

**THE DETERMINANTS OF LATE LIFE EXERCISE
IN WOMEN OVER AGE 70**

by

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ABSTRACT

Too many elderly women suffer rapid aging decline, frailty and hypokinetic disease simply because of inadequate levels of physical activity. While the biopsychosocial benefits of regular exercise are now well-known, explanations are lacking for the reluctance of aging Canadian females to take up, or keep up, healthful forms of leisure-time physical activity. The purpose of this study was to examine and explain the variability of participation in health-promoting forms of exercise in elderly women. Several health behavior theories and personal attributes have shown promise in explaining exercise behavior, and thus, a second purpose of the study was to test the utility of a composite theoretical model. The composite model included ten personal and situational attributes as well as five cognitive beliefs about physical activity adapted from Social Cognitive Theory and a belief about personal control over one's health from Health Locus of Control Theory.

A city-wide sample of 327 Vancouver women aged 70 and 98 years filled out survey questionnaires providing information on the 16 model variables in addition to kilocalorie estimates of exercise in the past week. Multiple regression analysis was used to explain late life exercise in three stages: 1) regression on the ten personal and situational attributes; 2) regression on the six cognitive beliefs; and 3) combined regression on all the significant predictors.

From the life situational variables, health, childhood movement confidence, school location, and age were significant factors explaining 18% of the variability seen in current exercise level. From the cognitive variables, current self-efficacy to exercise and current social support to engage in physical activity were the only significant predictors ($R^2 = 22\%$). A full regression model was tested by including the four statistically important situational variables

and the two cognitive variables from the previous analyses. The utility of the Composite Model was supported in that both situational variables and self-referent beliefs played significant and independent roles in explaining late life exercise ($R^2 = 26\%$). The main reasons that older women were physically active were: 1) they perceived high levels of social support to exercise ($b = .239$, $p < .01$); 2) they felt efficacious for fitness-types of activities ($b = .185$, $p < .01$), 3) they had satisfactory health ($b = .174$, $p < .01$), and 4) they were educated in foreign countries ($b = -.125$, $p < .01$). Health locus of control offered some explanation but was not able to demonstrate significance alongside other cognitive beliefs ($b = -.106$, $p < .06$). Education, socioeconomic status, work role, family size, and marital status were not able to explain late life exercise.

This study found that health difficulties do indeed interfere with women's activity patterns. However, women are also influenced by perceptions of declining social support, lower levels of movement confidence, and chronological age, to reduce their physical activity. Thus, regardless of their health situation, the explanation of exercise involvement in older women rests to a large degree on the amount of social encouragement they perceive from family, friends and physicians, their self-efficacy for fitness activity, as well as perceptions of age-appropriate behavior.

Older women who were educated as children outside of Canada, Britain and the U.S. appear to be culturally advantaged for late life physical activity participation. Moreover, childhood movement confidence stands as a significant predictor among the situational variables. These findings suggest that participation in physical activity, and positive beliefs about exercise in late adulthood, are rooted in competencies and experiences acquired in childhood.

Perceptions of inadequate encouragement appear to be limiting females, from childhood on, to develop and sustain confidence in their physical abilities that would promote a more active lifestyle into their oldest life stage.

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DEDICATION

Dad, this is for you. I remember your advice when I was 17 years old. You said, "Why don't you go to University just for one year so you will know what it is like?" Well, here is the outcome of what happened after that one year. Twenty-eight years later, I am in my twelfth year of university studies. And the most important thing that I have learned in all this time is that I will never stop learning.

PROLOGUE

In 1985, I attended Dr. Ernst Jokl's keynote speech at the Physical Activity, Aging and Sport Conference at Westpoint Military Academy. I was intrigued by something he said.

Play bestows and conveys the attitudes of youth. An old person who plays turns young. A young person who cannot play turns old.
Ernst Jokl, 1985.

The importance of physical recreation at all life stages is a concept that many physical educators endorse, but the lifelong significance of physical activity, exercise and sport has as yet to be scientifically determined. Dr. Jokl's speech started me thinking about the role of physical activity in healthy aging.

Shortly after this conference, I began to teach fitness classes to adults aged 50 to 75. Many of the participants were truly unfit, and among the women in particular, were some who could not do even one modified pushup or situp. Others in the group demonstrated excellent physical abilities -- physical fitness and skills which compared favourably to adults 30 to 50 years younger. Within a few months, the unfit were significantly fitter, and the already fit had started taking up new physical challenges, namely, gymnastics!

This was an intriguing phenomenon: elderly women venturing beyond the challenges of maintaining physical fitness, forging new skills in a young girls' sport, and then enjoying their efforts in public performances. There was a visible enthusiasm to test their physical limits and the commitment to training was obvious. Why were these women so eager now to participate in more vigorous physical activity?

The research literature is replete with evidence about the increasing biological, psychological and social heterogeneity that accompanies aging; it seems that human variability is no better demonstrated than in the exercise patterns and physical fitness measures of aging adults, some of whom have become functionally frail while others appear to successfully counter aging declines with high levels of physical activity and sustained physical fitness. Such visible evidence of these different outcomes for people led me to wonder why older people exercise as they do. Which of the many biological, social and psychological forces are operating to create such diverse lifestyles and health outcomes by late life?

The fitness class developed into a performing gymnastics team called the U of Agers. Since May of 1986, the twenty-five women and men on "the team" have been seen live and on national television news broadcasts on a number of occasions. They are the documentary centrepiece of the National Film Board's (1990) "Age is No Barrier." They appear frequently on CBC's "The Best Years" and are solicited to perform at major events across Canada. These older adults have become a remarkable social phenomenon mainly because the Canadian public has so underestimated the physical capabilities and interests of older adults. This social perspective, which finds elderly athleticism incongruous, drives the sociological and psychological aspects of this research.

Never before has society been better able to offer leadership, supportive technology and diverse opportunities for the physical education and recreation of aging adults. While a minority of elderly are ready for, and interested in, physical activity, the majority, do not appear to be interested enough to become participants. Curiosity about what leads to highly active versus highly sedentary living in older adulthood, has brought my research into focus.

I. INTRODUCTION

"Much more information is needed on how the determinants of physical activity change with age, with particular reference to factors influencing the participation of children and of middle-aged and elderly people." (Bouchard, Shephard, Stephens, Sutton & McPherson, 1990, p.10)

Background to the Problem

Differences in the way individuals age have intrigued scientists as well as lay people for years. The contemporary search for perpetual health and immortality has failed to find any "fountain of youth," but we know that people do age with remarkable variation (Nelson & Dannefer, 1992). Probably, the spectrum of aging possibilities are best seen in people's day-to-day lifestyle behaviors and the outcomes of these behaviors over the life-span.

For at least three decades, gerontologists have proposed that there are two ways of growing old: "usual" aging and "successful" aging (Butler, 1988; Dermody, Saxon & Sheer, 1986; Havighurst, 1963; Meusel, 1991; Nowlin, 1985; Palmore, 1979; Rowe & Kahn, 1987). In recent decades, increased longevity has illuminated the problems of "usual" aging, clarified what is normal and abnormal aging, and compelled societies to "rethink how we age" (Prado, 1986). Evidence is rapidly accumulating that regular and moderate forms of physical activity are a resource to adults which foster opportunities for improved survival, life quality and more successful aging (O'Brien & Vertinsky, 1991; Stewart & King, 1991). Although knowledge about how to age better is improving, population disability levels are climbing due to the relative aging and inactivity of the population (Ramlow, Kriska & Laporte, 1987; WHO Health Education Unit, 1986).

Enough scientific support exists to suggest that moderate and frequent exercise may be the "best preventive medicine" for old age. Exercise is being prescribed, first to prevent premature aging (Spirduso, 1986), and second, to prevent premature disease by controlling hypertension, heart disease, bowel and breast cancer, the immune response, osteoporosis, obesity, arthritis, diabetes, insomnia, and depression (see Chapter 3 for a complete review). Exercise scientists are beginning to understand the significant role which exercise can play in controlling aging decline and delaying mortality (Blair, Kohl, III, Paffenbarger, Jr., Clark, Cooper, & Giddons, 1989; Donahue, Abbott, Reed & Yano, 1988; Grand, Grosclaude, Bocquet, Pous, & Albarede, 1990; Kaplan, Seeman, Cohen, Knudsen & Guralnik, 1987; Linsted, Tonstad, & Kuzma, 1991; Rakowski & Mor, 1992).

Physiologists estimate that up to half of what we currently know as usual aging is a phenomenon of disuse (Berger, 1989; Bortz, 1982; DeVries, 1970, 1974; DeVries & Adams, 1972; Shephard, 1989a; Smith, 1981) -- disuse which hurries more women than men toward experiences of hypokinetic disease (Abdellah, 1985; Butler, 1968; Heckler, 1984; Ostrow, 1989; Verbrugge, 1990; Vertinsky, 1991). Government health promotion programs (Don't Take It Easy, 1983; Choosing Wellness, 1988) are conspicuous public health campaigns addressing the issue of unfit aging in Canada - an issue particularly targeting women who appear to have much to gain from increased participation in physical activity.

Dozens of scientifically-controlled exercise interventions, particularly since the 1980's, have provided substantial evidence that elderly individuals can positively affect their mobility, endurance, strength and balance by first, reversing the circulatory and neurological limitations they have acquired through sedentary living (MacRae, 1989; Spirduso, 1986), and second, by elevating their functional capacities to the level of adults decades younger than themselves

(Conger & O'Brien, 1989; Dummer, Clarke, Vaccaro, VanderVelden, Goldfarb & Sockler, 1985; Fiatarone, Marks, Ryan, Meredith, Lipsita, & Evans, 1990). Lee (1991) has reviewed the exercise intervention studies pertaining to middle-aged and older women and concludes that "older women have the potential to benefit from exercise to much the same degree as men" (p. 133).

Furthermore physical activity is known to be more than just a preventive and controlling measure; at certain intensities, sustained human activity is health-promoting and can lead to a "high-level wellness" (Dunn, 1961; Teague, 1987). Exercise elevates function to levels which guarantee more years of independent living (Health & Welfare Canada, 1989). Regular physical activity places controls on aging decline which, in "usual" aging, contributes to physiological losses of about one percent per year in most body systems (deVries, 1979). A consensus is forming that the health of most adults, including the able elderly, can best be promoted with brisk walking at 40 to 75% of one's maximal heart rate ($MHR = 220 - \text{age}$) (Bouchard et al., 1990).

Until recently, however, little attention has been placed on the mechanisms of women's aging and activity patterns. Frail elderly women, especially, have been virtually invisible in feminist, sociological, and gerontological literature (Evers, 1985, p. 86). By many accounts, most women can expect to live to the ripe age of 80 years or better, but are not likely to age very "successfully" (Dulude, 1978; Lewin & Oleson, 1985; Posner, 1980; Quinlan, 1988; Verbrugge, 1990a; 1990b; Verbrugge & Wingard, 1987). As women age, they are said to slow down, and for many, up to 55% of their body mass becomes infiltrated with fat (Young, Blondin, Tensuan & Fryer, 1963). Significant declines in strength, endurance and aerobic fitness are apparent even by middle-age (Alexander, Ready, & Fougere-Mailey, 1985; Cinque, 1990). Rarely are older women found participating

in the more vigorous forms of sport and recreation (Cauley, LaPorte, Black Sandler, Schramm, & Kriska, 1987).

Indeed, among older women, such activity is almost nonexistent except for the 12% who over a four-week period undertake from time to time a walk of two miles or more. (Abrams, 1988, p.32)

Health promoters are concerned, not only about older women, but about much younger females too. Only 24% of Canadian girls aged 15 to 19 could achieve the recommended levels of aerobic fitness on a recent Canada Fitness Survey (Stephens & Craig, 1990). Other research has found that 20% of Canadian children are considered to be obese and that 80 to 85% of those children remain obese as adults. Despite public awareness of the benefits of exercise at every life stage, as yet, females at all ages are less active than their male counterparts (Stephens, Craig & Ferris, 1986), and they are seen to become progressively less active as they get older (Alexander, Ready, & Fougere-Mailey, 1985). By late life, only a small minority are adequately active to benefit their health and well-being (Blair, Brill & Kohl, 1988; Lee, 1991; Stephens & Craig, 1990; Teague & Hunnicutt, 1989). Statistics Canada (1990) reports that only 10% of women over the age of 45 are considered to be "active" compared with one in three males. In the U.S., only 1% of adult women regularly performed more than one vigorous activity (Sallis, Haskell, Wood, Fortmann, Rogers, Blair & Paffenbarger, Jr. (1985).

