and fourth research questions investigated the factors that people identify as enhancing or deterring physical activity selection, duration and frequency over time. The second questionnaire was administered at the parent study's first goal setting session. It asked participants to name

their selected activity, why they chose this activity and what problems they expected; to state the duration of activity, why they chose this duration and what problems they expected; as well as to state the frequency of activity, why they chose this frequency and what problems they expected (refer to Appendix B). The participants' self reported data for each question was recorded as the first entry of a time series for each participant. As well, a group sum for each unique answer was recorded as the first entry of a time series. Later, questionnaires 3, 4 and 5 posed similar questions. Participants were asked why they wanted to do their selected activity and why it was difficult for them to do this activity; why their duration of activity was easy and/or difficult for them; as well as why their frequency of activity was easy and/or difficult for them (refer to Appendices C, D and E). Responses from these questions within the three latter questionnaires were grouped as a time series for each individual, and added to the data initiated in the second questionnaire. Similarly, collective patterns over time were obtained using group sums for each unique answer, and added to the time series data initiated in the second questionnaire.

The fifth research question investigated whether a relationship existed between activity type, duration and frequency on adherence over time. All five questionnaires (Appendices A to E) sought information about activity type, duration and frequency. Participant responses were recorded and reported two different ways for each predictor variable. Bar graphs were chosen to depict patterns for activity type, duration per session and frequency per week for

each participant over time. Also, group trends for walking over time were examined using medians derived from data depicting duration per session, frequency per week and cumulative activity time per week data. These two unsophisticated analytical approaches were selected to easily yet clearly illustrate the relationship of activity characteristics on adherence.

The sixth research question probed the factors that people report as influencing their physical activity repertoires to expand or shrink. Questionnaires 3, 4 and 5 ended with these three questions. "What activity did you try that you are no longer doing?" "What attracted you to this activity?" "Why were you not able to continue this activity?" Self reported data was grouped as a time series for each participant. This provided a framework to unravel trends.

For the six research questions, recording and reporting methods were chosen that reflect the complex interplay between physical activity characteristics as determinants of adherence over time. This interplay is illustrated in Tables 1, 2 and 3. Table 1 depicts the relationship between the research questions and their affiliative link with the questionnaires. In turn, Table 2 illustrates the analytical tools used to examine each of the research questions. The corresponding reporting instruments are provided in Table 3. As well, a narration of notable findings is included for each research question.

TABLE 2

DATA RECORDING AND ANALYSIS METHODS

Research Questions:	Questionnaires # 1	# 2	# 3	# 4	# 5
# 1: What factors do people identify that lead to a decision to become more physically active?					
Why did you decide to increase your physical activity at this time?	**a,c**				
Why did you choose this program?	**a,c**				
# 2: What factors do people identify that enhance or deter physical activity selection over time?					
Name the activity.	**b**	**b**	**b**	**b**	**b**
Why did you choose this activity?		**b,d**			
What problems do you expect?		**b,d**			
Why do you want to continue this activity?			**b,d**	**b,d**	**b,d**
Why is it hard to continue this activity?			**b,d**	**b,d**	**b,d**
# 3: What factors do people identify that enhance or deter physical activity duration over time?					
How many minutes?	**b**	**b**	**b**	**b**	**b**
Why did you choose this?		**b,d**			
What problems do you expect?		**b,d**			
What makes this easy for you?			**b,d**	**b,d**	**b,d**
What makes this hard for you			**b,d**	**b,d**	**b,d**

KEY:
(a) self-reported data for each participant, (b) self-reported data grouped as a time series for each participant, (c) group sum for each unique answer, (d) group sum for each unique answer as a time series, (e) bar graphs depicting time series data for each participant, (f) arithmetic medians derived from time series data for each participant

TABLE 2 (cont'd)

DATA RECORDING AND ANALYSIS METHODS

Research Questions:	Questionnaires # 1	# 2	# 3	# 4	# 5
# 4: What factors do people identify that enhance or deter physical activity frequency over time?					
How many times a week?	b	b	b	b	b
Why did you choose this?		b,d			
What problems do you expect?		b,d			
What makes this easy for you?			b,d	b,d	b,d
What makes this hard for you?			b,d	b,d	b,d
# 5: Is there a relationship between type, frequency, and duration of physical activities on adherence over time?					
Name the activity.	b	b	b	b	b
How many minutes?	e,f	e,f	e,f	e,f	e,f
How many times a week?	e,f	e,f	e,f	e,f	e,f
# 6: What factors do people identify that influence physical activity repertoires to expand or shrink?					
What activity did you try that you are no longer doing?			a	a	a
What attracted you to this activity?			a	a	a
Why were you not able to continue this activity?			a	a	a

KEY:
(a) self-reported data for each participant, (b) self-reported data grouped as a time series for each participant, (c) group sum for each unique answer, (d) group sum for each unique answer as a time series, (e) bar graphs depicting time series data for each participant, (f) arithmetic medians derived from time series data for each participant

TABLE 3

TABLES AND FIGURES USED FOR REPORTING

Research Questions:	Questionnaires # 1	# 2	# 3	# 4	# 5
# 1: What factors do people identify that lead to a decision to become more physically active?					
Why did you decide to increase your physical activity at this time?	*4,*5				
Why did you choose this program?	*6,*7				
# 2: What factors do people identify that enhance or deter physical activity selection over time?					
Name the activity.	*8	*8	*8	*8	*8
Why did you choose this activity?		*8,*9			
What problems do you expect?		*8,*10			
Why do you want to continue this activity?			*8,*9	*8,*9	*8,*9
Why is it hard to continue this activity?			*8,*10	*8,*10	*8,*10
# 3: What factors do people identify that enhance or deter physical activity duration over time?					
How many minutes?	*11	*11	*11	*11	*11
Why did you choose this?		*11,*12 *11,*13			
What problems do you expect?					
What makes this easy for you?			*11,*12 *11,*13	*11,12	*11,*12
What makes this hard for you?				*11,*13	*11,*13

Key: * Table, + Figure

TABLE 3 (cont'd)

TABLES USED FOR REPORTING

Research Questions:	Questionnaires # 1	# 2	# 3	# 4	# 5
# 4: What factors do people identify that enhance or deter physical activity frequency over time?					
How many times a week?	*14	*14	*14	*14	*14
Why did you choose this?		*14,*15			
What problems do you expect?		*14,*16			
What makes this easy for you?			*14,*15	*14,*15	*14,*15
What makes this hard for you?			*14,*16	*14,*16	*14,*16
# 5: Is there a relationship between type, frequency, and duration of physical activities on adherence over time?					
Name the activity.	+1-6	+1-6	+1-6	+1-6	+1-6
How many minutes?	+1,+3-6	+1,+3-6	+1,+3-6	+1,+3-6	+1,+3-6
How many times a week?	+2-6	+2-6	+2-6	+2-6	+2-6
# 6: What factors do people identify that influence physical activity repertoires to expand or shrink?					
What activity did you try that you are no longer doing?			*17	*17	*17
What attracted you to this activity?			*17	*17	*17
Why were you not able to continue this activity?			*17	*17	*17

Key: * Table, + Figure

CHAPTER IV: RESULTS

Overview of data analysis

For activity selection, duration, frequency, and adherence the data are recorded and reported in two different formats. Both individual as well as aggregate responses over time are examined (refer to Table 2).

Data interpretation (patterns, trends, commonalities) are derived from blending individual and aggregate responses over time. Melding the two analytical methodologies provides a more comprehensive, valuable perspective than would be possible if the data were examined using only one approach.

The following data analysis examines six research questions for twelve study participants. Ten of these participants chose walking as their main activity, while two preferred to use a stationary exercise bike.

RESEARCH QUESTION 1 : What factors do people people identify that lead to a decision to become more physically active?

Most (8/12) participants had more than one reason to begin to increase physical activity. Individual data describing reasons for starting to be more active are provided in Table 4 and categorized in Table 5.

TABLE 4

INDIVIDUAL DESCRIPTIVE DATA

Question: What factors do people identify that lead to a decision to become more physically active?

Participant # 1:
Living too sedentary a lifestyle. Tired all the time from inactivity.

Participant # 2:
To improve physical condition and to improve health.

Participant # 3:
Getting too fat, and don't feel as well as I should.

Participant # 4:
Stabalize blood glucose levels.

Participant # 5:
Overweight, tired and hope to go off shots and go to pills.

Participant # 6:
Baseball season is over and golf will be shortly.

Participant # 7:
Was advised by my doctor to take part in some sort of exercise to control blood sugar.

Participant # 8:
Decrease body fat and feel better.

Participant # 9:
I feel the need to be in better shape, not out of breath walking stairs, and to be more flexible.

Participant # 10:
I need to be more physically active, and I have a hard time doing things myself.

Participant # 11:
To try and get my breathing better, to get more fit, and hopefully lose some weight.

Participant # 12:
I need to lose weight, and haven't been doing much exercise lately.

TABLE 5

AGGREGATE ANALYSIS

Question: What factors do people identify that lead to a decision to become more physically active?

RESPONSES	FREQUENCY
To loose weight	5
Improve physical condition	4
Improve good health	3
Overcome tiredness	2
Stabalize blood glucose	2
Be more active	2
Improve respiratory problems	2
Substitute pills for insulin	1
Replace summertime sports	1
Be more flexible	1
To have the support of others	1

Weight reduction (5/12), improved physical conditioning (4/12), and improved overall health status (3/12) were perceived as being the main reasons for starting an activity program by persons with Type II obese diabetes. Other health reasons included stabilizing blood glucose levels (2/12), overcoming fatigue/shortness of breath on exertion (2/12), and wanting to substitute oral hypoglycemic agents for insulin (1/12). Personal reasons also included getting more active (2/12), replacing summertime sports (1/12), being more flexible (1/12), and getting support for their activity endeavors from others (1/12).

However, the key motivational determinants for participants choosing an appropriate physical activity program differed somewhat from their reasons to become more physically active (refer to Tables 6 and 7). The most frequent response for choosing the parent pilot study was that it was diabetes-centered (4/12). As well, several (3/12) participants valued the program because it was staffed by diabetes professionals. For some individuals receiving an invitation provoked interest and was seen as an opportunity to start to make changes. Only one respondent cited weight loss as a reason to join the program, even though this was the most frequently cited reason to start to increase physical activity.

In summary, most participants had more than one reason to begin to increase physical activity. Weight reduction, improved physical conditioning, and improved overall health status were perceived as being the main reasons for starting an activity program by persons with Type II obese diabetes. However,

TABLE 6

INDIVIDUAL DESCRIPTIVE DATA

Question: Why did participants choose this program?

Participant # 1:
Turn lifestyle around, control blood sugar, lose weight.

Participant # 2:
Want to be properly assessed physically and how to continue doing excercise.

Participant # 3:
Was sent an invitation and decided that now was the time.

Participant # 4:
Learn more about diabetes in general, and self-help in particular.

Participant # 5:
To see if it can help me live by myself.

Participant # 6:
It deals with diabetes

Participant # 7:
Interested in what it had to offer

Participant # 8:
Anything to help control diabetes is of interest and important to me, especially if monitored.

Participant # 9:
The Diabetes Association gave the opportunity, I appreciate the help.

Participant # 10:
For education, information on diabetes and associated factors.

Participant # 11:
Offered through the mail and thought it would be helpful. Not motivated to exercise alone, hope working with others will be motivating.

Participant # 12:
Seems interesting

TABLE 7

AGGREGATE ANALYSIS

Question: Why did participants choose this program?

RESPONSE	FREQUENCY
Learn more about diabetes	4
Professional assessed and coached	3
Interested/curious in what it had to offer	3
Turn lifestyle around	2
Control blood glucose	2
Received invitation/opportune time	2
Not motivated to exercise alone/need others	1
Increase independent living	1
Lose weight	1

the key motivational determinants for participants choosing an appropriate physical activity program differed somewhat from their reasons to become more physically active. The most frequent response for choosing the parent pilot study was that it had a diabetes focus. As well, several participants valued the program because it was staffed by diabetes professionals.

RESEARCH QUESTION 2: What factors do people identify that enhance or deter physical activity selection over time?

Incentives for physical activity selection

Data analyses reported in Tables 8 and 9 suggest relative stability of physical activity incentives for an individual over time. The stability was most pronounced when participants attributed enjoyment to the activity.

Being easy/convenient (4/9) was the most frequently reported reason for starting a walking program (refer to Table 9). Three out of the four participants who were attracted to ease/convenience of activity retained this predisposition over 20 weeks (refer to Table 8).

The participants (2/9) who gravitated to the pleasurable aspects of walking continued to enjoy walking over the 20 weeks (refer to Table 8). In addition, the person who cited walking as an appropriate starting activity continued to walk because he found it pleasurable.

TABLE 8

INDIVIDUAL RESPONSES OVER TIME

Question: What factors do people identify that enhance or deter physical activity selection over time?

Key: pre - pre-program, wk - week, W - walking, EB - exercise bike, B - bowling, A - aerobics, G - golf, BB - baseball, S - shopping. I - ill: temporary no activity on advice of doctor

Person	Activity	Incentives	Obstacles
# 1			
pre	bowling		
start	exercise bike	have a bike, can do it at home in spare time	getting started
wk 5	discontinued		
wk 9	shopping	easy to do	cold weather & sciatica with prolonged standing
wk 20	bowling	enjoyment	not hard
# 2			
pre	walking		
start	walking	its a way to start	bad weather
wk 5	walking	pleasurable	miserable weather
wk 9	walking	pleasurable	
wk 20	walking		
# 3			
pre	walking		
start	walking	easy	none
wk 5	walking	easy	time constraints
wk 9	walking	easy	none
wk 20	walking	easy	none
# 4			
pre	walking		
start	walking	convenient	none
wk 5	walking	convenient, suitable for my health status	
wk 9	walking	convenient	
wk 20	walking	easy to do, can be done indoors or outdoors	
# 5			
pre	walking		
start	walking	easy to do in a group at noon, convenient	weather & time
wk 5	walking, stair climbing	increase fitness	other events
wk 9	as above	to get out in fresh air	ice & rough packed snow
wk 20	walking	benefits whole body	sometimes lazy
# 6			
pre	baseball		
start	exercise bike	assist in leg circulation	sore thigh muscles
wk 5	exercise bike	stimulate bloodflow to legs	
wk 9	exercise bike	enjoy	
wk 20	exercise bike	feel better	

TABLE 8 (cont'd)

INDIVIDUAL RESPONSES OVER TIME

Person	Activity	Incentives	Obstacles
# 7			
pre	walking		
start	aerobics	trying to keep fit	none
	walking	improve circulation in legs	lazy
wk 5	no reply		
wk 9	no reply		
wk 20	aerobics	weight control, enjoyment	none
	walking	blood glucose control & enjoyment	
# 8			
pre	golf		
start	no reply		
wk 5	walking	fitness & lose weight	time
wk 9	walking	fitness	time
	curling	enjoyment	none
	basketball	fitness & enjoyment	none
wk 20	walking	health, weight & physical conditioning	busy schedule
# 9			
pre	walking		
start	walking	like it best	
wk 5	walking	enjoy it	dislike going out late nights
wk 9	walking	enjoy it, outside, only activity with my husband	ocassionally other commitments
wk 20	walking	enjoy	
	exercise bike		
# 10			
pre	walking		
start	walking	enjoyable	visitors, lack of motivation & bad
wk 5	walking	feel good, enjoy fresh air	weather
wk 9	walking	works for me, fresh air	none
	sit-ups		none
wk 20	ill		get a sore side
# 11			
pre	walking		
start	walking	already doing 3-4 times/week	none
wk 5	walking	more fit	ill with bronchitis
wk 9	walking	feel good afterward	breathless if walking too fast
wk 20	walking	sleep better, more energy	
	exercise bike		boring, need more comfortable seat
# 12			
pre	walking		
start	walking	easy	cold weather
wk 5	walking	because its good	time
	exercise bike		
wk 9	walking	healthy, easy activity	none
wk 20	walking	quick	

TABLE 9

ACTIVITY SELECTION: AGGREGATE DATA OF INCENTIVES OVER TIME

Start	Week 5	Week 9	Week 20
Walking			
easy - 3	enjoy - 3	fresh air - 3	enjoy - 3
enjoy - 2	fitness - 3	enjoy - 2	easy - 2
convenient - 1	good for health - 2	easy - 2	sleep better - 1
companionship - 2	convenient - 1	convenient - 1	more energy - 1
way to start - 1	easy - 1	health - 1	health - 1
improve circulation to legs - 1	improve circulation to legs - 1	feels good afterwards - 1	benefits whole body - 1
already doing it 3 - 4 /week - 1	lose weight - 1	activity with husband - 1	can be done indoors & out - 1
		works for me - 1	lose weight - 1
		fitness - 1	quick - 1
			physical conditioning - 1
			blood glucose control - 1
Exercise Bike			
have a bike - 1	improve leg circulation - 1	enjoy - 1	fel better - 1
can do it at home - 1			
do it in spare time - 1			
improve leg circulation - 1			

The person who selected to ride his exercise bike to increase circulation to his legs persisted with the activity because he enjoyed it. Whereas, the person who initiated exercise bike use because it was convenient did not persist with the activity.

Obstacles to physical activity selection

Collective trends reveal that cold treacherous weather was a common concern (4/9) for those starting a walking program in autumn (refer to Tables 8 and 10). Weather conditions remained problematic but mellowed over time. The deterrent effect of time constraints (3/9) peaked at five weeks into the activity but also waned considerably over time (refer to Tables 8 and 10).

Health problems, whether preexisting, intermittent or newly acquired, periodically surfaced to interfere with both walking and using the exercise bike. The interruption of sick days on physical activity was significant and more fully substantiated in the daily activity diaries kept by the participants as part of the parent pilot study.

Single subject time series data suggest that activity inhibitors such as inclement weather (2/4) and time constraints (1/3) are less stable within individuals over time than physical activity incentives (refer to Table 8). This was even more clearly demonstrated by aggregate responses over time (refer to Table 10).

TABLE 10

ACTIVITY SELECTION: AGGREGATE DATA OF OBSTACLES OVER TIME

Start	Week 5	Week 9	Week 20
Walking			
poor weather - 4	time - 3	time/other commitments - 2	busy schedule - 1
lazy - 2	poor weather - 1	cold weather - 1	slipery roads - 1
visitors - 1	bronchitis - 1	ice, rough packed snow - 1	lazy - 1
none - 3	other events - 1	breathless - 1	none - 1
	dislike going out late nights - 1	sciatica - 1	
	none - 2	none - 2	
Exercise Bike			
getting started - 1	boring - 1		boring - 1
boring - 1			need more comfortable seat - 1
sore thigh muscles - 1			

Summary

The repertoire, of incentives for walking over time, expanded both individually and collectively. With time, participants were not only attracted to the activity because of its immediate attributes (ease, convenience, enjoyment, companionship, and fresh air), but also increasingly became more appreciative of activity spin-offs (more energy, better sleep, weight loss, physical conditioning, blood glucose control, and diverse body benefits). Whereas, data suggest that activity inhibitors such as inclement weather and time constraints were less stable within individuals over time than physical activity incentives.

RESEARCH QUESTION 3: What factors do people identify that enhance or deter physical activity duration over time?

Incentives for physical activity duration

Perceived benefits of activity duration varied considerably between individuals (Table 12), but tended to be relatively stable for each person over time (Table 11).

TABLE 11

INDIVIDUAL RESPONSES OVER TIME

Question: What factors do people identify that enhance or deter physical activity duration over time?