In the eight extra years that women, on average, outlive their male counterparts, too many of them endure poor mental health (Grau, 1988), over one-third are frail and physically limited (Charette, 1988), and almost one quarter of women over age 65 use sleeping pills (Health & Welfare Canada, 1989). The aging difficulties of women have prompted researchers to examine differences in their lifestyle. Both medical and social professions would probably agree; the

one factor that is most likely to exacerbate the emotional and physical difficulties of very aged women is their inadequate leisure-time exercise -- often a lifelong deficiency of vigorous and strength-promoting physical activity (Biddle & Smith, 1992; Verbrugge, 1990a; Vertinsky, 1991; Work, 1989).

While "doctor's orders" might activate up to 25% of women, almost 60% of older women have said that "nothing would persuade them to increase their physical activity" (Shephard, 1986, p.136). Of interest is the fact that where other health behaviors are concerned, women generally exhibit better life habits than men; physical activity is the *only* positive health behavior that is pursued by men more than women (Stephens, 1985; Stephens & Craig, 1990). While public health campaigns about the risk of heart disease has spurred many men into joining health-promoting exercise programs (Davidson & Sedgewick, 1978), simply raising the issue of heart disease may have frightened aging women away.

If there is a persuasive force to mobilize aging women to more activity, it might be "figure improvement" (Davidson & Sedgewick, 1978) and stress reduction (Duda & Tappe, 1989). "Feeling better" and "looking better" are important reasons why women have been physically active in the past (Canada Fitness Survey, 1983). But this reasoning is problematic. Almost half of Canadian females over age 45 are at risk of health problems due to obesity - a group who could most benefit from increased physical activity but who are at risk by doing so. Those women who are more inclined to be active are already leaner and healthier, and thus, the women who least need to increase activity levels are the most likely to do so (Dishman, 1990; Sallis, Haskell, Wood et al., 1985; Stephens & Craig, 1990). Possibly concerned about their health and safety, women prefer to exercise in groups under expert leadership. About 50% of active women over age 65 say they exercise in public places and are more likely than men to be in supervised

activity settings (Stephens & Craig, 1990). Female propensity for public participation does pose a problem for bigger and older women. Recent research has found that overweight women perceive social disapproval for their body size; unfortunately they also perceive disapproval and experience embarrassment in the exercise setting where they most anticipate rewards for participating (Bain, Wilson, & Chaikland, 1989). Evidently, older women who are active are already somewhat comfortable with their physique in public settings; the heavier women, who most want to look and feel better as they age, are unfortunately less likely to participate in, or adhere to, the kinds of programs which might help them succeed.

But more important than female appearance must be female health. Just as many women will die of heart disease as will men (Statistics Canada, 1986), and yet women's risks have not been a focus of heart health campaigns (Nachitall & Nachitall, 1990). While women's spines and abdomens "take a tremendous beating in pregnancy and childbirth" (Davidson & Sedgewick, 1978, p.27), "older women who perform aerobic exercise for the sake of improved health are generally viewed somewhat suspiciously" (p. 27). Without sufficient exercise, older women exhibit a level of muscle weakness that places them in a category of "functionally disabled" (Branch & Jette, 1981; Work, 1989).

Social scientists have argued convincingly that women have merely learned their social roles well; passive behavior is thought to be the outcome of a lifelong experience of female disempowerment and learned helplessness (Fedorak & Griffin, 1986; Myers & Huddy, 1985; Schulz, 1980; Zinberg & Kaufman, 1963). Others point to women's chronic stress from poverty (Labonte & Penfold, 1981), their commitment to caregiving for others (Robinson, 1988; Thomas, S.P., 1990), and fatigue from "daily hassles" (Mishler, Amarasingham, Hauser, Liem, & Oshers,

1981; Spacapan & Oskamp, 1989). Aging individuals apparently live up to the "self-fulfilling prophecy" of social expectation that labels older people, and women in general, as less physically competent (Kuypers & Bengston, 1973). Evers (1985) proposes that elderly women, more than men, continue to live at home with disabilities because "women are simply expected to be able to put up with limiting disabilities to a greater extent than are men" (p.89).

Indeed it is a paradox that one of the main reasons given in surveys of elderly women for not being more physically active is their declining health and the perception that they are "too old," while at the same time scientific research increasingly demonstrates that one of the certain benefits of physical activity is health improvement. It is a further paradox that, while women have proven more durable than men from a physiological standpoint, they have done so in a culture which has, until recently, encouraged them to take on the characteristics of aging too readily. (Vertinsky, 1991, p.8)

Elderly women, suggest some critics, impose more on the health care system, collect social security benefits and receive government assistance longer than men, and are most at risk of living out their last decade of life with severely diminished capacities (Statistics Canada, 1990 Women in Canada; Wilkins, Murb & Adams, 1983). These phenomena concern government and health care systems (Eriksson, Mellstrom & Svanborg, 1987), especially since older women are the fastest growing segment of the population. The women who reach the age of 90 outnumber their male counterparts by almost 3:1 (Statistics Canada, 1990).

There are, however, examples of remarkably athletic elderly women with limited resources who have not shied away from vigorous involvements with their own serious and sometimes multiple health conditions (Drinkwater, 1988; Dummer, Clarke, Vaccaro, Vandervelden, Goldfarb, & Sockler, 1985; Gandee, Campbell, Knierim et al., 1989; National Film Board, 1990; Ruder, 1989; Starischka & Bohner, 1986; Wilmore, Miller & Pollock, 1974). While some females at all ages

do enjoy a highly active lifestyle, insufficient participation, especially in

vigorous play and sport, is more characteristic of the female life course from adolescence on (Vertinsky, 1992) and serves to highlight the heterogeneity of this social group. This heterogeneity is aptly described by Eric Pfeiffer as follows:

In my considerable contacts with elderly persons, both clinically and socially, I have run into not only the lonely and the despaired and disabled elderly. I have also met some very, very exciting older people. Older people who were intellectually and socially stimulating and exciting, who were physically active and who obviously seemed to have made a successful adaptation to their growing years. Yet as I observed one after another aging person with whom I came in contact, there did seem to emerge a set of common characteristics for all or almost all of these persons. It struck me as though the successfully aging person was someone who somewhere along the way had decided to stay in training. He or she had decided to stay in training physically, intellectually and emotionally, and socially. (Pfeiffer, 1973, p.3)

This holistic view of human aging accounts for physical, intellectual, emotional and social developments and provokes the conception of biopsychosocial models that could better guide research, have clinical utility, and provide more comprehensive understanding (Engel, 1980; Levy, Derogatis, Gallagher & Gatz, 1980). McPherson (1986a) advocates the interdisciplinary approach in aging and sport research:

...there could very well be greater levels of explanation achieved concerning aging phenomena and the elderly if sport scientists from different disciplines were to pool their expertise. Specifically, greater attention needs to be directed to possible interactions among social, psychological, biological and physiological variables. (McPherson, 1986a, p. 8)

Statement of the Problem

Too many older women are at heightened risk of suffering hypokinetic diseases and rapid aging decline simply because they are insufficiently physically active. Yet, the reasons for the deficient physical activity patterns of women in their seventh, eighth and ninth decade of life are virtually

unexplored. The paradox, that those aging women who could best improve their well-being through regular exercise, may often be the least likely to do so, suggests that certain barriers may be operating. These barriers to more active lifestyles need to be identified if women are to age with better life quality, less chronic disease, and full independence. Until the main barriers to older women's physical activity involvement are more clearly identified, social and educational programs cannot be designed with clear objectives for change.

As evidence mounts regarding the significant health-promoting role of exercise in mental, social and physical well-being, social scientists ask, "Why are so few older women taking advantage of the 'best preventive medicine?'" To address this question, some researchers have focussed on people's beliefs about physical activity -- beliefs which are thought to be socially learned and internalized. Other research suggests that people are victims of their circumstances, and that gender, age, health, education and financial means are more likely to be the limiting forces affecting individual lifestyle behavior. Little research has attempted to mesh these two theoretical perspectives into a single study even though both perspectives appear to have merit in the explanation of why some older women are highly active while many more fall far short of adequate physical activity.

This study brings together the most promising explanations of late life exercise for older women by merging the cognitive beliefs of Social Cognitive Theory and Health Locus of Control Theory with ten personal and situational attributes. Guided by a composite theoretical approach, this study aims to capture the most important influences on the physical activity behavior of a community-wide sample of women over age 70.

In particular, I am interested in the answers to these research questions:

1. What are the participation patterns of older women in leisure-time physical activity?
2. To what extent can life situation explain variability in leisure-time physical activity behavior in women over age 70?
3. To what extent can cognitive beliefs explain variability in leisure-time physical activity behavior in women over age 70?
4. Does a composite theoretical model have utility in explaining late life exercise?

Rationale and Significance of the Study

The research presented here explores needed and promising explanations for older women's exercise behavior. This study integrates potentially useful constructs from several theoretical perspectives; altogether there are 16 variables with biological, psychological, sociological, or environmental origins which have been found to predict health behavior and physical activity behavior. McPherson has asserted that:

...future work concerning socialization in a sport context needs to abandon the almost exclusive use of the functionalist perspective and become more theoretically integrated. This does not imply that eclecticism should prevail, but rather that conscious attempts to examine the process from a merged theoretical perspective are needed to advance knowledge... In short, not only is there a need for greater use of microlevel theories but also for the integration and synthesis of theories within sociology and between sociology, psychology, and related disciplines. (McPherson, 1986b, p.116)

To assist in understanding the barriers to more active lifestyles, the Health Promotion Survey (Charette, 1988) and the recent Campbell's Survey (Stephens & Craig, 1990) provide substantial information on the physical activity of Canadian adults of all ages. ~~These government-funded studies have assessed~~
activity behavior in representative populations and have begun to identify

various situational and psychological barriers to exercise by age and gender groupings. But to date, little is known about the relative importance of these barriers in explaining exercise behavior. More importantly, much of the research has searched for explanation without the guidance of human behavior theory. When behavioral theories have been used to predict exercise, they are often partially applied using only one or two key constructs. Moreover, current behavioral theories do not account for past situations and former attributes which may be important to the explanation of older adult behavior. Behavioral theories have tended to focus on the prospective perceptions, attitudes, and beliefs of adults, (all of which are considered to be alterable), with little regard for their social settings and personal circumstances which may make behavior modification difficult. Thus there is inadequate information about the relative influence of social and environmental factors *versus* individual beliefs in explaining late life exercise. Yet identifying the main biopsychosocial *determinants*¹ of active lifestyles and their relative significance and interactions would assist a range of professionals and agencies on how best to help older women age more successfully.

This study will enrich Canadian data concerning the epidemiology of women's exercise patterns in old age - information that may assist physical educators and health practitioners in promoting the physical abilities and interests of older women. The specific nature and scope of the physical activity patterns of Canadian women over age 70 is poorly understood and data are lacking on the particular activities in which older women are engaged. As well, normative data are lacking on the amount of energy expended on weekly exercise by older women.

¹ The term determinant is used according to the definition of Dishman (1990), that is to denote a reproducible association or predictive relationship other than cause and effect.

The development of the Older Adult Exercise Status Inventory for the purpose of this study will provide a potential solution to the problem of assessing the weekly participation of the elderly in exercise pursuits. The inventory, based upon a seven-day recall design in combination with the Canada Fitness Survey form, was designed specifically for older adult activity assessment. This kind of inventory is considered to be "a pragmatic approach for large populations for which direct observation or objective monitoring cannot be implemented" (Dishman, 1990, p.94). The inventory is easy to use, yet it generates a great deal of information about the frequency, intensity, duration and specific type of activities engaged in by older adults. The instrument has demonstrated reliability, concurrent validity with two contemporary field instruments and is built upon instruments that have demonstrated criterion validity.