Key: pre - pre-program, wk - week, W - walking, EB - exercise bike,
B - bowling, A - aerobics, G - golf, BB - baseball, S - shopping.
I - ill: temporary no activity on advice of doctor

Person	Duration	Incentives	Obstacles
# 1			
pre B	120 min.		
start EB	10 min.	can manage this	too tired if do more
wk 5 EB	10 min.	can do it watching TV	hard sitting on seat
wk 9 S	varies		can't always get out
wk 20 B	150 min.	relaxed evening, not intense	
# 2			
pre W	20 min.		
start W	30 min.	fresh air	if it rains
wk 5 W	45 min.	I feel good after	lazy
wk 9 W	45 min.	fresh air	wind chill too high
wk 20	no reply		
# 3			
pre W	30 min.		
start W	20 min.	easy to accomplish	none
wk 5 W	30 min.		not enough time
wk 9 W	30 min.	can do it anywhere	overtime at work
wk 20 W	30 min.	easy to fit into lifestyle	
# 4			
pre W	30 min.		
start W	45 min.	to control glucose levels	occ. spinal problems
wk 5 W	45 min.	close to mall, corridors	available in apt. block
wk 9 W	45 min.	a home person	
wk 20	60 min.	determined to control diabetes	occasional depression
# 5			
pre W	20 min.		
start W	20 min.	work group walks this long	weather & time
wk 5 W	20 min.	walk with work friends	weather & time schedule
wk 9 W	25 min.	walk with co-workers	get off butt & go
wk 20 W	20 min.	accompany fellow workers	bad weather
# 6			
pre BB	120 min.		
start EB	10 min.	realistic objective	soreness
wk 5 EB	10 min.	watching TV during hockey & football games	
wk 9 EB	10 min.	not too stressful	
wk 20 EB	20 min.		

TABLE 11 (cont'd)

INDIVIDUAL RESPONSES OVER TIME

Person	Duration	Incentives	Obstacles
# 7			
pre W	20 min.		
start W	20 min.	walk to work, feel better	sticking to it
wk 5	no reply		
wk 9	no reply		
wk 20 W	40 min.	walk home from work in nice weather	none
A	60 min.	friend accompanies	
# 8			
pre G	270 min.		
start	no reply		
wk 5 W	30 min.	dog enjoys walk	time
wk 9 W	45 min.	enjoyment	time
wk 20 W	60 min.	sometimes joined by wife	busy schedule
# 9			
pre W	30 min.		
start W	30 min.	like it best, do it with husband	
wk 5 W	40 min.	with husband who already walks	laziness
wk 9 W	40 min.	several routes, same lenght to keep it interesting	very cold or blizzardy
wk 20 W	30 min.	enjoy & need exercise	slippery roads
EB	20 min.	can watch TV	occasional hip & back pain
# 10			
pre W	45 min.		
start W	45 min.	plan route for this amount of time	
wk 5 W	60 min.	schedule time, make duration worthwhile	weather
wk 9 W	60-90 min.	make it worthwhile	
wk 20	ill		
# 11			
pre W	15 min.		
start W	20 min.	selected route takes about this amount of time	
wk 5 W	30 min.		
EB		already in living room	
wk 9 W	25 min.		dislikes walking from track to car in dark
wk 20 W	45 min.		foot need surgery
# 12			
pre W	60 min.		
start W	60 min.	recommended by doctor	weather
wk 5 W	15 min.	good for me	forget sometimes
wk 9 W	15-60 min.		
wk 20 W	30-60 min.	quick	

TABLE 12

ACTIVITY DURATION: AGGREGATE DATA OF INCENTIVES OVER TIME

Start	Week 5	Week 9	Week 20
Walking			
fresh air - 1	feel good - 1	enjoyment - 1	quick - 1
easy - 1	good for me - 1	fresh air - 1	enjoy - 1
walk to work - 1	can do anywhere - 1	homeperson - 1	accompany fellow workers - 1
enjoy - 1	close to mall/apt. corridors - 1	walk with co-workers - 1	sometimes joined by wife - 1
companionship - 1	schedule time - 1	easy to fit into lifestyle - 1	control blood glucose - 1
work group walks this long - 1	make duration worthwhile - 1	make duration worthwhile - 1	
selected route takes this duration - 1	companionship - 1	walk home from work in nice weather - 1	
plan route for this duration - 1	walk with work friends - 1	several routes of same lenght to be interesting - 1	
recommended by doctor - 1	dog enjoys walk - 1		
control blood glucose - 1			
Exercise Bike			
realistic objectives - 1	can do it watching TV - 1	not too stressful - 1	
	already in living room - 1		

Initially, the practical/convenience aspects of the activity such as distance to and from work, noontime walking with co-workers and pleasant routes influenced walking duration (3/9). By the fifth week, with the encroachment of winter, these practical factors were extended to include accessibility to malls/apartment corridors for walking in inclement weather. Over the twenty weeks companionship, convenience, enjoyment, and health benefits continued to be recurrent criteria for determining walking duration.

Only one walker tailored the route to meet predetermined activity duration goals. Whereas both exercise bike riders were interested in setting realistic duration goals when starting the program. However, by the fifth week watching TV while riding the exercise bike became the key consideration in determining activity duration for both participants.

Obstacles to physical activity duration

Initially, inclement autumn weather (5/9) was the main reason for not walking longer (refer to Table 13). Gradually, between the fifth and ninth week, time constraints became more pronounced (3/9) while poor winter weather conditions became a little less problematic (3/9). As well, walking duration was intermittently inhibited by health problems (4/10) and laziness (2/10) over the twenty weeks. Participants gradually cited fewer obstacles.

TABLE 13

ACTIVITY DURATION: AGGREGATE DATA OF OBSTACLES OVER TIME

Start	Week 5	Week 9	Week 20
Walking			
poor weather - 5	time constraints - 3	poor weather - 3	inclement weather - 2
time constraints - 1	poor weather - 2	time constraints - 2	time constraints - 1
lack of motivation - 1	lazy - 2	getting started - 1	tired - 1
spinal problems - 1	forgetful - 1	dislike walking from track to car in dark - 1	short of breath - 1
none -1		foot surgery - 1	depression - 1
Exercise Bike			
too tired to do more - 1	hard seat - 1		hip and back pain - 1
soreness - 1			

For those using the exercise bike, riding discomfort was the main reason for not extending the activity time.

Summary

Over the twenty weeks companionship, convenience, enjoyment, and health benefits continued to be a recurrent criteria for determining walking duration. Initially, inclement autumn weather was the main reason for not walking longer. Although inclement winter weather, time constraints and health concerns remained problematic, over time participants cited fewer obstacles.

RESEARCH QUESTION 4: What factors do people identify that enhance or deter physical activity frequency over time?

Incentives for physical activity frequency

Despite the relative stability of incentives to increase walking frequency within individuals over time (Table 14), there were subtle shifts in aggregate responses over time (Table 15).

TABLE 14

INDIVIDUAL RESPONSES OVER TIME

Question: What factors do people identify that enhance or deter physical activity frequency over time?

Key: pre - pre-program, wk - week, W - walking, EB - exercise bike,
B - bowling, A - aerobics, G - golf, BB - baseball, S - shopping.
I - ill: temporary no activity on advice of doctor

Person	Frequency	Incentives	Obstacles
# 1			
pre B	1/wk		
start EB	3/wk	arbitrary number	lack of conviction
wk 5 EB	3/wk	don't have to go out	not difficult to achieve
wk 9 W	several/wk	Xmas shopping required it	can't always get out
wk 20 B	1/wk	scheduled activity	
# 2			
pre W	2/wk		
start W	3/wk	get away from TV	
wk 5 W	3/wk	fresh air & enjoy scenery	bad weather
wk 9 W	3/wk	likes walking	sloppy conditions
wk 20	no reply		
# 3			
pre W	5/wk		
start W	3/wk	realistic goal	none
wk 5	no reply		
wk 9 W	5/wk	can usually accomplish	sometimes feet are sore
wk 20 W	7/wk		
# 4			
pre W	7/wk		
start W	7/wk	necessary to control glucose levels	occasional spinal spasms prevent walking
wk 5 W	7/wk	my retired lifestyle	
wk 9 W	6/wk	being a home person	
wk 20 W	7/wk	determined to control blood glucose	
# 5			
pre W	5/wk		
start W	5/wk	convenience	weather & time
wk 5 W	5/wk	workplace suggests fitness	
wk 9 W	5/wk	lunch time	dressing to go out in bad weather
wk 20 W	5/wk	noon time	
# 6			
pre BB	1/wk		
start EB	3/wk	personal starting goal	fatique at first
wk 5 EB	3/wk	watching baseball/hockey 3 times/week	
wk 9 EB	3/wk	habit	
wk 20 EB	3/wk		weak at times

TABLE 14 (cont'd)

INDIVIDUAL RESPONSES OVER TIME

Person	Frequency	Incentives	Obstacles
# 7			
pre W	5/wk		
start W	2/wk	none	none
wk 5	no reply		
wk 9	no reply		
wk 20 W	3/wk	time is available	none
A	2/wk		
# 8			
pre G	2/wk		
start	no reply		
wk 5 W	5/wk	dog needs exercise	time
wk 9 W	4/wk		
wk 20 W	5-7/wk	enjoyment	occasionally time
# 9			
pre W	3/wk		
start W	4/wk	want to push myself	if my cold gets worse
wk 5 W	4/wk	husband walks most evenings	unexpected guests & bad weather
wk 9 W	5/wk	usually go out at 10 p.m. as routine before tea & bed	don't feel like going out
wk 20 W	4/wk	habit	back pain
EB	3/wk	on alternate days to walking	lazy sometimes
# 10			
pre W	2/wk		
start W	3/wk	walking twice already, want to increase	visitors on weekend
wk 5 W	3/wk	make effort to keep schedule	visitors, Hallowe'en canvassing
wk 9 W	4/wk	plans usually work out, enjoy the warm weather	visitors & exams
wk 20 w	ill		
# 11			
pre W	3/wk		
start W	5/wk	more than currently walking	
wk 5 W	6/wk		
wk 9 W	6/wk		if left hip hurts
wk 20 W	4/wk		tired, short of breath, sore hip, foot needs surgery
# 12			
pre W	3/wk		
start W	3/wk	coincides with lunch	time
wk 5 EB	3/wk		time
wk 9 W	3/wk		
wk 20 W	3/wk		

TABLE 15

ACTIVITY DURATION: AGGREGATE DATA OF INCENTIVES OVER TIME

Start	Week 5	Week 9	Week 20
Walking			
more than currently walking - 2	workplace suggests fitness - 1	lunch time - 1	enjoyment - 1
want to push self - 1	dog needs exercise - 1	usually go out at 10 p.m. as routine before bed - 1	enjoy warm weather - 1
convenient - 1	husband walks most evenings - 1	plan usually works - 1	habit - 1
coincides with lunch - 1	fresh air & enjoy scenery - 1	can usually accomplish - 1	time available -1
realistic - 1	retired lifestyle - 1	like it - 1	noon time - 1
get away from TV - 1	make effort to keep schedle - 1	home person - 1	determined to control blood glucose - 1
necessary to control blood glucose - 1			
Exercise Bike			
arbitrry number - 1	don't have to go out - 1	habit - 1	
realistic starting goal - 1	watch baseball/ hockey - 1		

Self improvement (3/9) was the main reason that people increased the number of times they walked per week near the beginning of the program. One person who chose walking and one person who chose the exercise bike identified a need to set realistic expectations for themselves. Convenient opportunities such as lunch breaks that accommodated walking also initially influenced walking frequency (2/9).