While much health promotion literature is aimed at finding ways to increase the physical well-being of the elderly, the age cohort of women under study (age 70 and older) has largely been neglected in previous research in terms of understanding the factors related to lifelong vigor and exercise participation. This study examines women, rather than men, because of their unique and often limited experiences with vigorous forms of physical activity, because of their relatively poor participation rate in late-life physical activity, and the fact that women are long-living, more chronically ill, and under-researched.

Unique to this study is the self-assessment of the perceived risks and perceived benefits of six different fitness-related activities. In addition to Likert rating scales, subjects were asked open-ended questions about what they perceived to be the benefits and risks of six specific exercises commonly found in adult fitness classes. These data appear to be the first of their kind to

elicit responses from older women about their fears and hopes about the expected outcomes of participating in a contemporary exercise setting.

This study initiates an important line of enquiry exploring the life situations and personal factors which lead to movement confidence and the perceived ability to be physically involved at different life stages. Recent work in the epidemiology of exercise participation stresses the importance of a life course perspective in forming and maintaining health promoting behavioral patterns - patterns which have the potential to be socially and environmentally influenced positively or negatively at any point in life span. The present research takes a retrospective and prospective look at female involvement in vigorous physical activity at two life stages: memories from girlhood in the early years of the 20th Century, and at late adulthood in recent years.

If it can be confirmed that participation in school or organized sports as a youth leads to a more physically active adulthood, then appropriate changes in policy should be vigorously pursued. At the moment, however, we have little hard data with which to support such recommendations. (Powell & Dysinger, 1987, p.281)

To date, little research has been done to begin to understand the past and present factors which would explain the reluctance of females, from girlhood on, to take up, or keep up, healthful levels of physical recreation, sport and play.

This study will begin to explore, in retrospective fashion, possible childhood sources of physical competency for activity in later life. This study is unique for its inclusion of several historical-situational variables: childhood social support, childhood movement confidence for six physically challenging skills, and country of main schooling as a child. The merging of current exercise behaviors and beliefs with perceptions of childhood opportunity and capability for skilled physical activity, promises to generate new

understandings about the attitudes and experiences of elderly women toward exercise and how these may be a lifelong consequence of previous experience.

The study will provide information that can inform policies concerned with public health and physical education for the elderly. Policy makers and health promoters, however, need specific information on the enabling elements of society that influence whether late life will be vigorously active or relatively sedentary. Physical educators can better design and instruct exercise programs if the attitudes and perceptions of the elderly toward fitness activities are known.

Vancouver, with its mild winter climate, provides a particularly appropriate arena for this kind of study. The city is one of the "retirement" headquarters of Canada, and Western Canadians are known to be more active than other Canadians (Stephens, 1988). Therefore the women in this study are thought to be found in the "best of environments" for regular physical activity.

Definition of Key Terms

The following definitions will assist the reader in the interpretation of the theoretical framework and for the review of literature.

Efficacy Expectation is the conviction that one can successfully execute the behavior required to produce desired outcomes (Bandura, 1977a,b). Efficacy refers to personal judgements of how well one can organize and implement patterns of behavior in situations that may contain novel, unpredictable, and stressful elements (Bandura & Schunk, 1981). Perceived efficacy can affect one's choice of activities and activity environments. Persons who continue to shun activities

out of self-doubts preclude opportunities for skill development and thereby remain inefficacious (Schunk & Carbonari, 1984).

Exercise is a subset of physical activity that is planned, structured, repetitive and has as an objective the improvement or maintenance of physical fitness (Caspersen, Powell & Christenson, 1985). Although "exercise" is used interchangeably with "physical activity," researchers recognize that "it has characteristics that separate it from many other physical activities" (Powell & Paffenbarger, 1985, p.118).

Health is "a human condition with physical, social, and psychological dimensions, each characterized on a continuum with positive and negative poles. Positive health is associated with a capacity to enjoy life and to withstand challenges; health is not merely the absence of disease. Negative health is associated with morbidity and, in the extreme, with mortality" (Bouchard, Shephard, Stephens, Sutton & McPherson, 1990, p.6).

Health Incentive (Motive) is defined as the behavioral incentive, instrumental value, or motivation to participate in health promoting behavior. In terms of older adult exercise participation, motivation to live a long and healthy life was the incentive considered in this study.

Health Locus of Control is defined as one's perceived control over one's health. An external locus of control describes perceptions that a health event is due to chance or the actions of powerful others. Internal locus of control refers to perceptions that a health event is due to one's own personal actions (Kist-Kline

& Lipnickey, 1989; Wallston, Wallston, Kaplan & Maides, 1976; Wallston, Wallston & DeVellis, 1978).

Health Benefits are defined as the degree of perceived advantage or positive health outcomes from participation in physical fitness activity.

Health Risks are defined as the degree of perceived personal harm or negative health outcomes from participation in physical fitness activity.

Movement Confidence is a combination of personal efficacy and personal experience which represent a person's perception of assurance of success in physical activity and performance settings.

Outcome Expectation (Perceived Risk or Benefit) is defined as a person's estimate that a given behavior will lead to certain outcomes (Bandura, 1977a,b). The expected outcomes of exercise participation may be viewed as positive or negative (beneficial or harmful) to health and well-being.

Physical Activity is defined as any bodily movement produced by skeletal muscles which results in energy expenditure. The energy expenditure can be measured in kilocalories (Caspersen, Powell & Christenson, 1985).

Physical Competence describes the perceived mastery of complex motor skills in a particular movement situation as judged by an external authority. Such mastery may require a certain amount of physical fitness, but in addition, skilled

movement may require precision, strength, balance and coordination which requires substantial learning and practice.

Physical Fitness is a set of functional attributes that are health- and/or skill-related which can be measured with specific performance tests (Caspersen et al., 1985). Tests of fitness aim to measure physiological attributes (such as muscular strength, muscular power, cardiovascular endurance or flexibility).

Physical Fitness Activity refers to self-regulated participation in fitness-enhancing exercise activities such as sport, dance, vigorous walking, home or community exercise programs. Optimal benefits are thought to be achieved with regular sweat-inducing participation at least three times per week, and the activity must have the potential to contribute in some way to development or maintenance of aerobic fitness, joint mobility, muscle strength and endurance, posture or balance. For the purposes of this study, housework was not considered in this definition.

Physical Efficacy is the strength of an individual's perceived self-confidence or belief that she or he can successfully complete a physical task through the expression of movement ability (Brody, Hatfield & Spalding, 1988, p.32). See also "self-efficacy to exercise" and "physical competence".

Self-efficacy to Exercise refers to the strength of an individual's perceived self-confidence or belief that one can successfully complete a task through the expression of physical ability (Bandura, 1977a). In some of the literature, ~~physical ability is referred to as "physical competence" although a distinction~~

should be made that competence in physical situations is often judged by others and is not necessarily a personal judgement. For the purpose of this study self-efficacy to exercise is considered to be a reflection of self-perceived performance ability. Self-efficacy to exercise is potentially mediated by actual performance knowledge and the known judgements of others.

Social Support refers to the endorsement, approval, advocacy or encouragement by significant others of an individual's behavior (in physical activity).

Delimitations

The study is limited to women born in 1921 or earlier (presently age 70 or older) who are currently attending community programs in Central Vancouver or who reside within its proximity. The sample is all female, predominantly Caucasian, Canadian educated and middle class.

Limitations

Following the example of other prominent studies, the present research was limited to a seven-day recall assessment of leisure-time physical activity, exercise, and sport. Thus the domestic physical activities of women have been omitted from this study. The significant role which physical work in the home may add to the overall physical activity patterns of women was considered at the outset of the study. However, a conscious decision was made that the study would focus on voluntary exercise normally found in leisure time. Thus gardening, but not other domestic work was admitted to the activities assessed in this survey. The reader could argue that women's domestic work is often conducted in their ~~leisure-time, and may be considered to be voluntary and enjoyable. In~~

retrospect, I may have erred in assuming that most women view domestic labour to be a work experience, devoid of choice and pleasure.

A further limitation exists with the weekly assessment of energy expended on leisure-time or voluntary activity. Adults are known to overestimate their activity levels in self-report situations. Furthermore, the assessment is only an *estimate* of energy expended on exercise. While the assessment is detailed, the actual calculation of kilocalories is based on approximated MET units for each particular activity reported.

A critic of this research would probably take issue with the retrospective data collected on childhood efficacy and childhood social support. These were "recall" measures and thus are vulnerable to memory loss and altered perceptions over the years. However, these measures have demonstrated satisfactory reliability in a pilot study, and although validity is not guaranteed, the *perceptions* of early efficacy and support are really what matter in providing the foundation for the attitudes and beliefs of older women toward exercise. Validity for the childhood recall measures was, however, found in this study as discussed in Chapter 6.

Geographic community sampling improved the prospects of reaching older women who would be representative of all segments of society. However, non-random sampling is susceptible to selection bias. Less represented in this study were older women who were house-bound as caregivers, or at home with their own physical limitations. Although senior's lodges and residences were represented in the sample, women in institutional settings or hospitals were not accessible to this study.

Volunteer subjects who fill out exacting surveys are, in many ways, ~~exceptional individuals. They are more likely to be highly educated, at least~~

middle class, in good health and highly mobile. Furthermore, the oldest women in this study represent the survivors of their generation - by longevity alone they have outlived most of their birth cohort, and thus may represent an array of exceptional qualities attributable to genetics, biological resilience, positive coping strategies and other skills for adaptation. Therefore the results of the study can only be generalized to mobile elderly women of metropolitan centers with similar ages and social context.

Organization of the Remaining Chapters

The review of literature following next in Chapter 2 presents the key constructs of the main theories which guide the explanation of human behavior and surveys the literature with regard to their application to the explanation of physical activity. From the review of literature, the theoretical model guiding this study is drawn. The theoretical framework integrates key constructs of previous research into a Composite Model and thus a separate chapter is justified and follows immediately in Chapter 3. Chapter 4 explains the methodological design of the study from data collection to statistical analyses. Chapter 5 reports on the descriptive results of the study and provides the outcomes of the regression analyses. Chapter 6 includes a summary and discussion of the findings, identifies policy implications and discusses unanswered questions. The references are displayed in alphabetical order in Chapter 7 followed by appended materials as described below.

Appendix A contains the survey questionnaire; Appendix B contains the approval forms of the Ethics Committee of the University of British Columbia; Appendix C holds the form used to obtain agency approval, and also instructions ~~to the university students for oral administration of the questionnaire.~~

Voluntary letters from subjects who offered interesting comments and points of view are found in Appendix D. Appendix E contains post-hoc analyses conducted on the subjects who provided missing data. The residual error of the final regression equation is plotted and discussed in Appendix F. Finally, Appendix G contains a critical review of literature pertaining to the reliability and validity of the outcome variable, "exercise in the past week".

II. REVIEW OF THE LITERATURE

Introduction

The multidisciplinary nature of this study, as well as the number of variables involved, demands parsimonious selection and careful organization of the relevant research literature. Over 2000 articles were reviewed in the initial planning of this study. Dozens of research papers were found on many of the independent variables; despite this, few studies were found which specifically related to the explanation of exercise behavior of aging adults, namely older women. Therefore this chapter will focus on the literature most pertinent to the study at hand, namely that which is known about the theoretical variables driving the study and their known relationships to the dependent variable, weekly exercise in late life.

The chapter begins with a brief overview of the problems facing today's elderly women -- problems which are considered to be outcomes of their past socialization and experiences as younger females. Because of studies which indicate that early activity habits may be maintained throughout the life course, the review explores historical perspectives and the activity socialization of females born before 1921. Next, their contemporary characteristics are presented in the form of a demographic profile of women born before 1921. In this section the following topics are addressed: size of the aging population, marital status, family size and socioeconomic status, education, ethnicity, health status, and institutionalization rates. The profile sets the stage for understanding the women involved in this research by highlighting the significant contextual features of their generation.

Next comes a review of the literature about the known exercise and physical activity patterns of older women. Recent findings confirm that in the past ten years, activity patterns of Canadians have actually decreased slightly, and the majority of older adults are still insufficiently active. At the same time, the enormous benefits of exercise have become known, and enough evidence has accumulated to know that the risks of participating in late life exercise are very minimal. A thorough review of the known benefits and risks of exercise participation are discussed in this chapter. Thus the logical conclusion is that significant barriers must be operating which thwart the involvement of older women in health-promoting physical activity.

To examine these barriers, the second half of the chapter turns to theoretical explanations for understanding the determinants of late life exercise in women. Two theoretical perspectives which are used to generally guide health behavior research are introduced: 1) social epidemiology and socialization which focus upon the personal characteristics and environmental situation of the individual; and 2) cognitive beliefs of an individual representing a psychobehavioral perspective. The chapter introduces the Health Belief Model, Health Locus of Control Theory, the Theory of Reasoned Action, and finally Social Cognitive Theory. The cognitive determinants of exercise are well-articulated in Social Cognitive Theory, and the research literature related to the self-efficacy construct is strong. The chapter concludes with a focus on the relationship of exercise and the main constructs of Bandura's Social Cognitive Theory: Incentive, Self-Efficacy, Environmental Cues (social support), and Outcome Expectations.

The Poor Aging of Women

Aging for women is, in many ways, a "survival of the unfittest" (Isaacs, Livingstone & Neville, 1972) because a female's extra life span is usually accompanied by significantly high levels of reported illness (Verbrugge, 1987). Simply too many women are encountering early onset of preventable chronic diseases. Part of the explanation is that women may be more attentive to their symptoms of ill health, may perceive that society accepts, if not expects, them to report health problems, and may find it easier to visit doctors due to flexible work patterns (Waldron, 1982).

Others blame the health difficulties of women on their more passive lifestyle - a lifestyle reinforced, in North America, at least, by public policy which limits their participation in health promoting physical activities over much of the life span (Boutilier & SanGiovanni, 1983). The social sanctions imposed on women in sport contexts, for example, have been likened to the marginal social status of the disabled whereby both have been viewed as helpless and are reinforced by society to compound this helplessness (Mastro, Hall & Canabal, 1988). The penalties of lifelong inactivity are ultimately seen in frailty, depression and inability to carry out the simple activities of daily living - factors which guarantee institutionalization for almost half of all women over the age of 85 (Fletcher & Stone, 1982; Gee & Kimball, 1987).

In the following section, historical perspectives are presented about the socialization of women born before 1921. The limited socialization of females into vigorous forms of physical activity in the first half of the 20th Century helps to explain why their aging is often accompanied by sedentary lifestyles and health difficulties.

The Activity Socialization of Females Born Before 1921

The social incentives and rewards for participating in vigorous exercise and sport have historically been lacking for girls and women (Csizma, Wittig, & Schurr, 1988; Greendorfer, 1983). The 1909 Board of Education's Syllabus of Physical Exercises for the Public Elementary Schools portrays females demonstrating a number of static postures in the gym. In the same syllabus, boys are depicted climbing ropes, and in more dynamic situations showing movement and strength (Board of Education, 1909). Adding to this lack of curricular support for girls to be as active as boys have been medical notions of female fragility (Vertinsky, 1988), social devaluation and invisibility (Gee & Kimball, 1987).

Sport socialization research describes a clear picture of the gender constraints on turn-of-the-century, middle-class females undertaking the more vigorous forms of exercise (Lucas & Smith, 1978; Morrow, Keyes, Simpson, Cosentino & Lappage, 1989; Verbrugge, 1990a). One conspicuous limitation was the heavy, multi-layered and cumbersome attire worn by females of all ages which placed women in greater danger than any physical exertion (Bolotin, 1987, 1980; Heisch, 1988; McCrone, 1988). The corset, for example, was not only uncomfortable, it deformed the ribs, and caused abdominal organs to be permanently displaced. The wasp-waist corset bound the lower rib-cage so tightly and restricted breathing so seriously that women easily fainted. Judged by their clothing, women of this generation were indeed physically limited and helpless.

As significant as fashion in dictating the physical abilities and activities of girls and women was their socialization into a particular feminine role -- that of mother and caregiver for her family (McPherson, Curtis, & Loy, 1989). Childbearing was extremely important -- a fact which allowed medical authority

to have a crucial role to play in prescribing appropriate behaviors and activities for females. Early adolescence was the focus of most medical concern, for this was the stage of maximum female growth for sexual maturation. Doctors believed that all physical energies had to be conserved for the critical development of reproductive maturity (Vertinsky, 1990). The complex physiology of women seemed to overtax the understanding of an all-male medical profession; physicians many times prescribed even more passive behavior for females who were having physical or psychological difficulties with their lifestyles.

Males, at all ages, were universally judged to be better physical specimens than females - a phenomenon that seems to have been rooted in their more physically aggressive play patterns in childhood. Tolerance for aggressive behavior, even fighting, was the social context for boys and men, while the labelling of active girls as "tomboys" and "bicycle faces" (Heisch, 1988) was probably only a small part of the larger socio-environmental forces limiting the physical opportunities of females (Dishman & Dunn, 1988; Espenshade, 1969; Gilman, 1911). Tomboy style of play was considered by many to be rude and vulgar (Guttman, 1988). Once into the mothering role, a woman would have scant time and energy to take on sportive or other recreative activity outside the context of her family (Gee, 1987, 1986a, 1986b).

Clearly deterrents to be as strong, as fast and as physically able as the average male were operating in the early twentieth century and undermined many young female's motivations to be physically competent and able-bodied in strenuous undertakings. The negative reactions of the female body and mental health to this narrow social role were explained at the time as further evidence of the inferiority of women. For those women who did ignore society's expectations, competencies were acquired in skilled activities which no doubt

enhanced their physical well-being, but which may have taken a psychological toll on their status as they stepped outside of conventional female roles.

There are some historical accounts and women still alive to tell us that, by necessity or choice, they did not adopt the passive role that society expected of them. While middle and upper class women were socially constrained, there were many working women who had to labor intensively in order to survive. Photographic evidence exists that show many immigrant women acting as "horse-teams" on the prairies, pulling ploughs when oxen were not available (Bolotin, 1987), while others combed the fields, literally on their hands and knees, at harvest time. Thousands of rural women, mostly immigrants, did intense and difficult work carving out a pioneer existence and building homesteads in western North America. The physical challenge and skill of horse-back riding and ranching cattle were also part of the lifestyle for many of these women.

Just over one hundred years ago, young women were admonished for their reckless attempts to learn how to ride bicycles (Lucas & Smith, 1978). By the mid-1890's, a number of city women were riding bicycles for transportation and pleasure (Harmond, 1984). Some women found physical challenge in permissible forms of dance such as ballet training and tap dancing. Social types of dance were highly popular with both men and women and "marathon" dancing was in vogue. Others developed interest in tennis (Danzig, 1928; Heathcote, 1894), swimming, (Shea, 1986), golf (Nickerson, 1987), basketball (Smith, 1984), and figure skating (Cruikshank, 1921).

In the early decades of the twentieth century, the more wealthy women were beginning to experience the sport club scene in golf and tennis. While middle-class women were still being socialized into more passive roles than males, at times, necessity required that working class women contribute resilience,

endurance and sweat alongside the physical labour of men. This dialectic between the roles of women according to their social class is perhaps part of cultural answer in explaining the heterogeneity in physical activity which accompanies women's aging.

In the next two sections, I present information which describes the present life quality and lifestyle status of today's elderly women. First, a demographic profile touches on the size of the aging female population, followed by a brief examination of their cohort features such as socioeconomic status, marital status, family size, education, ethnicity, health status, and rates of institutionalization. Second, the participation patterns of elderly women in physical activity, exercise and sport are presented. These two sections summarize the *life situation* of older women as it is known for the pre-1921 cohort.

A Demographic Profile of Women Born Before 1921

Each generation is accompanied by contextual features which help to make that cohort unique. Reviewing these contextual features may help to set the stage for understanding the physical activity and sport patterns of today's older women in Western Canada. Although one's life circumstances do not remain stable over the lifespan, one's short-term situation is often uncontrollable and irreversible from an individual viewpoint. Thus, the prospects for rapidly improving women's quality of aging by knowing how past and present circumstances create barriers or opportunities for exercise involvement may be limited.

Size of the Aging Population

Over 1.25 million Canadian women are over the age of 65, and of these, 13% reside in British Columbia. In the 1986 Census, 12.1% of the total population of B.C. was over the age of 65 (Sources, 1991) and 5% were over the age of 75. The Vancouver Metropolitan Area Population Forecast, 1986 - 2011 (1988) predicted that in 1991, 1.5 million people of all ages would reside in Central Metropolitan Vancouver, and of these, 11.5% would be over the age of 70. Almost 6,000 individuals were estimated to be over the age of 90!

Canadian women over the age of 65 began to outnumber men in 1961 (Stone & Fletcher, 1980). In Vancouver, there are proportionally more older women in the 65+ population than is found in B.C. or in Canada as an average. Women over the age of 65 in Vancouver now represent about 60% of the total seniors population (Table 2.0). By age 85, women outnumber their male peers by 2:1 and by age 90, by almost 3:1 (Statistics Canada, 1984).

The City of Vancouver is home to approximately 28,000 women over the age of 70, or about 1.5% of the general population (City of Vancouver, 1986 Census). The 327 women involved in this study represent over 1% of these 28,000 women.

Table 2.0

Demographic Structure of Elderly Women

VARIABLE		CANADA ²	BRITISH COLUMBIA ³	VANCOUVER ⁴
65+ FEMALE POPULATION		1,269,440	166,340	98370
65+ MALE POPULATION		1,010,850	131,830	68480
% FEMALE OF 65+ POP.		55.7%	55.8%	59.0%
MARITAL STATUS	Married	41.4%	34.5%	39.0%
	Widowed	50.5%	57.1%	48.4%
	Single	7.2%	6.4%	6.0%
	Divorced	1.1%	2.1%	4.3%
EMPLOYMENT		6.0% (1981) 4.6% (1985)	5.4%	4.9%
EDUCATION	< Grade 9	41.7%	36.6%	31.0%
	Gd. 9 to 12	48.3%	38.6%	41.4%
	Post-Second.		22.0%	23.7%
	Univ. Deg.		2.9%	3.8%
ETHNIC STATUS	British		50%	63.7%
	German		7.9%	8%
	Scandinav.		4.7%	
	Chinese		2.9%	12%
	Other		20.8%	24%
SELF-RATED HEALTH	Excellent ⁵	20%		
	Good	42%		
	Fair	30%		
	Poor	8%		

² Profiles Part II. (1988). Census Tracts. Ottawa: Ministry of Supply & Services. Also data came from a special run on Census data from Statistics Canada.

³ Seniors' Resources and Research Society of B.C. (1991). Profile of seniors in British Columbia. Sources, #503 - 1185 West Georgia St., Vancouver, B.C., V6E 4E6. Also: Ministry of Health. (1988). Disease Surveillance, 9(8), 188-218.

⁴ Profiles - Vancouver Part 2 (1988). Census Tracts. City of Vancouver (1986). Ottawa: Minister of Supply & Services.

⁵ Statistics Canada. (1987). Health and Social Support, 1985. Ottawa: Minister of Supply & Services Canada.

Marital Status, Family Size and Socioeconomic Status

Census data indicate that in Vancouver, about two-thirds of women over age 65 are widowed, single or divorced (Table 2.0). After age 85, four out of five Canadian women are widowed (Statistics Canada, The Elderly in Canada, 1984). Statistics Canada reports in Women in Canada (1990) that the most significant group of persons living alone is that composed of females aged 65 and over. Thus by late life, the majority of Canadian women are without partners and many are without pensions: a predicament with serious economic implications for quality of life and life choices.