As time progressed, affiliative considerations such as companionship, workplace endorsement, and pet responsibilities enhanced the likelihood of going for a walk (3/9). Enjoying the fresh air and scenery while walking and finding basketball/hockey games pleasurable while using the exercise bike became instrumental in determining the frequency of activity for some participants (2/12). For one person there was a natural ease which walking fit into their life-style; whereas for another a concerted effort needed to be made to accomplish set goals for activity frequency.

With time, walking became a routine (4/10). This is illustrated by comments such as: usually walk at ten in the evening before tea and bed, or walk at lunch time, or have a planned time or its become a habit (4/10). As well, a regular activity time gradually became a habit for one person who used the exercise bike.

Obstacles to frequency of physical activity

Initially health problem (flu/spinal problems) (2/9), time constraints/socializing (2/9), and poor weather (1/9) prevented more frequent walking (refer to Table 16). As the participants walking program progressed into winter, time constraints (3/9), and inclement weather (2/9) became more problematic. Unappealing weather (3/9) continued to be a major deterrent throughout winter for some participants while for others it was health problems such as sore feet/hip, tiredness (3/9).

With the onset of spring, weather concerns diminished but health problems (foot deformity, sore hip, back pain, shortness of breath, sciatica) remained disconcerting (5/9). As well, time constraints (visitors, exams) resurfaced as obstacles to walking more frequently (3/10).

For the person who continued to use the exercise bike for the twenty weeks, limited exercise tolerance (fatigue, weakness) continued to be the key deterrent to riding the bike more often (refer to Table 14).

Summary

Despite of the relative stability of incentives to increase walking frequency within individuals over time, there were subtle shifts in aggregate responses over time. Self improvement was the main reason that people

TABLE 16

ACTIVITY DURATION: AGGREGATE DATA OF OBSTACLES OVER TIME

Start	Week 5	Week 9	Week 20
Walking			
bad weather- 1	time constraints - 1	sloppy conditions - 3	sore left hip - 1
time constraints - 1	unexpected guest - 1	sore feet - 1	foot need surgery - 1
visitors on weekend - 1	visitors/other events - 1	sore left hip - 1	shortness of breath - 1
flu/cold - 1	bad weather - 2	tired - 1	back pain - 1
ocassional spinal spasms - 1		dressing to go out in bad weather - 1	weak at times - 1
none - 1		don't feel like going out - 1	time constraints - 1
		canvassing - 1	exams - 1
			visitors - 1
			none - 1
Exercise Bike			
lack of conviction - 1	none - 1		
fatique - 1			

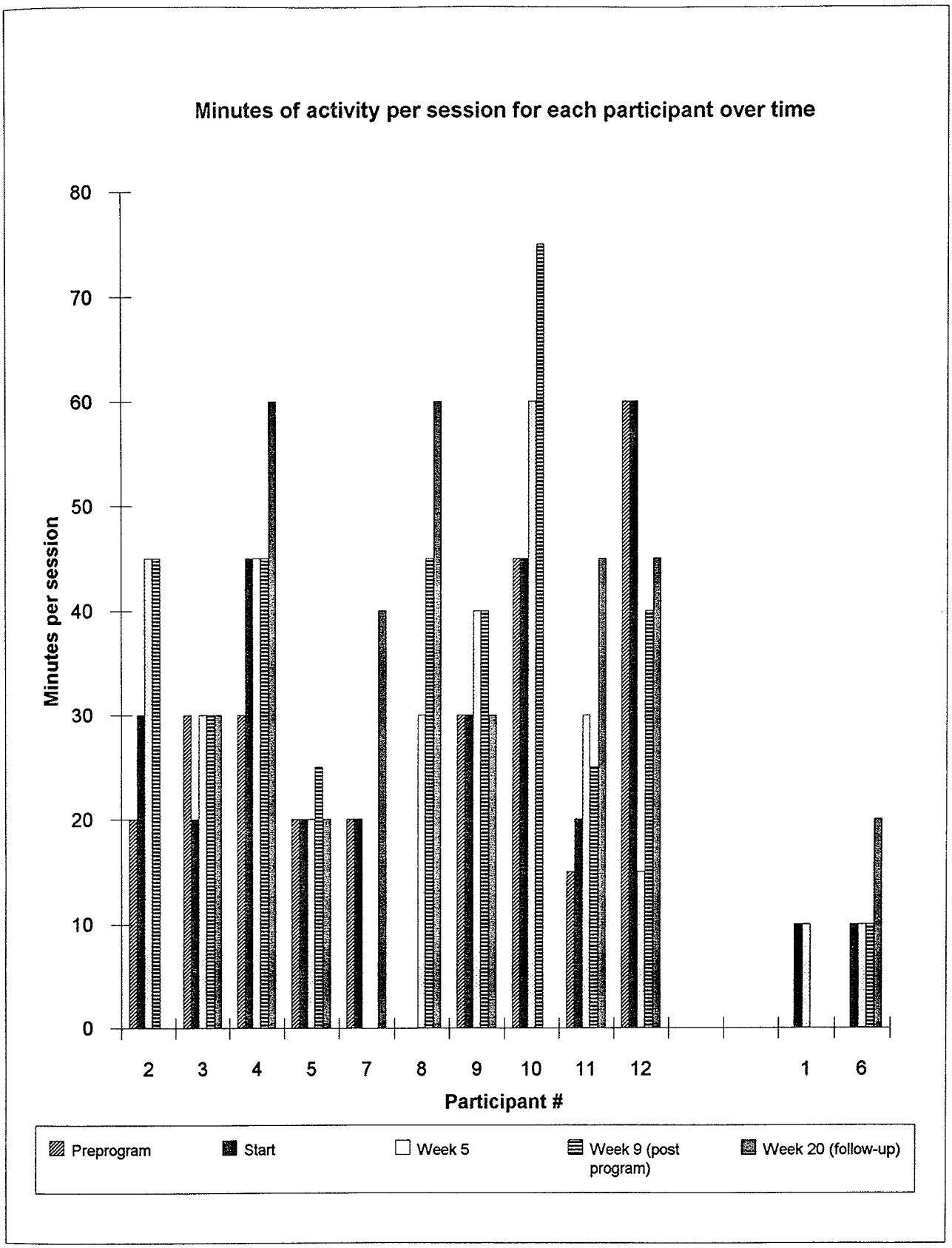
increased the number of times they walked per week near the beginning of the program. As time progressed, affiliative considerations enhanced the likelihood of going for a walk. With time, walking became a routine. Weather concerns were mainly seasonal, however health problems remained a disconcerting obstacle to activity.

RESEARCH QUESTION 5: Is there a relationship between type, frequency and duration of physical activity on adherence over time?

Only three of the twelve participants reported that their baseline physical activity repertoires were limited to sporadic recreational activities. One of these people chose walking as the main activity during the program and the other two preferred to start to use the exercise bike.

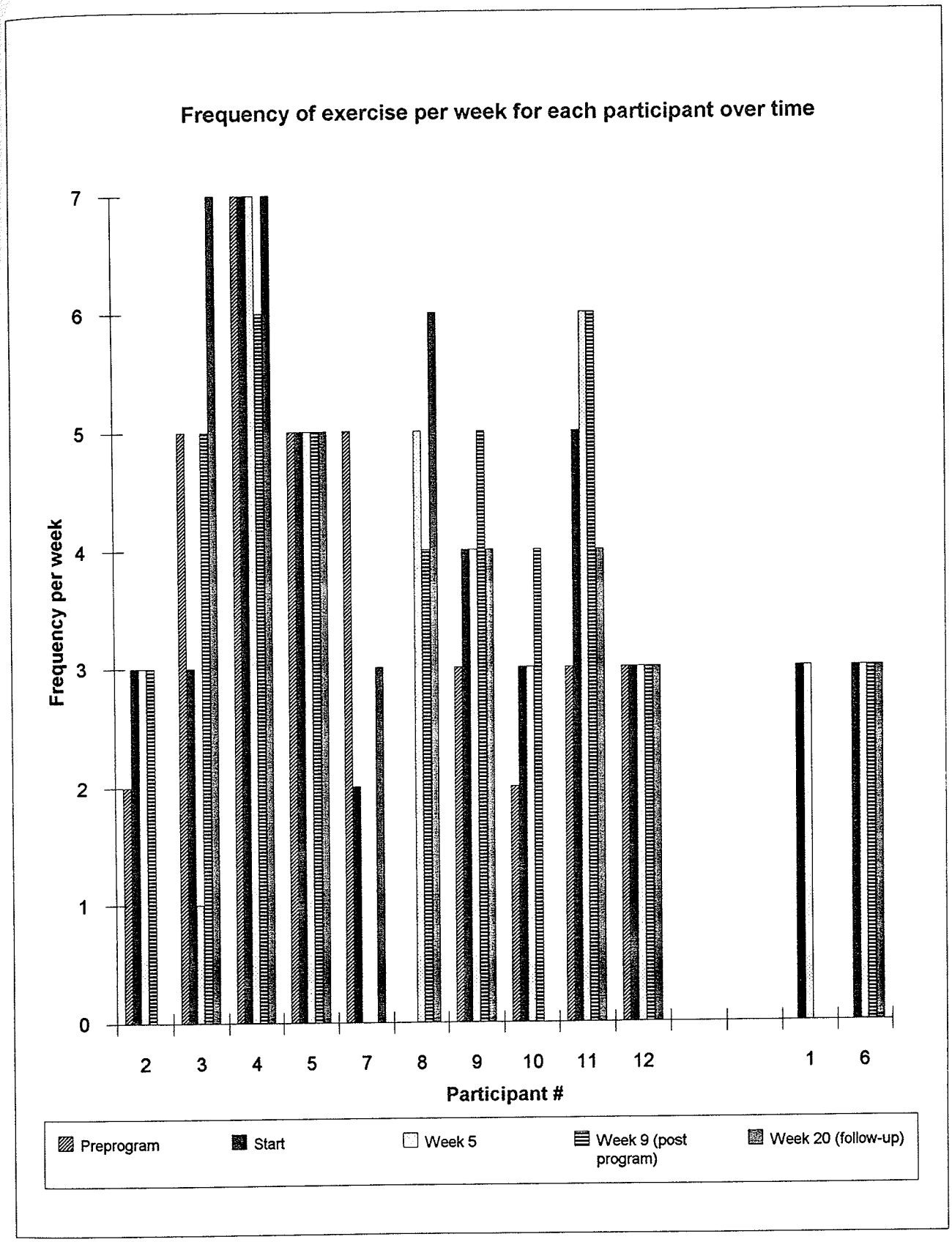
Walking duration and/or frequency for some participants (subjects 3, 5, 7, 9, and 12) periodically waxed and waned over the twenty weeks and consequently their total walking time per week would also fluctuate. Other participants (subjects 2, 4, 8, 10, and 11) for the most part steadily increased their duration and frequency of walking and therefore their cumulative walking time per week steadily improved (refer to Figures 1, 2 and 3).