The statistics on the financial status of older women are shocking. The traditional social roles of women have meant that marriage has usually provided a woman a degree of financial security, at least while her spouse was alive. But being widowed, living alone, and living with minimal finances are predictable outcomes for the majority of aging women. In Canada, 60% of women over age 65 are regarded as poor, and 80% of these women are widows. The National Advisory Council on Aging reports that some 43% of seniors received the Guaranteed Income Supplement in 1990, meaning that almost half of Canada's seniors have only a marginal monthly income. Housing represents 29% of the expenses of female seniors compared to 16% of the expenses of the total population (NACA Precis No. 1, 1991). In B.C., 56% of female seniors live in detached family homes while another 33% live in their own apartments. Even when mortgages have been paid off, property taxes and house repairs can be a major financial burden to an older woman living on her own.

Even those women who had procured satisfactory employment in their younger years, had often earned the lower wages of women throughout the 20th Century, ~~meaning that poverty often accompanies their aging. More than 20% of Canada's~~

poor are senior citizens who are living on fixed incomes. Yet despite such limited finances, less than five percent of women over age 65 report any current employment income (Statistics Canada, 1986).

In 1981, the average income of B.C. females aged 65 to 69 was \$8,478 while that for same-age males was \$16,802 (Sources, 1991). In 1988, the average annual income of families headed by a person aged 65 and older was \$37,462, but only \$16,316 for singles aged 65 and over (National Advisory Council on Aging, 1991). In 1986, more than one-third of senior's incomes came from Old Age Security and the Guaranteed Income Supplement.

The high poverty rates among older females, no doubt, have some degree of impact on the health and activity behaviors of those affected. Limited financial resources place extra stress on the older woman, and ultimately limits her solutions to health problems that accompany aging. Seniors in the upper-middle income category are more than twice as likely (59%) to rate their health as excellent as those in the very poor category (28%) (Sources, 1991).

Family size may have contributed to the financial and health burden of women. Older women tended to raise larger families than women do today. In 1920 to 1924, the U.S. Bureau of the Census reported there were 2,701 children for every 1,000 ever-married women. Although many North American women at the turn of the century remained single and up to 20% of all women were childless (U.S. Bureau of the Census (1975), between 1910 to 1920, 11 to 16% of all women aged 15 to 44 years gave birth in any single year.

Education

The Canada Fitness Survey states that "by most definitions of active leisure, there is a direct relationship between amount of education and the probability of being active" (Stephens & Craig, 1988, p.4).

Recognition of a relationship between education and economic development and of the subsequent improvement of personal and social life, thus provides a further economic argument for a radical change in the organization of education, since education, economic development and improved quality of life are intimately connected. (Cropley, 1977, p.25)

Lack of education in Canada is significantly related to poorer health, physical limitations and less happiness. Canadian data reports that about 50% of adults over the age of 70 had less than Grade 9 education while less than 5% received a University degree (Statistics Canada, The Elderly in Canada, 1984). In the 65 and over age group, 34% of those with only an elementary education report fair to poor health, compared to 7% of those with post-secondary education (Health & Welfare, Canada, 1989).

According to the 1981 Census, 61.4% of B.C.'s seniors reported completing nine or more years of schooling. This figure is increasing over time (from 50% in 1971) and may have positive implications for the future educational programs seniors will attend. People in B.C. who have less than secondary education are less likely to have plans to improve their health than those with higher education.

In Vancouver, over 25% of the women in the age-group studied have post-secondary education and almost 4% have university degrees. But having higher education doesn't guarantee women the same financial status as males. For example, Canadian women aged 65 to 74 with University degrees had an average annual income of \$14,500, half that of the same-age and qualified male income of

\$27,900. Women with some university education had an annual income at the same level as males who had less than Grade 9 (about \$9000).

This data suggests that education may not be a good substitute variable for socioeconomic status of women. Rather education may be important to examine as lending skills for information seeking about health knowledge, as well as extending opportunities to female students to participate in active recreation and sport further into their adult years.

Ethnicity

In Canada, the predominant ethnic groups among the elderly are of British descent, who make up half of the elderly population, and those of French descent, who account for 25%. These ethnic features reflect Canada's demographic trends over many decades in the past, when birth rates among the French were higher than those of the total population and when immigration of British persons was particularly high. Almost 17% of the Jewish population in Canada are over the age of 65 while the Native peoples over the age of 65 account for less than 4% of their total population (Statistics Canada, 1984).

In British Columbia, 64% of the elderly are of British descent with other ethnic groups represented in quite small proportions (<5% each). In Vancouver, English is the mother tongue for 66% of citizens, while French is represented by 1.6%. Almost one third of Vancouver residents speak a non-official language. Chinese is the most prominent non-official language, and is spoken by 43% of the non-official group (Burrard Health Unit, 1990).

Health Status

General population health practices in Western Canada are considered to be slightly better than in the rest of the country. The B.C. Ministry of Health (1988) reports that B.C. is third behind the Yukon and Alberta for reporting regular exercise (66%, 63% and 61% respectively). Obesity (BMI = 28.6 in women) applied to 14% of B.C. women and 16% of B.C. men. Twenty-one percent of the women were underweight while only six percent of the men were underweight.

As with other Canadian provinces, about 90% of British Columbians of all ages perceived their health to be good, very good, or excellent. However, people of low socio-economic level and the elderly were two groups less likely to report good health. Not only was health poorer in these groups but plans to improve health were less common (B.C. Ministry of Health, 1988). While the average person visited a physician five times a year, persons between 65 and 74 make 7.4 visits, and those over 75 make 8.2 visits (Schick, 1982). Functional problems rise after the age of 80 and this is the point where need for support systems greatly increase (Stone & Frenken, 1988).

The Health and Activity Limitation Survey (Statistics Canada, 1988) uses the World Health Organization's definition of disability, which is

"...any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being." (Statistics Canada, 1988).

In this survey, disabled persons were defined as those who indicated some difficulty in performing any of the 17 activities, such as "Do you have any trouble walking up and down stairs?" or "Are you limited in the kind or amount of activity you can do because of a long-term emotional, psychological or mental health condition?" Older Canadians rate their health quite positively ~~considering that about 30% of them have activity limitations, and 6% of these~~

limitations are considered to be severe (Health & Welfare, Canada, 1989). In 1987, there were 494,340 disabled males over the age of 65 compared to 727,655 disabled older women in Canada (Statistics Canada, 1988).

Older women also rate their health less positively than men. Only 17% of women over age 65 rate their health as excellent compared to 24% of men; 29% of older women rate their health as poor compared to 24% of men; 37% of women report activity limitations compared to 31% of men; 32% of older women say life is fairly or very stressful compared to 27% of men; 9% of older women say they are not too happy compared to 6% of men (Health & Welfare, Canada, 1989).

Institutionalization

The proportion of Canadian seniors over age 85 who are residents of institutions has risen since 1976 from 36.5% to 40.5% for women and 25.2 to 28.4% for men (Government of Canada, 1988). Below the age of 85, however, the number of institutionalized adults is declining slightly, and at age 70 to 74, only 3.2% of women and 2.9% of men are living in institutions. About 55% of people confined to nursing homes suffer from chronic mental conditions or senility (Schick, 1986).

In British Columbia, 56% of seniors live in houses, 33% live in apartments and 8% of the senior population live in nursing homes, old age homes or chronic care institutions (Sources, 1991). In the age group 75 to 84, the proportion of institutionalized elderly increases to 21% and then becomes as much as 55% of all those over age 85. These numbers will likely continue for some years to come.

In the U.S., women comprise 75% of all nursing home residents aged 65 and over (United Nations Office at Vienna, 1990) and yet families are still the ~~largest resource for the long-term care of older relatives. Perceptions exist~~

that the majority of informal caregivers are women, and many appear to be mid-life women who are caring for older women. Meta-analysis recently conducted on gender differences in caregiving contradicts this finding (Miller & Cafasso, 1992), but in the majority of studies documented, most caregivers were women with female children claiming caregiver roles in 79% of the cases (Miller, 1990).

The family unit as a caregiving resource for the elderly appears to be in jeopardy. In Canada, Fletcher and Stone (1982) claim that the increasing incidence of childlessness or one-child families, the increasing rate of divorce, the high rate of mobility among young adults and recent increases in the labour force participation of women, all point to the probability that an elderly person in the future will have less access for family support than present and previous generations of older persons. This means that more older adults need to be maintaining their strength and mobility in order to live out their remaining years with dignity and independence.

Elderly Women's Exercise Patterns

Known exercise patterns of older women

In reviewing the literature on the known activity patterns of older women, there are inconsistent findings. Part of the confusion arises because there are different methods used to quantify physical activity and there have been dynamic shifts in participation trends over a period of a few years.

While activity levels seem to be generally on the rise since 1981, Stephens (1988) warns that many adult Canadians are unaware of how much exercise is adequate. Most epidemiological literature supports an age-related decline in participation, with women exhibiting less activity and less physical fitness at

every age group (Alexander, Ready, & Fougere-Mailey, 1985). While post-adolescent girls demonstrate a greater decline in fitness than at any other time, the next most critical period in terms of physical fitness decline is considered to be age 40 to 49 (Alexander et al., 1985).

Over 1200 women across six Canadian regions were interviewed in the 1985 General Social Survey where active physical exercise was defined as "exercise which made one perspire or breathe more heavily than normal" (General Social Survey, 1987, p. 59). From this survey, it was estimated that only 27% of the adult Canadian population over the age of 15 were active enough to anticipate health benefits which may include additional years of life. The survey notes that physical activity declines sharply after age 24, and again after age 44. In addition, among adults over age 65, almost 40% are identified as sedentary. Only 14% of the 65 and over women in this survey were in the "active" category, and 36% were in the "sedentary" category.

The report Changing times: Women and physical activity (Fitness and Amateur Sport: Women's Program, 1984) stated that 53% of Canadian females over age 60 were active in their leisure time (an average of at least three hours per week over nine months of the year). Next, 21% of the women were moderately active while 24% were sedentary. Only 39% of the women studied achieved the recommended level of cardiovascular fitness. Therefore, the agency concluded that "women need to increase the intensity of their participation" (p.2). But the report Women in Canada: A Statistical Report (1990) using data from the 1985 General Social Survey conducted a few years earlier, classified only 6.3% of Canadian women over age 65 as "active".

The Campbell's Survey on the well-being of Canadians reports that 50% of men and 30% of women over the age of 65 are participating in regular aerobic activity

for at least 30 minutes every other day (Stephens and Craig, 1990). The report suggests that women are just as active as men in time spent, but do less intense physical activities. The physical recreation activities which have the largest number of participants are walking (77% of all-age women), gardening (55% of all-age women) and swimming (48% of all-age women). With increasing age, the number of adults walking and gardening increases, while the number who are cycling, swimming, and dancing decreases.

While almost half of women over 65 claim to be exercising regularly (The Active Health Report on Seniors, 1989), as few as 15 percent of older women are exercising at an intensity that would foster better health (Stephens, 1985). The Campbell's Survey (Stephens & Craig, 1990) notes that there is a general decline in participation with age, but since 1981, adults of all ages, and notably older adults, have made significant efforts to become more physically active. Still the most recent document on the physical activity of Canadians (Health Promotion, 1993) suggests that little change at all has occurred in the past ten years.

The deficient activity patterns of adults of all ages, and the particular reluctance of women to participate in the more vigorous activities, suggests that the benefits of involvement in moderately intense exercise are not well known or are of little consequence to the average citizen and the risks of exercise may appear to be too great. On the contrary, the reality is that the benefits of regular exercise are almost overwhelming to document as can be seen in the quite sizable section following. In addition, the negligible risks of adult participation are also presented.

Known Benefits of Exercise Participation

Introduction

Health, in its broadest sense, is the topic of central interest and is the primary reason for most research on physical activity. (Kohl, Blair, Paffenbarger, Jr., Macera & Kronenfeld, 1988, p. 1229)

Evidence is rapidly accumulating that physical mobility has become a survival need for the elderly, and that society must change its attitudes toward older women and their physical capabilities and requirements (Milde, 1988). An array of studies from a number of disciplines provide support for a long list of biopsychosocial benefits from involvement in physical activity throughout the entire life span: increased longevity, improved physical and mental health, as well as independence and improved quality of life in very old age (O'Brien & Vertinsky, 1991).

Some seniors appear to be aware of these benefits; 30% of older men and women with heart disease identified lack of exercise as a personal lifestyle problem (Clark, Janz, Becker, et al., 1992). Not only do seniors want to avoid institutionalization, but they also seek opportunities for social involvement and personal growth (Toward A Better Age, 1989). However, recent research indicates that health promotion programs for older employees may have an insignificant impact on increasing their exercise behavior, even when the employees have good intentions to become more active. Sharpe & O'Connell (1992) failed to find any increase in exercise behavior of university faculty and staff after one year of health promotion activities such as participation in walking groups, one-to-one counselling, and work-site exercise programs. Predictors of intention to exercise were level of education, gender, self-efficacy, outcome expectancies, perceived barriers, and baseline exercise frequency. However, at the end of the study, only

exercise at baseline was predictive of current exercise level. Thus work-based initiatives in promoting activity may not succeed if older adults are not convinced of the personal benefits of exercise, or if other life circumstances interfere in their intentions to exercise.

The Benefits of Exercise

By the 1980's, the benefits of exercise for older women were becoming evident in the scientific literature; presently, physical activity is consistently addressed as one of the most significant health interventions in the lives of the elderly. The preventive and restorative benefits of physical activity are recognized by medical and sport science research in most serious health threats. Table 2.1 outlines some of the exercise outcomes that have been found with aging women in relation to exercise intervention research. Although at least half a dozen studies have found no significant change in their dependent measure of exercise, it is because the intensity of exercise, the duration of the training program, or the type of exercise chosen are often inadequate to produce benefits. Overall the evidence seems to favor aerobic activity for both psychological and physiological impact. However, frail elderly women appear to be able to make gains in functional status even with mild mobility programs.

Table 2.1

The Known Benefits of Exercise

HEALTH BENEFIT	SCIENTIFIC SOURCES
Aerobic fitness, increased maximum oxygen uptake	<u>Badenhop</u> , Cleary, Schall, Fox, & Bartels, 1988; <u>Barry</u> et al., 1966; <u>Blumenthal</u> , Emery, Madden, Schniebolk, Walsh-Riddle, George et al., 1991; <u>Blumenthal</u> , Schocken, Needels, & Hindle, 1982; <u>Cobb</u> & Coleman, 1991; <u>Foster</u> , Hume, Byrnes, Dickinson & Chatfield, 1989; <u>Hopkins</u> , Murrah, Hooger, & Rhodes, 1990; <u>Johannessen</u> , Holly, Lui & Amsterdam, 1986; <u>Kilbom</u> , 1971; <u>Suominen</u> , Heikkinen, & Parkatti, 1977; <u>Toning</u> & Driscoll, 1988.
Management and control of chronic obstructive pulmonary disease	<u>Atkins</u> , Kaplan, Timons, Reinsch, & Lofback, 1984; <u>Swerts</u> , Kretzers, Terpstra-Lindeman, Verstappen, & Wouters, 1990, <u>Webster</u> , 1988.
Prevention and control of heart disease	<u>McCunney</u> , 1987; <u>Morey</u> et al., 1989; <u>Posner</u> et al., in press; <u>Sedgwick</u> , Taplin, Davidson, & Thomas, 1988; <u>Sidney</u> & Shephard, 1978; <u>Terpstra-Lindeman</u> , Verstappen, & Wouters, 1990; <u>Upton</u> , Hagan, Rosentswieg, & Gettman, 1983.
Control of obesity, lower cholesterol	<u>Blumenthal</u> , et al., 1989; <u>Shephard</u> , 1986b; <u>Sidney</u> , Shephard, & Harrison, 1977;
Therapeutic value for arthritis	<u>Ellert</u> , 1985; <u>Harcom</u> , Lampman, Banwell, & Castor, 1985; <u>Lewis</u> , 1984; <u>Minor</u> , Hewett, Webel, Anderson, & Kay, 1989.
Incidence of cancer, heightened immune response	<u>Fiatarone</u> , Morley, Bloom, et al., 1989;
Prevention and control of osteoporosis	<u>Block</u> , Smith, Freidlander, & Genant, 1989; <u>Evans</u> & Smith, 1987; <u>Rikli</u> & McManis, 1990; <u>Smith</u> , Reddan, & Smith, 1981; <u>Snow-Harter</u> , 1987; <u>Snow-Harter</u> & Marcus, 1991.
Social support and encouragement for exercise	<u>Andrew</u> et al., 1981; <u>Dishman</u> , 1986; <u>Gray</u> , 1987; <u>Hauge</u> , 1973; <u>Perusse</u> , LeBlanc, & Bouchard, 1988; <u>McPherson</u> , 1982; Powell, Spain, Christenson, & Mollencamp, 1986; <u>Snyder</u> & Spreitzer, 1973; <u>Spreitzer</u> & Snyder, 1973; <u>Stephens</u> & Craig, 1990; <u>Tait</u> & Dobash, 1986; Wankel, & Berger, 1991; <u>Wechsler</u> , Levine, Idelson, Rohman & Taylor, 1983.

continued.....

Table 2.1 continued...

The Known Benefits of Exercise

HEALTH BENEFIT	SCIENTIFIC SOURCE
Control of hypertension	<u>Barry</u> , <u>Daly</u> , <u>Pruett</u> , et al., 1966; <u>Emes</u> , 1979; <u>Richardson</u> , & <u>Rosenberg</u> , 1989; <u>Shephard</u> , <u>Corey</u> , & <u>Cox</u> , 1982; <u>Vaccaro</u> , <u>Ostrove</u> , <u>Vandervelden</u> , <u>Goldfarb</u> , & <u>Clarke</u> , 1984; <u>Weber</u> , <u>Barnard</u> & <u>Roy</u> , 1983;
Control and management of diabetes	<u>Cantu</u> , 1982; <u>Shephard</u> , 1984.
Improved functional status	<u>Sulmar</u> & <u>Wilkinson</u> , 1989.
Cognitive processing speed	<u>Baylor</u> & <u>Spirduso</u> , 1988; <u>Dustman</u> , <u>Ruhling</u> , <u>Russell</u> et al., 1984; <u>Emery</u> , 1991; <u>Powell</u> , 1974; <u>Stacey</u> , <u>Kozma</u> , & <u>Stones</u> , 1985.
Balance	<u>Burger</u> , 1989; <u>Hopkins</u> , <u>Murrah</u> , <u>Hoeger</u> , & <u>Rhodes</u> , 1990; <u>Lichenstein</u> , <u>Shields</u> , <u>Shiavi</u> , & <u>Burger</u> , 1989; <u>Rikli</u> , & <u>Edwards</u> , 1991.
Positive self-concept, improved body image, and control of depression	<u>Bolla-Wilson</u> & <u>Bleeker</u> , 1989; <u>Mittleman</u> , <u>Crawford</u> , <u>Holliday</u> , <u>Gutman</u> , & <u>Bhakthan</u> , 1989; <u>Perri, II</u> , & <u>Templar</u> , 1984-85; <u>Sidney</u> & <u>Shephard</u> , 1976.
Joint mobility	<u>Karl</u> , 1982; <u>Morey</u> , <u>Cowper</u> , <u>Feusner</u> , et al., 1898.
Muscular strength and endurance	<u>Brown</u> , & <u>Holloszy</u> , 1991; <u>Guedner</u> & <u>Spradley</u> , 1988; <u>Meredith</u> , <u>Frontera</u> , <u>Fisher</u> , et al., 1989; <u>Naso</u> , <u>Carner</u> , <u>Blankfort-Doyle</u> , et al., 1990; <u>Petersen</u> , <u>Petersen</u> , <u>Raymond</u> , et al., 1991; <u>Sinaki</u> & <u>Grubbs</u> , 1989.
Gait velocity	<u>Judge</u> , <u>Underwood</u> , <u>Gennosa</u> , 1991.
Posture and increased height	<u>Ball</u> , <u>VanderVeen</u> , <u>Johnson</u> , & <u>Lukert</u> , 1991.
No benefit or change found	In balance (<u>Emes</u> , 1979; <u>Clarke</u> , <u>Wade</u> , <u>Massey</u> , & <u>VanDyke</u> , 1975); In cognitive speed and aerobic fitness (<u>Molloy</u> , <u>Richardson</u> , & <u>Crilly</u> , 1988); In physical and psychological measrues (<u>Blankfort-Doyle</u> , <u>Waxman</u> , <u>Coughey</u> et al., 1989; In bone mineral content (<u>Nelson</u> , <u>Fisher</u> , <u>Dilmarian</u> , et al., 1991); In hematological, anthropometric and metabolic comparisons (<u>Nieman</u> , <u>Pover</u> , <u>Segebartt</u> et al., 1990.

Research studies have begun to develop a profile of those elderly women who are physically active. Whether she has been active all her life, or is a recent convert to exercise, the physically active woman is likely to be one or two decades younger physiologically than her sedentary contemporary (Drinkwater, 1988). Master's athletes in their seventies can match performances of sedentary 20 year old individuals (Vaccaro, Dummer & Clarke, 1981).

In brief, knowledge is available about two types of benefits to be expected: first, within weeks, short term enhancement of physical, social and emotional well-being; and second, over years, long term contributions to prolonged good health, resistance to illness, optimization of self-care and functional independence, reduced mortality risk and overall increased quality of life.

Immediate Benefits

Many health and fitness benefits of regular exercise participation are felt immediately by the older adult. For example, those who are new to physical activity often report "feeling better" right away (Fitness and Aging, 1982; Feel Better, 1980). Such feelings include the perception of doing something good for oneself (Dowall, Bolter, Flett & Kammann, 1988) as well as a sense of achievement (Lutter, Merrick, Steffen, Jones, & Slavin, 1985). Participants entering supervised programs generally find themselves in a social group with others of their age and the potential then exists to widen their social network. Social support and interaction are thought to be among the most important factors in adherence and enjoyment in activity programs, although research is lacking in this regard (Lee & Markides, 1990; Wakat & Odom, 1982). A quite strenuous seniors' 100 day cycling tour under the scientific scrutiny of Mittleman, Crawford, Holliday, Gutman and Bhaktan (1989) proved instead to be a test of the

social relations of older adults with 6 of the 33 cyclists dropping out only one week from the conclusion of the tour. Feelings toward others and social intolerance were cited as reasons. More study is obviously needed to determine the social benefits and social risks of exercise in a variety of contexts.

A number of inter-related psychosocial and physiological parameters have been positively linked with short-term exercise participation. Possibly among the most important outcome of physical activity is stress reduction (DeVries, 1975) since coping with stress is probably linked to other benefits such as better sleep (Griffin & Trinder, 1978; Osis, 1986), muscle relaxation (Berger, 1989), positive mood states (Bolla-Wilson & Bleeker, 1989; Monahan, 1986), improved self-image (Paige, 1987) and self-concept (Perri & Templar, 1984-85). Overall, exercise appears to act as a buffer in many stress-illness relationships (Eichner, 1987; Eisdorfer & Wilkie, 1977) possibly through biochemical interactions linking mind and body (Haug, Ford & Sheafor, 1985). For example, increased levels of beta-endorphins accompanying high-intensity exercise may explain some individual's enhanced perceptions of increased coping and relaxation (DeVries, 1981). However, it is doubtful that many older women exercise at this level of intensity.

Exercising individuals demonstrate higher levels of self-efficacy (Atkins, Kaplan, Reinsch, & Lofback, 1984; Hogan & Santomier, 1984), internal locus of control (Perri & Templar, 1984-85) or sense of life control (Rodin, 1986). No less important to psychological health is the opportunity created by exercise to socialize, to play and have fun with peers, form new friendships and develop a community spirit with other elderly (Eckert, 1986; Langlie, 1977; Wakat & Odom, 1982).