Figure 1



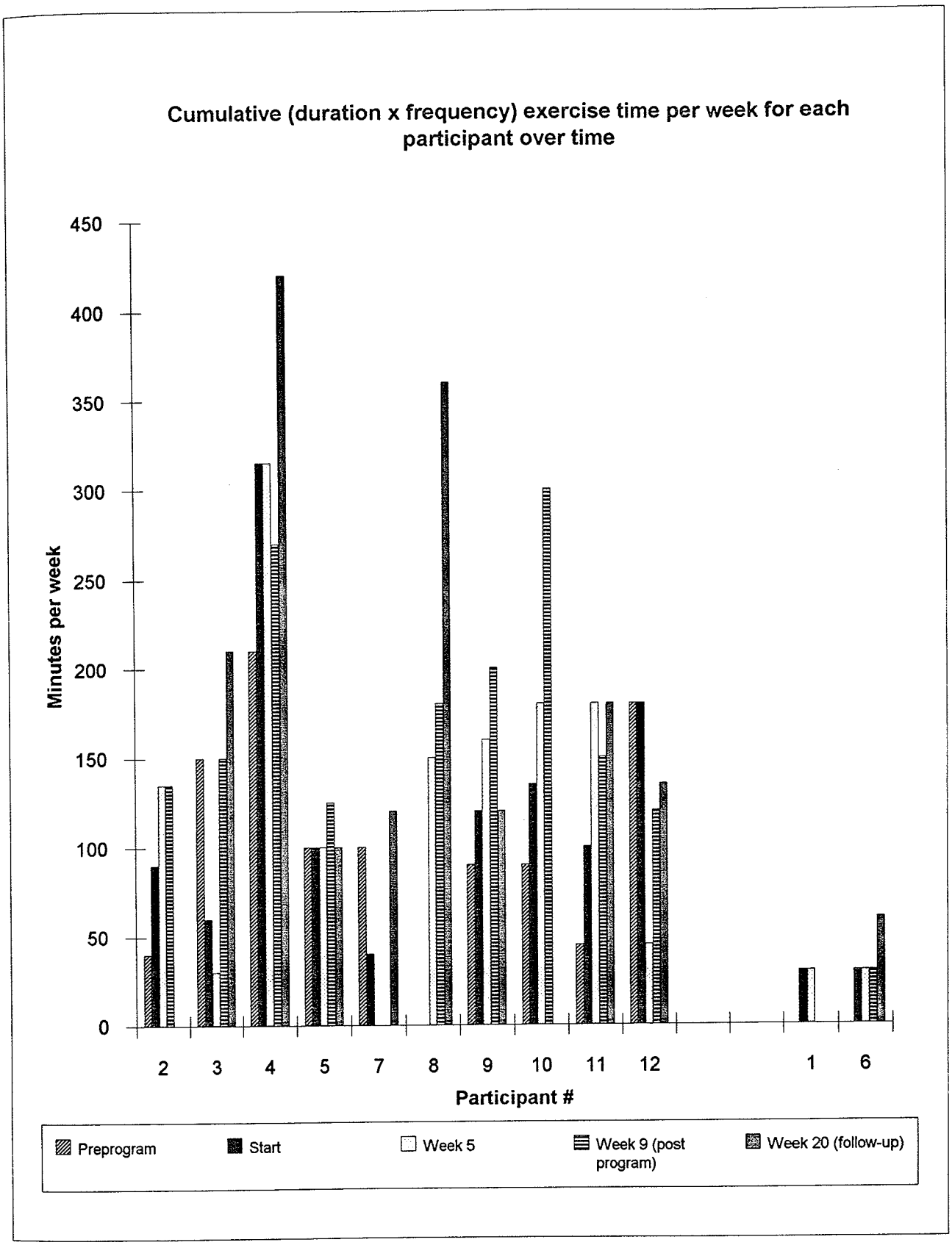
Note: Participants 2 - 5 and 7 - 12 walk. Participants 1 and 6 use excercise bike.

Figure 2



Note: Participants 2 - 5 and 7 - 12 walk. Participants 1 and 6 use excercise bike.

Figure 3



Note: Participants 2 - 5 and 7 - 12 walk. Participants 1 and 6 use excercise bike.

Statistical methods to analyze the data for walking duration and frequency need to take into account not only the small sample size of ten walking participants, but also the potentially strong modifying effect that four items of missing data could induce. Boxplots indicating median values were selected as the most appropriate statistical approach to deal with these data limitations.

Aggregate data for activity duration per session, frequency per week, and cumulative time per week is numerically summarized in Figure 4. These data are also visually depicted using boxplots to examine potential relationships within the data (refer to Figure 5). Salient features of the boxplots include the outlined central box which depicts the middle half of the data between the twenty-fifth and the seventy-fifth percentiles. The horizontal line across the box marks the median. If the median is synonymous with the upper or lower border of the boxplot, this median is indicated by horizontal arrows. The whiskers extend from the top and bottom of the box to display the highest and lowest connected data value. Extreme data values are plotted individually, usually with a circle. Very extreme values are plotted with a starburst. Both circle and starburst outliers are computed according to guidelines provided by Velleman et al, 1981.

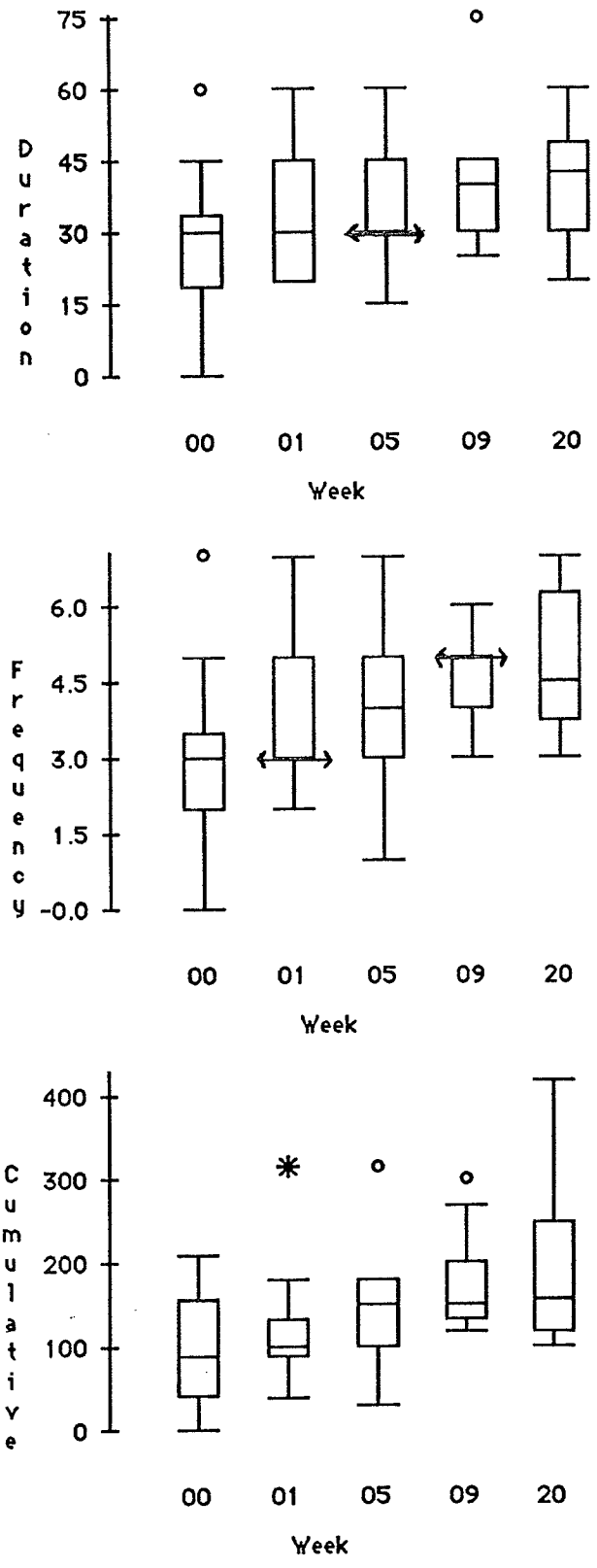
FIGURE 4

AGGREGATE DATA FOR ACTIVITY DURATION PER SESSION, FREQUENCY PER WEEK AND CUMULATIVE ACTIVITY TIME PER WEEK FOR EACH PARTICIPANT OVER TIME

	Duration					Frequency					Cumulative				
	pre	start	wk5	wk9	wk20	pre	start	wk5	wk9	wk20	pre	start	wk5	wk9	wk20
W															
#2	20	30	45	45	*	2	3	3	3	*	40	90	135	135	*
#3	30	20	30	30	30	5	3	1	5	7	150	60	30	150	210
#4	30	45	45	45	60	7	7	7	6	7	210	315	315	270	420
#5	20	20	20	25	20	5	5	5	5	5	100	100	100	125	100
#7	20	20	*	*	40	5	2	*	*	3	100	40	*	*	120
#8	0	*	30	45	60	0	*	5	4	6	0	*	150	180	360
#9	30	30	40	40	30	3	4	4	5	4	90	120	160	200	120
#10	45	45	60	75	s	2	3	3	4	s	90	135	180	300	s
#11	15	20	30	25	45	3	5	6	6	4	45	100	180	150	180
#12	60	60	15	40	45	3	3	3	3	3	180	180	45	120	135
EB															
#1	0	10	10	0	0	0	3	3	0	0	0	30	30	0	0
#6	0	10	10	10	20	0	3	3	3	3	0	30	30	30	60

Key: * - no reply, s - sick, W - walking, EB - exercise bike.

Figure 5. Boxplots to Compare the Data by Week



The medians within the boxplots reveal several patterns (refer to Figure 5). The medians for walking duration stay fixed at 30 minutes per session for data obtained at baseline, during the first week of the exercise sessions, as well as the fifth week. However, at the ninth and twentieth week records the median increases to approximately 40 minutes per session. The median frequency of walking remains stable at 3 times per week at baseline and at the first week of the exercise program. It increases to approximately 4 times per week for the fifth week, peaks to 4.5 times per week at the ninth week and then drops back to 4 times per week at follow-up. Consequently the median cumulative walking time, tabulated as frequency times duration per week, shows its most pronounced improvement between the first week and the fifth week records. This median cumulative walking time was maintained at the subsequent ninth and twentieth week reports.

Noteworthy is the pattern of variance for cumulative walking time exhibited by the boxplots. At the first week the variance is tight, whereas the greatest variability is demonstrated at the three month follow-up. More specifically, this follow-up data reveals that the major part of the variance exists within the top whisker, hence the most variability is amongst the most active participants.

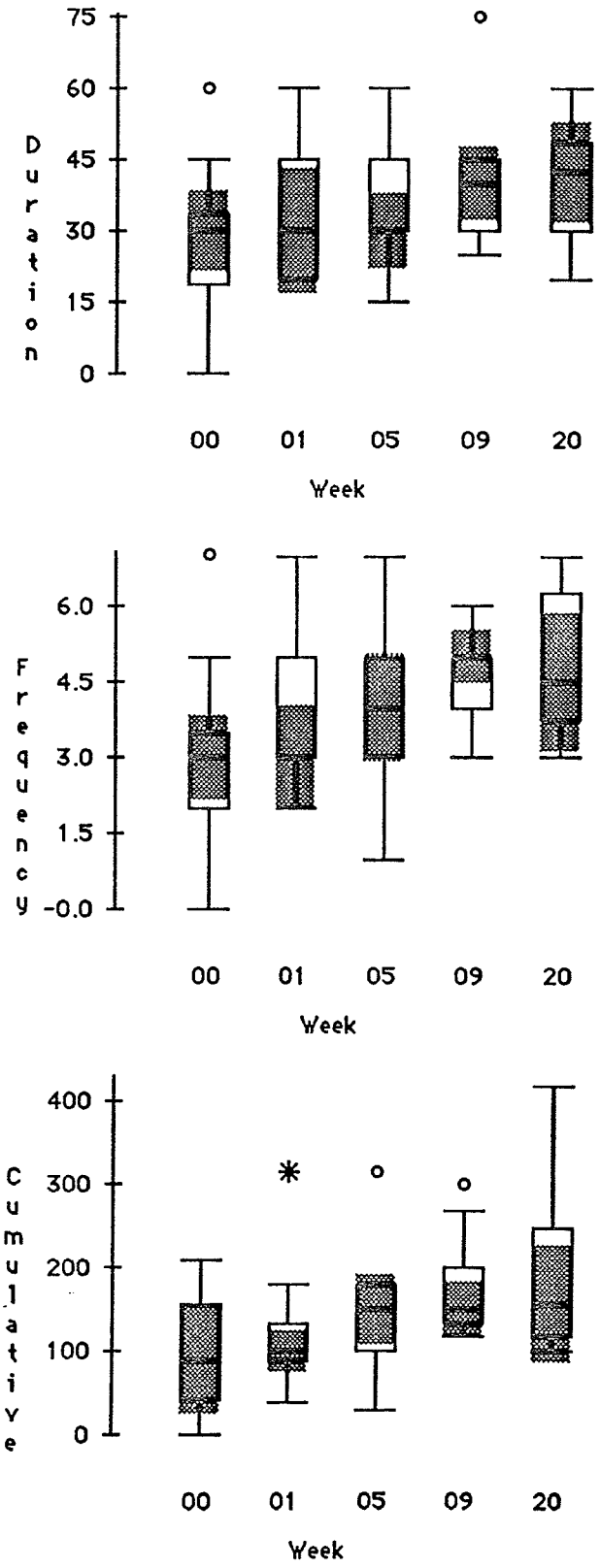
This study's small sample size along with the use of medians as the key analytical approach to analyzing aggregate data prohibits the use of powerful tests of statistical and inferential significance. However, an exploratory

inferential method using boxplots is available (Velleman et al, 1981). The boxplots in Figure 5 can be augmented by superimposing a shaded area in each box indicating 95% confidence interval bounds around its median (refer to Figure 6). These are not individual confidence intervals, but rather are constructed so that if two grey boxes fail to overlap, its suggest that the corresponding medians are discernibly different at approximately the five percent significance level.

Using this inferential method, Figure 6 illustrates that for each category of walking duration and cumulative time, all of the shaded boxes overlap suggesting that the differences between their medians is not statistically significant. However, for frequency of walking per week data, the shaded boxes for the first and ninth weeks do not overlap suggesting that the corresponding medians may be discernibly different at the five percent significance level. It needs to be emphasized that this inferential methodology is exploratory in nature. A larger sample size accompanied by the use of more powerful tests to determine statistical and inferential significance are needed for more conclusive results.

The one participant who continued to use his exercise bike maintained a steady pattern of frequency and duration for this activity for the first nine weeks. However, his duration time per session gradually doubled during the subsequent three month follow-up period.

Figure 6. Boxplots to Compare the Data by Week
(with 95% confidence intervals for comparing pairs of medians)



The daily exercise diaries from the larger study provided a valuable tool to ascertain the reliability of questionnaire responses regarding activity type, duration and frequency. Unfortunately for questionnaires 1 and 2 (baseline and start of formal program) there was no mechanism available to verify the accuracy of participant responses. The parent study had not yet initiated daily activity diaries, therefore this instrument for verifying questionnaire responses was not yet available. However, daily activity diaries were available to compare with questionnaires 3 and 4 (week five and nine) for all the participants. There was minimal discrepancy between the two databases. As well, at the end of the program the diary entries for the preceding three weeks were averaged for each participant. There was no notable discrepancy between this averaged score and the responses to questionnaire 5 (three month follow-up), for the six participants for whom it was available.

In summary, walking duration and/or frequency for half of the participants periodically waxed and waned over the twenty weeks and consequently their total walking time per week would also fluctuate. The other participants for the most part steadily increased their duration and frequency of walking and therefore their cumulative walking time per week steadily improved.

RESEARCH QUESTION 6: What factors do people identify that influence physical activity repertoires to expand or shrink?

Ten participants chose walking as their main physical activity while two individuals chose to use the exercise bike. All participants either continued with preexisting activities or started new activities to supplement walking or using the stationary bike. However, individuals varied as to the point in time during the twenty weeks that they were ready to introduce new activities into their repertoire (refer to Tables 8 and 17).

Three participants started stair climbing. One participant vigorously reactivated curling and basketball while dramatically intensifying his walking over time. Whereas another participant intensified her walking while continuing aerobics. Yet another participant engaged in aerobics in the follow-up period as an adjunct to walking.

One person started sit-ups and another initiated step-up-and-downs after these activities were demonstrated in the parent study. Other supplemental activities included using the exercise bike, swimming, parking further from destinations, and walking to the mailbox. As well, one participant who discontinued using the stationary bike as her main activity reactivated weekly bowling.

TABLE 17

Question: What factors do people identify that influence physical activity repertoires to expand or shrink?

Person	Incentives	Obstacles
# 1 wk 5 EB	had a bike	uncomfortable seat & boring
# 2 wk 9 A	enjoyment, ease & fitness	
# 3 wk 5		
# 4 wk 9 SW	pool in apartment block	unable to carry on 2 major activities, feel walking is more beneficial
# 5 wk 5 SC*		
# 6 wk 9 W wk 20 SC	the program indoor activity	sore hip exercise bike easier
# 7 wk 20 EB	indoors, could watch TV	boring, unenjoyable, returned bike
# 8 wk 5 FD&W*		
# 9 wk 9 SU wk 20 W/MB	benefit to midsection wanted extra activity	developed sciatica & will resume when medical treatment is discontinued lazy & got mail by car
# 10 wk 20 EB	can do as alternative activity when hips sore	
# 11 wk 9 SU	introduced in class	pain in right side
# 12 wk 5 SU&D	different & interesting	time constraints, lost interest

Key: W - walking, EB - exercise bike, SC - stair climbing, SW - swimming, A - aerobics, SU - sit ups, W/MB - walk to mail box, SU&D - step-up & down, FD&W - further destination & walk, * - not reported in questionnaire; reported in daily diaries.

Incentives for these additional activities varied (refer to Table 17). The convenience of not having to go outside during inclement weather made stair climbing, swimming, and using the exercise bike within their home or work appealing (3/12). Connecting music with aerobics, and viewing television while using the exercise bike made these activities more attractive for some participants (2/12). For others, supplemental activity incentives reflected a need for variety (2/12), novelty (2/12), alternative activities for health problems (1/12), or simply the availability of already having the equipment (1/12).

The reasons for abandoning physical activities also varied (refer to Table 17). Activities that were considered boring (2/12), created health problems (2/12), were the main reasons for discontinuing an activity. Other curtailed activities were considered not enjoyable (1/12), uncomfortable (1/12), too difficult (1/12), or not suitable (1/12). As well, laziness and time/energy constraints were reported as personal deterrents to physical activity adherence.