Possibly the most significant short-term benefit for females of all ages is the potential to gain same day improvement in joint mobility (Burgess, 1992; Hartley-O'Brien, 1980). Mobilizing and lubricating major joints of the body through a variety of stretching and relaxation regimes seems to have great therapeutic merit by contributing to better motor control and dynamic balance (Manchester, Woollacott, Zederbauer-Hylton & Marin, 1989). However, joint mobilization, on its own, has not been researched for its potential in easing the strain of everyday living.

Long-Term Benefits

The broader health benefits of regular physical activity can be realized months or years later (Suominen, Heikkinen & Parkatti, 1977). Rikli and Edwards (1991) found significant improvements in motor function and cognitive processing speed continuing throughout a three year period of exercise in older women, while declines were evident in a non-exercising control group. Bortz (1980) claims that there is no medicine that can compete with the range of pathology for which exercise has been prescribed: obesity, depression, diabetes, arthritis, hypertension, coronary heart disease, menstrual cramps, migraine, smoking cessation and many other states.

The most tantalizing prospect is the ultimate extension of life and several new studies support the prospect of reduced mortality, at least for males, stemming from regular participation in physical activity (Blair, Kohl, III, Paffenbarger, Clark, Cooper & Gibbons, 1989; Grand, Grosclaude, Bocquet, Pous, & Albarede, 1990; Kaplan, Seeman, Cohen, Knudsen, & Guralnick, 1987; Karvonen, Klemola, Virkajarvi & Kellonen, 1974; Linsted, Tonstad, & Kusma, 1991; Paffenbarger, Hyde, Wing, & Hsted, 1986; Paffenbarger & Hale, 1975; Paffenbarger,

Wing, & Hyde, 1978). Reuben, Siu, and Kimpau (1992) have found that measures of physical performance can predict mortality over a two-year period. Rakowski and Mor (1992) recently reported that less activity/ exercise was associated with a higher risk of mortality for each of four questions relating to activity compared to their peers, having a regular exercise routine, getting enough exercise, and days walking a mile per week. For individuals with one or more impairments in the activities of daily living, walking was associated with lower mortality.

This investigation supports literature on the importance of maintaining physical activity into older adulthood, and suggests that clinicians should attend to reports of activity level by their patients as one of the broader psychosocial domains of patient care. (Rakowski & Mor, 1992, p. M122)

Added to the rapidly accumulating mortality data is an extensive list of claimed long-term benefits of exercise such as postponement of cardiac diagnoses (Marti, Pekkanen, Nissenen, Ketola, Kivela, Punsar, & Karvonen, 1989; Posner, Gorman, Prouty Sands, Gitlin, Kleban, Windsor & Shaw, in press); reduced mortality risk through mediating factors such as effective weight control (Evans & Meredith, 1989; Upton, Hagan, Rosenswieg & Gettman, 1983) and not smoking (Heydon & Fodor, 1988); lower blood pressure (Adams & deVries, 1973; Vaccaro, Ostrove, Vandervelden, Goldfarb & Clarke, 1984; Weber, Barnard & Roy, 1983); lowered cholesterol levels (Evans & Meredith, 1989; Blumenthal, Emery, Madden, George, Coleman, Riddle, McKee, Reasoner & Williams, 1989); reduced risk of colon cancer (Gerhardsson, Norell, Kiviranta, Pederson, & Ahlbom, 1986); and increased aerobic fitness (DeVries, 1979; Buskirk & Hodgson, 1987; Seals, Hagberg, Hurley, Ehsani & Hollowszy, 1984).

Some have argued that the prospects for life extension are effectively very small (Heyden & Fodor, 1988; Waterbor, Cole, Delzell, & Andjelkovich, 1988) and others claim that life span changes are affected more by genetics (Johnson, 1988), or environment (Bourliere, 1973), or cultural factors (Waldron, 1976). At

least one animal study has revealed a possible age-threshold for mortality benefits; exercise initiated in older rats was found to actually reduce their survival rates (Edington, Cosmas, & McCafferty, 1972). Palmore (1989) reviewed the evidence and suggested that healthier people do have reduced mortality, and are naturally bound to be more active; hence reduced mortality may just be an association with healthier individuals who self-select for physical activity.

A nine- to twelve-month exercise program of walking and/or jogging at 80% of maximal heart rate improved fat distribution patterns in 60 to 70-year-old men and women (Kohrt, Obert, & Holloszy, 1992). Older adults lost 3 to 4% of their body weight over the course of the intervention, all of the weight lost was fat weight, and furthermore, the fat lost occurred in the truncal area indicating "a preferential loss of fat from the central regions of the body (Kohrt, et al., 1992, p. M99). This study provides evidence that one mechanism by which exercise operates to reduce risk of disease may be the control of abdominal obesity.

Evidence is accumulating that physically fit elderly adults experience less profound declines in cognitive performance than their less-fit contemporaries (Chodzko-Zajko, 1991). Other significant findings accompanying exercise participation include quicker reaction time (Baylor & Spirduso, 1988; Rikli & Edwards, 1991; Spirduso, 1975, 1980), improved joint flexibility (Frekany & Leslie, 1978; Munns, 1978; Rikli & Edwards, 1991), muscular strength and endurance (Rikli & Edwards, 1991; Shephard, 1978; Work, 1989), increased muscle mass (Meredith, Frontera, Fisher, Hughes, Herland, Edwards & Evans, 1989), and the retardation of osteoporosis (Oyster, Morton & Linnell, 1984; Sidney, Shephard & Harrison, 1977) or even increased bone mineralization (Blumenthal et al., 1989; Rikli & McManis, 1990; Smith, Reddan & Smith, 1981) after only weeks of exercise (Beverly, Rider, Evans & Smith, 1987).

A balanced program of nutrition, exercise, and stress reduction appear to benefit all postmenopausal women (Davidson, 1986). A recent study of 3,110 retired Florida residents, average age of 73, concluded that walking one mile at least three times per week offered protection from bone fractures (Sorock, Bush, Golden, Fried, Breuer & Hale, 1986). Peterson and associates recently found that 59 healthy women, ages 36 to 67, increased muscular strength over 12 months, but not bone mass (Peterson, Peterson, Raymond, Gilligan, Chechovich & Smith, 1991).

Aerobic exercise intervention, more than a basic calisthenics program, appears to be important in enhancing the cognitive skills of older adults. While research supports short-term neurophysiological improvements in measures of memory, intelligence and cognitive speed (Stacey, Kozma & Stones, 1985), a non-aerobic three month exercise program was ineffective in elevating neuropsychological attributes in elderly institutionalized women (Molloy, Delaquerriere Richardson, & Crilly, 1988). Thus the level of intensity of an exercise program does appear to matter, but not whether the program is conducted at home or in a supervised setting (Miller, Haskell, Berra, & DeBusk, 1984).

Aerobic efforts may not have the expected aerobic effect in very old age. In women averaging over 80 years of age, active women were walking briskly over 100 minutes per week, while an inactive group was averaging about 5 minutes of walking per week. Exercise histories showed that the active group had followed their present exercise program of walking for an average of 28 years. These differences in activity level did not translate into significant differences in aerobic fitness in old-old age, a finding that is partially explained by inadequate sample sizes (Nieman, Pover, Segebartt, Arabatzis, Johnson & Dietrich, 1990). The active women had higher aerobic capacities, less body fat, and lower perceived exertion — but in samples so small that statistical significance was

not reached. However in other studies on cardiovascular responses with small sample sizes, the exercise effects have been powerful enough to obtain 30% increases in aerobic capacity (Seals, Hagberg, Hurley, Ehsani, & Holloszy, 1984).

Most studies find that physical conditioning has significant positive effects on the older adult. Adults suffering from osteoarthritis and rheumatoid arthritis can also obtain important improvement in aerobic capacity, walking time, depression, anxiety, and increased habitual activity after a 12 week walking or aquatic exercise program (Minor, Hewett, Webel, Anderson, & Kay, 1989).

Researchers are exploring the possibility that exercise might prevent falls by improving balance, but so far, the results are not promising (Emes, 1979). Twelve weeks of light physical activity is not apparently long enough, or intense enough to reverse losses in proprioceptive function. A prospective study attempted to reduce falls and injury in the elderly using stand-up exercises from sitting in a chair, and step-ups onto a 6 inch high stool (Reinsch, MacRae, Lachenbruch, & Tobis, 1992). The researchers concluded that the exercise program had merit, but was too light in intensity to reduce falls significantly.

Many of the activities which seem to appeal to the interests of women are also lacking adequate intensity and vigor. While old-timer hockey, golf and slow-pitch are attracting large numbers of middle-aged and older men, the pursuit of skilled exercise and team sport activities do not seem to be favoured by many elderly women; rather individual, expressive, socially cooperative and self-paced activities are more popular offerings of community programs for older women (e.g. Tai Chi, Yoga, Line dance, Keep fit, Aquacise). Older women seem to prefer supervised and low skill programs close to home. An important activity that is ~~fitness enhancing, age appropriate, suitable to both men and women and self-paced~~

is walking, and of course, gardening. Not surprisingly, walking is the most popular form of exercise with older adults (Fitness and Aging, 1982).

Despite the remarkable benefits just outlined, the declining physical activity involvement as women get older suggests that there must be significant barriers operating which undermine their participation. The fact that elderly women are rarely, if ever, seen in vigorous activities such as running and team sports, suggests that older women avoid high exertion settings. In this next section, the known risks of exercise involvement are explored as possible barriers for older women.

Known Risks of Exercise Participation

Introduction

Although the real risks of engaging in physical activity are becoming known, risk assessment is often strictly based on personal beliefs, and not always is attached to personal experience. While susceptibility to risk of illness and disease in general is under-rated by most people (Weinstein, 1984), and furthermore is likely very much under-rated as an outcome of insufficient exercise, perceptions about susceptibility for harm from exercise participation is common (Heitmann, 1982; Monahan, 1986; Waller, B., 1985).

Conrad (1976) observed that the elderly tend to exaggerate the risks of exercise, overestimate the benefits of irregular physical activity, underestimate their exercise capabilities and believe that the need for regular exercise decreases with age. Women, especially, appear to have greater fears about exercise risk even though incidents of sudden death are almost universally a male phenomenon (Ragosta, Crabtree, Sturner & Thompson, 1984). ~~Risk judgments are~~

influenced by the memory of past events and the imagination of future events. There is even the possibility that simply reminding people that exercise prevents CV disease may alert them to their personal vulnerability to heart attack and make them even more cautious (Slovic, 1986)!

Further discussion about the perceived risks of exercise is presented in Chapter 3. In the following section, the known risks of sudden death, injury and ill-health are presented.

Known Risk of Sudden Death in the Elderly

Serious complications in supervised exercise programs for even heart disease patients are rare. Van Camp and Peterson (1986) observed one fatality per 750,000 patient hours of supervised exercise and nine cardiac arrests per million patient hours of exercise - a mortality figure no different than would be expected in non-exercising patients in this age group. Cardiac risk assessment in the elderly is considered to be essential protocol in identifying "silent ischemia" (Smith, 1988) and regular exercise is recommended in order to provide older adults with early warning of symptoms related to disease and deficiency in the cardiovascular system (Gottlieb & Gerstenblith, 1988).

There is no medical evidence that physical activity - even strenuous exercise - is harmful to the healthy cardiovascular system. However a person with structural cardiovascular disease, even if asymptomatic, is at an increased risk for sudden death during vigorous forms of physical activity and therefore supervised and graded exercise for these individuals becomes mandatory (Van Camp, 1988). Submaximal and maximal exercise stress assessment permits a differentiation of changes in heart rhythm, heart rate, systolic blood pressure

and ECG manifestations if myocardial ischemia is present (Bruce & McDonough, 1969).