In summary, all participants either continued with preexisting activities or started new activities to supplement walking or using the stationary bike. However, individuals varied considerably as to which additional activities they chose and to the point in time during the twenty weeks that they were ready to introduce new activities into their repertoire. Incentives for these additional activities varied. The most commonly cited incentives included convenience, pleasure, variety and novelty. The reasons for abandoning physical activities also varied. Activities that were considered boring or created health problems were the main reasons for discontinuing an activity.

CHAPTER V: DISCUSSION

Overview of findings

This study explored a number of research questions: What factors do people identify that lead them to a decision to become more physically active? What factors do people identify that enhance or deter physical activity type, duration and frequency over time? Is there a relationship between type, frequency and duration of physical activity over time? What factors do people identify that influence physical activity repertoires to expand or shrink?

The findings of this study provided a composite of the complex, varied and evolving interplay of motivational incentives and deterrents associated with physical type, duration, frequency, and adherence. The following is a summary of the data as it pertains to each of the research questions.

Most participants had more than one reason to begin to increase physical activity. Weight reduction, improved physical conditioning, and improved overall health status were perceived as being the main reasons for starting an activity program by persons with Type II obese diabetes. However, the key motivational determinants for participants choosing an appropriate physical activity program differed somewhat from their reasons to become more physically active. The most frequent response for choosing the parent pilot study was that it was diabetes-centered. As well, several participants valued the program because it was staffed by diabetes professionals.

The repertoire, of incentives for walking over time, expanded both individually and collectively. With time, participants were not only attracted to the activity because of its immediate attributes (ease, convenience, enjoyment, companionship, and fresh air), but also increasingly became more appreciative of activity spin-offs (more energy, better sleep, weight loss, physical conditioning, blood glucose control, and diverse body benefits). Whereas, data suggest that activity inhibitors such as inclement weather and time constraints were less stable within individuals over time than physical activity incentives.

Over the twenty weeks companionship, convenience, enjoyment, and health benefits continued to be recurrent criteria for determining walking duration. Initially, inclement weather was the main reason for not walking longer. Although inclement weather, time constraints and health concerns remained problematic, over time participants cited fewer obstacles.

Despite the relative stability of incentives to increase walking frequency within individuals over time, there were subtle shifts in aggregate responses over time. Self improvement was the main reason that people increased the number of times they walked per week near the beginning of the program. As time progressed, affiliative considerations enhanced the likelihood of going for a walk. With time, walking became a routine. Weather concern concerns were mainly seasonal, however health problems remained a disconcerting obstacle to activity.

Walking duration and/or frequency for five of the participants periodically waxed and waned over the twenty weeks and consequently their total walking time per week would also fluctuate. The other five participants for the most part steadily increased their duration and frequency of walking and therefore their cumulative walking time per week steadily improved.

All participants either continued with preexisting activities or started new activities to supplement walking or using the stationary bike. However, individuals varied considerably as to which additional activities they chose and to the point in time during the twenty weeks that they were ready to introduce new activities into their repertoire. Incentives for these additional activities varied. The most commonly cited incentives included convenience, pleasure, variety and novelty. The reasons for abandoning physical activities also varied. Activities that were considered boring, or created health problems or discomfort, were the main reasons for discontinuing an activity.

However, the degree to which the individual and aggregate data accurately and completely portray reality remains uncertain. Recent studies have shown that self reports closely represent what respondents usually do (Freeman et al, 1987). This is further supported by the close approximation between questionnaire responses and corresponding data gleaned from weekly exercise diaries kept by participants as part of the parent study (refer to Appendices D and E). Nevertheless data completeness may remain more suspect than data accuracy.

Comparisons with previous research

This study concurs with previous research findings that both men and women are more likely to adopt moderate exercise such as walking, exercise bike and stair climbing (Stephens et al, 1990; Sallis et al, 1986). This study clearly indicated a strong predisposition to moderate intensity exercises. Ten participants chose walking and two preferred the exercise bike as their main physical activity. As well, their supplemental exercise repertoire reflected predominately moderate physical activities such as stair climbing, swimming, sit-ups, walking to mail box, or parking further from destinations and walking.

The parent study provided a quasi-structured physical activity program. Although participants were part of a supervised walking program on the track once a week, they tended to select moderate intensity free living activities between the structured sessions (refer to Tables 8 and 17). This study supports other research evidence which suggests that when people have the flexibility to select different modes of physical activity and exercise at different times and places, this is more conducive to long term exercise adherence than structured programs (Epstein, 1984; Thompson, 1980). This study's experience is also congruent with the findings of a large community sample that the dropout rate for moderate activities was less than thirty-five percent as compared to a fifty percent dropout rate for vigorous activities (Sallis et al, 1986). In this study only one person did not attend the three month follow-up session, resulting in a modest eight percent dropout rate. This rate is considerably below the thirty-five percent dropout rate reported for moderate activity by Sallis in a large community sample.

This study also supports existing research that indicates that exercise needs to be enjoyable and satisfying to be adopted and sustained over time (Shephard, 1988; Stones, 1987). Participants 2, 8, 10 and 11 were four of the six people who reported their walking as enjoyable (refer to Table 8). These four individuals were among the five who steadily increased their cumulative walking time (refer to Figures 3 and 4).

However, the relationship between activity deterrents (Miller Lite Report, 1983; Perrier Study, 1979; Dishman et al, 1985; Martin et al, 1985; Gallup Organization, 1985) and walking adherence is less clear. Five participants (subjects 2, 4, 8, 10 and 11) steadily improved their cumulative walking time (refer to Figures 3 and 4). However, their questionnaire responses indicated considerable variation regarding the number, type and pattern of impediments to their walking endeavors (refer to Table 8). One of these participants (subject 4) did not cite any obstacles to walking during the twenty weeks. However, the other four participants continued to increase their cumulative walking time in spite of inclement weather, time constraints and health problems. On the other hand, three participants (subjects 3, 7 and 12) who reported few walking deterrents reported cumulative walking times which fluctuated over the five months (refer to Table 8 and Figure 4).

Previous research indicates that aerobic activity durations of more than forty-five minutes and frequencies exceeding five days per week have resulted in exercise dropout rates by those previously untrained (Pollock, 1988). Although injuries did not provoke the participants in this study to dropout; injuries with increased activity duration and frequency were problematic. Participants in this study who walked less than the threshold described above recorded no walking injuries. On the other hand, six participants (subjects 2, 4, 8, 10, 11 and 12) reported at least once that they walked more than forty-five minutes, whereas six participants (subjects 3, 4, 5, 8, 8, 9 and 11) recorded at least once that they walked more than five times per week. For activity which lasted forty-five minutes or longer, three of these participants (subjects 4, 10 and 11) cited occasional spinal problems, sciatica and shortness of breath. Under medical advisement, the participant with sciatica needed to temporarily relinquish the walking program. Similarly, two participants (subjects 3 and 11) associated sore feet and leg spasms with walking more than five times per week.

This study provided an opportunity to examine whether physical activity type, duration and frequency are merely descriptors or if these activity characteristics can also function as determinants of exercise adherence. Three landmark documents (Stephens et al, 1990; Bouchard et al, 1990; U.S. Department of Health and Human Services, 1984) recommended that future research examine when and how preferences for types and intensities of activity are formed and

how they influence future activity. In this study, those participants (subjects 2, 4, 8 and 11) who consistently improved their cumulative weekly walking time over the twenty week period all demonstrated successive increases in walking duration over time, whereas these individuals varied in their pattern of walking frequency per week (refer to Figure 4). Two participants (subjects 2 and 10) steadily increased the number of times they walked per week whereas three participants (subjects 4, 8 and 11) fluctuated in their frequency of walking per week. The findings of this study may suggest that physical activity type and duration influences future activity.

In summary, this study of process design concurs with previous single exposure research. It demonstrated that middle aged men and women prefer and more readily adhere to moderate intensity physical activity. This study also supplements a mounting body of evidence that activity enjoyment is a prime incentive to exercise whereas time constraints and seasonally inclement weather acted as key deterrents to free living activity. In addition, this study supports other research findings that indicate health problems could be attributed to or aggravated by increasing duration and frequency of exercise.

Future directions

Previous research considered activity characteristics primarily as descriptors. As well, these studies were preoccupied with inducements and obstacles solely regarding physical activity type, usually in terms of aerobic conditioning (Bouchard et al, 1990). This study provides preliminary descriptions about the dynamic nature of incentives and deterrents inclusive of physical activity duration and frequency, as well as type of physical activity. This study also provides preliminary evidence that physical activity type and duration may act not only as exercise descriptors but may also influence future activity. Future prospective studies of process design with sample size and statistical methods sufficient to demonstrate true differences are necessary to confirm or refute these findings.

CHAPTER VI: CONCLUSIONS and RECOMMENDATIONS

Summary of findings

Walking was the main physical activity chosen by participants. This study's data suggest that walking as a newly acquired or intensified activity is often perceived as enjoyable by participants. This enjoyment, though interfaced with inclement weather, time constraints and health problems, tended to become stronger over time and overrode the deterrents.

Similarly, incentives such as convenience and ease and enjoyment for walking duration and frequency expanded for individuals over time. Whereas perceived obstacles such as inclement weather and time constraints though still significant tended to diminish. Gradually a routine became enmeshed into the participants' life-style. Concurrently, for half of the participants who chose walking their duration, frequency and cumulative walking time for the most part increased over time. In addition, all participants either continued with preexisting activities or started new activities to supplement walking. Incentives and deterrents for these supplemental activities varied.

Study contribution

This prospective, qualitative study confirms and expands the current body of knowledge about physical activity characteristics as determinants over time. This study concurs with previous single exposure research. It demonstrated that middle aged men and women prefer and more readily adhere to moderate intensity physical activity. This study also supplements a mounting body of evidence that activity enjoyment is a prime incentive to exercise whereas time constraints and seasonally inclement weather acted as key deterrents to free living activity. In addition, this study supports other research findings that indicate health problems could be attributed to or aggravated by increasing duration and frequency of exercise.

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This study of process design also provides preliminary evidence that physical activity type and duration may act not only as exercise descriptors

but may also influence future activity. Future prospective studies of process design with sample size and statistical methods sufficient to demonstrate true differences are necessary to confirm or refute this finding.

The questionnaires developed for the purposes of this study served to be valuable instruments to obtain the desired data. The study design, though labour intensive, provided a useful reporting and recording mechanism for both analysis of individual and aggregate data over time. Individual data obtained intermittently over time, though cumbersome, provided a sensitive barometer for personal motivational fluctuations. Whereas aggregate data, collected periodically over time, provided an easy vehicle to identify prevalence shifts of physical activity determinants. The thesis questionnaires and both of the analytical approaches previously described would be of benefit to future investigations of similar intent.

Limitations of the study

It is worth noting a number of limitations for this study.

Designing data collection procedures to obtain a good response rate is critical to meaningful data analysis. Questionnaires 2, 3, 4, and 5 were administered as part of the parent study following the educational portion of the sessions; but prior to the exercise components. However, as participants were usually very eager to get walking on the track, this scheduling may have

inadvertently predisposed some respondents to rush to complete the questionnaires. It may have been preferable to administer the questionnaires between two content segments during the latter part of the educational sessions.

The intimate relationship between the thesis questionnaires and the parent pilot study may have biased the exploration of factors that influence activity selection, frequency, duration and adherence over time. For all the thesis research questions, it would have enhanced the study design if there had been a concerted attempt to dissociate the questionnaire replies from the influences of the parent pilot study. This was difficult as the questionnaires were so intricately entrenched into the timelines and behaviour modification fabric of the larger study. Nevertheless, it would have been useful to more clearly decipher in which ways the questionnaires responses were independent or dependent of the parent study.

Further insights, though embryonic and still potentially tainted, may have been revealed by asking the following questions:

Questionnaire 1:

- In what way did the program influence your commitment to begin or to increase your physical activity at this time?
- Would you have still tried to increase your physical activity without the program? If yes, in what way? If no, why not?

Questionnaires 2, 3, 4, & 5:

- In what way has the program influenced your activity choice, duration, or frequency?

Other important questions remain unresolved and are worthy of future investigation. Are program attenders significantly different than those who initiate physical activity on their own? Do the participants of this study even differ in their motivational makeup from those who would choose a more generic activity program?

The findings of this study need to be cautiously extrapolated. Small sample size solely comprised of middle aged persons with Type II obese diabetes, as well as data obtained from questionnaires which were intricately imbedded in the fabric of the parent study; both make any generalizations beyond the parameters of the larger study precarious.

Recommendations

The questionnaires and analytical approaches used for this thesis to track both individual and aggregate responses over time would be of benefit to future investigations of similar intent. However, future investigations require a larger sample size and assessments extended over longer periods of time.

This study could serve as a model to explore similar research questions for the general population. Future research could concurrently compare people who independently pursue their physical activity plans, those who select heterogeneous activity programs, and those who seek programs that they feel are tailored to their specific needs. These findings would have significant value for those involved in physical activity policy planning and program delivery.

Future investigations should also consider participants' history for previous attempts to increase their physical activity. It would be of value to seek information regarding the manner, frequency and degree of success that participants experienced in their attempts to expand their commitment to exercise within the previous five years. This could provide clues as to whether people tend to fluctuate in their physical activity levels similar to weight cycling observed in people who are frequently on diets (Hospers et al, 1990; Kayman, 1990; Lissner et al, 1990; Schotte, 1990; Westover, 1990; Blackburn et al, 1989; Brownell, 1989; Collins, 1989; Holbrook, 1989; Rossner, 1989; Saris, 1989). Exploring the relationship between a person's exercise history and their current physical activity selection, duration, frequency and adherence over time could provide valuable information to help programmers priorize and modify existing programs to sub-groups of the population.

In this study, investigating motivational incentives to become more physically active and comparing these to the participant's program selection criteria provided interesting insights. Reasons for participants wanting to be more active were similar to, but not synonymous with valued program attributes. The prime reason cited for increasing physical activity was weight reduction. There are many venues and programs offering this service by both profit and nonprofit organizations. However, the parent pilot study attracted interest and initial commitment because of its diabetes focus and the involvement of experienced diabetes educators. Future promotional efforts to attract participants for subsequent research of similar intent should consider

capturing visual or written testimonials from former participants to highlight the benefits of a physical activity program which provides a diabetes focus by experienced professionals. As well, research teams should not underestimate the value of informing and mobilizing other health professionals to offer their endorsement. This could provide a valuable nudge for people who would be attracted to programs that are considered credible by the diabetes community.

It is encouraging that middle aged men and women who have had Type II obese diabetes for several years still desire to initiate or intensify regular activity. The parent study findings reinforce the notion that health educators need to offer periodic encouragement to sedentary individuals with Type II obese diabetes to become more active, and to endorse credible behaviourally based activity programs. The larger study demonstrated that within behavioural eating and exercise programs, for some participants the desire to be more active can be nurtured and transformed into accomplishments that continue to evolve over time.

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Appendix A

Name_____

Date_____

QUESTIONNAIRE # 1

What do you do for physical activity on the average for one week?

Type of Activity	How Many Minutes	How Many Times

Why did you decide to increase your physical activity at this time?

Why did you decide to choose this program?

Appendix B

Name_____

Date_____

QUESTIONNAIRE # 2

Let's take a look at what physical activities you plan to do in the next week and why you chose them.

Name the activity	Why did you choose this activity?	What problems do you expect?
How many minutes?	Why did you choose this?	What problems do you expect?
How many time a week?	Why did you choose this?	What problems do you expect?

Appendix c

Name_____

Date_____

QUESTIONNAIRE # 3

Let's take a look at what activities you have tried since you started the program. Let's also try to figure out why the fit between you and the activity was or was not a good one.

First let's look at what activity you were doing last week.

Name the activity	Why do you want to continue this activity?	Why is it hard to continue this activity?
How many minutes?	What makes this easy for you?	What makes this hard for you?
How many times?	What makes this easy for you?	What makes this hard for you?

What activity did you try since the beginning of the program that you are no longer doing?

What attracted you to this activity?

Why were you not able to continue with this activity?

Appendix D

Name_____

Date_____

QUESTIONNAIRE # 4

Let's take a look at what activities you have tried in the last month. Let's also try to figure out why the fit between you and the activity was or was not a good one.

First let's look at what activity you were doing last week.

Name the activity	Why do you want to continue this activity?	Why is it hard to continue this activity?
How many minutes?	What makes this easy for you?	What makes this hard for you?
How many times?	What makes this easy for you?	What makes this hard for you?

What activity did you try in the last month that you are no longer doing?

What attracted you to this activity?

Why were you not able to continue with this activity?

Appendix E

Name_____

Date_____

QUESTIONNAIRE # 5

Let's take a look at what activities you have tried since you finished the program. Let's also try to figure out why the fit between you and the activity was or was not a good one.

First let's look at what activity you were doing last week.

Name the activity	Why do you want to continue this activity?	Why is it hard to continue this activity?
How many minutes?	What makes this easy for you?	What makes this hard for you?
How many times?	What makes this easy for you?	What makes this hard for you?

What activity did you try since you finished the program that you are no longer doing?

What attracted you to this activity?

Why were you not able to continue with this activity?

Appendix F

RECORD

THINGS TO DO	SUN	MON	TUES	WED	THUR	FRI	SAT
ACTIVITY GOAL: (write number of minutes of activity) **Cue:** **Reward:**							
FOOD GOAL: **Cue:** **Reward:**							
LIFESTYLE GOAL: **Cue:** **Reward:**							

NAME:_____

DATE:_____

Appendix G

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
9 (December)	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1 (January)	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19

* In the squares, write the kind of activity you did and for how long you did it.

Name:_____

These are some questions that I want to discuss at the next session.

These are some things which helped me eat less and exercise more; that might be helpful to others.

Appendix H

DEVELOPMENT AND EVALUATION OF A COMMUNITY BASED EATING AND EXERCISE BEHAVIOUR CHANGE PROGRAM TO IMPROVE TYPE II DIABETES CONTROL

Description of the Study

The proposed study will deliver a program designed to change eating and exercise behaviours which should improve blood glucose control for people with Type II diabetes.

Prior to taking part in the program, arrangements will be made for you to see the project's physician to find out whether the physical activity offered in the program is suitable for you. Enclosed is a copy of the medical assessment so that you will know what to expect.

As a participant in the study, you will take part in a 10 week program which is designed to bring about changes in your eating and exercise habits. Sessions will be held once a week. You will receive information, practical day-to-day tips, as well as learn from the experiences of others in the group. You will also have a chance to do some low intensity activity. Instructors will include diabetes educators, dietitians and physical educators.

Our findings will be shared with other health professionals to help them deliver similiar programs for people with Type II diabetes.

Measurements

The following measurements will be conducted prior to the program, immediately following its completion, and after 3 months:

Blood Test

Venous blood will be obtained by a registered nurse or trained technician for the determination of glycated hemoglobin (indicator of blood glucose control).

Body Composition Assessment

Measurements to assess body composition will include standing height and body weight, girth measurements (chest, waist, hips, thigh), and skinfold measurements (triceps, biceps, subscapular, iliac crest, medial calf). The assessment will take approximately 15 minutes and you should wear a T-shirt and shorts or sweatpants.

Life Satisfaction and Self-Esteem Questionnaires

You will be asked to complete a short questionnaire which is designed to measure satisfaction with your quality of life and self-esteem. The time required to complete the questionnaires should be less than 15 minutes.

Activity Questionnaire

You will be asked to complete a short activity questionnaire five times during the program. It will ask you why you prefer certain activities and what does or does not help you stick to these activities.

Nutritional History and Food Record

Prior to the program, you will be asked to complete a nutritional history. You will also be asked to keep track of your food intake for three days at various times throughout the study.

CONSENT FORM

Development and Evaluation of a Community Based Eating and Exercise Behaviour Change Program to Improve Type II Diabetes Control

I have read the description of the study, understand the measurement procedures involved, and consent to participate in the study.

I also understand that my participation in this study is voluntary and that I may withdraw from it at any time without prejudice.

All information will be kept confidential.

* *

I understand that the research team will be made aware of any data collected during the study on my eating and exercise behaviours as well as my assessment results.

I understand that participation in this research study, is done at my own risk and I hereby release the University of Manitoba, their agents, officers, and employees from any liability, with respect to any damage or injury (including death) that I may suffer during my participation in the research study.

_____ _____

Date Participant

_____

Witness