Van Camp and Petersen (1986) obtained data from 167 randomly selected cardiac rehabilitation programs via mailed questionnaires reporting on over 50,000 cardiac patients and over 2 million hours of exercise between 1980 and 1984. Twenty-one cardiac arrests (18 in which the patient was successfully resuscitated and three fatal) and eight nonfatal myocardial infarctions were reported. The 1.3 fatalities per 784,0000 patient-hours of exercise was considered to be a normal mortality rate. The findings suggested that supervised programming along with heart-rate monitoring provided low risk health promoting exercise opportunities for cardiac patients.

Ewart and Taylor (1985) claim that the biggest barrier to recovery in individuals experiencing a cardiac event is an unrealistic fear arising from inaccurate self-perceptions about one's physical abilities. Nearly half of the men under 70 years of age who survive three weeks after a myocardial infarction are physically capable of resuming their normal activities within 12 weeks of the acute event. Many of these individuals become physically over-cautious while a few become overzealous and are apt to exercise too strenuously. These researchers make a case for the role of self-efficacy assessment in identifying individuals who are deficient in perceived competence as well as those who are over-confident in their self-perceived ability to resume normal activity levels.

McKelvie (1986) claims there is no medical evidence that super-marathon type running protects one from coronary heart disease; rather, there is evidence that extreme endurance events, especially in middle age, place people with unknown problems at increased risk. People add to their own risk by ignoring symptoms of ~~vague or definite chest pain during activity - warning signs that should be~~

immediately addressed in order to reap the benefits of early detection. As population age increases, progressively larger numbers of aged adults will be affected by serious pathologies where vigorous exercise is contraindicated. In such cases a reconditioning program at a steady heart rate of 100 to 120 beats per minute provides an effective stimulus for senior citizens, meaning that for older individuals new to exercise, "walking, recreational swimming, dancing, lawn bowling and even chair exercises have training value" (Shephard, 1986a, p.227). Shephard summarizes the available evidence by stating:

Given the strong probability that moderate, progressive activity improves the quality of life, such findings are no reason to prohibit physical activity in an asymptomatic senior citizen. (Shephard, 1986a, p.227)

Known Risk of Injury in the Elderly

To consider "exercise" a health-promoting practice already implies that we have prejudged its benefits as outweighing its risks. Indeed, tens of millions of people have already made this judgement, as they regularly engage in a variety of aerobic exercise activities. However, if health professionals are to promote exercise objectively, they need to provide consumers with a balanced view". (Koplan, Siscovick & Goldbaum, 1985, p.190)

While risk of musculoskeletal injury may be high, especially in sport activities requiring training for competition, such risk may not exist at other activity levels. Kavanagh and Shephard (1978) found that in the early months of geriatric exercise programs, about 50% of the participants had encountered muscular injury. Yet, a ten week, five day-a-week aerobic program of brisk walking and jogging elicited not a single injury in sedentary middle-aged women according to Johannessen, Holly, Lui, and Amsterdam (1986).

Koplan, Siscovick & Goldbaum (1985) suggest that the risks of exercise injury are linked to the specific characteristics of the type of activity (~~intensity, duration and frequency~~) as well as the attributes of the participant

and the exercise environment. In this respect, incidence information is unavailable on the actual specific risks of exercise to specific individuals in specific situations.

In summary, there is little data on adults of any age group with which to objectify and quantify specific exercise risk. Moreover the long-term effects of exercise, such as relationships to osteoarthritis, do not exist. Adding to the problem of insufficient short and long-term data are inadequate definitions. Comparisons across the exercise research on risk require standard definitions of injury, of the characteristics of various groups of participants, of the non-participants (or drop-outs), of the time interval or the main purpose of the participation etc. (Koplan et al., 1985). Without longitudinal and randomized cohort studies, such challenges may be difficult to overcome. In summary, the literature advises the pursuit of moderate exercise in a variety of physical activities allowing for adequate recovery, and this makes good sense until more is known about incidence relationships (Bruce, 1984; Munnings, 1988).

Risk of Over-Exertion or Exhaustion

"In those callings that require great physical qualifications, old age is decisive." (de Beauvoir, The Coming of Age, 1972:385)

Clearly one has to be realistic about the aging process and admit that physical declines are part of the natural aging process no matter how heroic one is in terms of disciplined participation in fitness activity. With even the most ambitious older adult, declining activity levels are likely to accompany old age as one "often sinks into physical weariness, general fatigue and indifference" (de Beauvoir, 1972, p.404). Moreover, fitness for the future is no longer important as "our eager spring towards the future is broken" (de Beauvoir, 1972, p.404). Cooperating with one's finitude may in the long run be the more healthy

route, and acceptance to adapt where necessary is better than acceptance of helplessness. The only general statement that can be made about older adults is that one cannot generalize!

Risk of Provoking Ill Health

Each year, one in five aged women suffer an injury requiring medical attention and their injury rate surpasses that of elderly men. Moreover, older women are more often ill and experience more days of bed-disability than men. The bones of elderly women are more vulnerable to fracture because they are smaller and more porous, and while exercise is certain to help maintain bone strength, activity itself is an inherent risk. Older women are twice as likely as men to have arthritis and 13 percent of elderly women are limited by arthritis alone in their daily activities (Haug, Ford & Sheafor, 1985). But exercise is not considered to be the threat to this disease as much as is the lack of it. In fact, Burckhardt (1988) reports that passive recreation pursuits are significantly more important to women with arthritis; she notes that particularly for the over 70 year old women, quality of life and dissatisfaction with active recreation and personal fulfilment in general were significantly affected.

Musculoskeletal fatigue, soreness, joint stiffness and delayed recovery is particularly a risk for those who are unaccustomed to exercise and who do not initiate exercise in very gradual and low intensity stages (Kasper, 1990). The first experience with an exercise program for an elderly women may turn out to be a painful experience, and one that is soon learned to be avoided.

Summary

To this point in the chapter, the health difficulties and poor aging of women have been addressed as likely outcomes of the past socialization and present lifestyle of women born before 1921. The benefits of exercise have been well-documented, while the known risks of participation appear to be almost insignificant. The reluctance of so many older women to reap the many benefits from physical activity demands explanation, and this explanation is explored in the coming section presenting prominent theoretical approaches.

The Determinants of Exercise Behavior: Useful Theoretical Approaches

Introduction to Determinants

The known determinants of physical activity can be categorized as past and present personal attributes, past and present environments, and physical activity itself (Dishman, 1990). Dishman (1990) uses the term *determinant* to "denote a reproducible association or predictive relationship other than cause and effect"(p. 78). Personal attributes are defined as demographic variables, biomedical status, past and present behaviors, activity history, and psychological states and traits associated with physical activity. Dishman claims that determinants residing or originating in the individual are important because they can identify personal variables or population segments that may be targets for interventions to increase physical activity, or conversely, can describe impediments or people resistive to physical activity interventions. However, summarizing the associations of personal variables and exercise behavior poses a challenge.

The absence of uniform standards for defining and assessing physical activity and its determinants and the diversity of the variables, population segments, time periods, and settings sampled in published studies make it difficult to interpret and compare results. (Dishman, 1990, p.78)

The complexity of predicting a health behavior such as physical activity has been aptly described as "a web of causation" (Sallis, & Hovell, 1990; Thomas, 1984). Addressing this complexity are two major theoretical perspectives, representing two different research approaches: 1) social epidemiology, and 2) behavioral health psychology. An understanding of these two approaches is essential to the study of exercise behavior and theory development because:

...the degree to which the true origin of the determinants resides in the person or the environment remains to be determined. (Dishman, 1990, p.84)

In the present study, personal attributes have been divided into two categories:

- 1) "situational" determinants, or the personal and socio-environmental circumstances of each older woman representing a social epidemiological perspective, and ...
- 2) "cognitive" determinants, or the self-referent beliefs of the older woman, representing a psychobehavioral perspective.

The material immediately following introduces social epidemiology and socialization theory as perspectives which attend to the personal characteristics and environmental situation of the individual. The situational characteristics reviewed are age, education, health status, marital status, family size, work role in mid-life, socioeconomic status, ethnicity, childhood socialization and childhood movement confidence.

SOCIAL EPIDEMIOLOGICAL PERSPECTIVES

Social Epidemiology

The social epidemiological perspective focuses upon personal characteristics and the environmental situation of the individual (Berkman, 1980). The personal qualities and social circumstances of individuals have important associations with health and activity behavior and thus are considered to be useful predictors (Belloc & Breslow, 1972; Berkman & Breslow, 1983; Dishman, 1989).

Such predictors infer that people are not the creators of their behaviors, but rather are victims of circumstance. Bandura (1989) calls this "environmental determinism" or the study of human behavior in terms of "mechanical agency" (Bandura, 1989, p. 1175). In this view, internal events are mainly products of external ones devoid of any causal efficacy on the part of individuals. For example, Sidney, Niinimaa and Shephard (1983) found that both active and inactive senior citizens had equally positive attitudes toward physical activity. They wondered why there were discrepancies between attitudes and behavior, and concluded that "there must be other factors, perhaps more important than attitudes, which influence behaviour" (p. 207). As another example, one's life occupation can alter possibilities for active behavior later on. Svanborg (1988) reports on a longitudinal study that found previously sedentary workers were more disabled in activities of daily living than those whose work had been strenuous.

At the level of the individual, personal attributes and life situations are not easily altered, and therefore are not entirely suitable to social intervention and health promotion. Even so, epidemiological approaches are useful because they identify specific social groups that can be targeted for particular assistance. ~~Theoretically, however, demographic variables on their own, are~~

deficient because they only provide association, not explanation. Once descriptive associations are found, however, hypotheses can be developed to explain the findings which then can be tested in further research. For example, if never-married women are found to be significantly more active in late life, hypotheses would then be generated and tested as explanations for this finding.

McPherson (1986a) emphasized that demographic characteristics can interact or confound one another. For example, intracohort (age) differences, which could explain activity involvement, can vary dramatically by education, marital status, health status, economic status, degree of mobility, employment status, and social network. Nixon II, (1990) recently claimed that sport socialization research "needs to address these issues of 'contextualization'" (p. 35). In Sweden, understanding contextualization was essential to the development of a comprehensive health promotion intervention of 1200 adults over age 70 (Eriksson, Mellstrom, & Svanborg, 1987). For the Swedish study, a "life-style" hypothesis was proposed: that the kind of everyday life led by the individual had consequences not only for social performance but also for functional well-being.

We are only beginning to understand why some people are physically active and others are not. The behavior is determined, at least in part, by characteristics of the person, the environment, and the activity itself. (Powell & Paffenbarger, 1985, p. 120)

Ten life situational variables appear to have significance as potential determinants for late life exercise. These ten variables are reviewed in the coming section for their relevance in explaining late life exercise.

Age and Exercise

Age is not just a chronological variable but also a social construct that defines social behaviour at specific points in the life cycle. Age is an important form of social differentiation that can result in social inequality because of ageism. (McPherson, 1984, p.223)

There is a well-documented and universal pattern of declining physical activity and sport participation by age, especially in the early twenties and again after age 65. These sharp decreases in participation have been tied to two major life events - leaving highschool or entering the work force, and leaving the work force (McPherson, 1984).

The pattern of declining involvement with age appears to be more pronounced among the less educated, those with lower incomes, those in rural and smaller communities, among females and blue collar workers and among those who live in countries where sport participation is not highly valued or promoted (Stephens & Craig, 1990). McPherson (1978) makes the point that, after peak performance age in many sports, incentives are lacking for adult participation. Facilities and coaching time tend to be allocated to high performance children. With only young role models present in a sport, adults readily assume that these sports events are for the young.

The most recent Canadian data states that 42% of men over 65+ and 23% of women over age 65 are active (spending 3+ kilocalories per kg. per day on exercise) which exceeds that of middle-aged groups (Stephens & Craig, 1990). In the age group of 45-64, only 30% of men and 20% of women are classified as active. Adults are at their most sedentary in the years just approaching retirement (Stephens & Craig, 1990).

Little is known how physical abilities and skilled motor patterns actually deteriorate over the years, although disuse, muscle wasting, muscle deactivation and neural decline are thought to be inter-related (Shephard, 1989a; Smith & Serfass, 1981). There is evidence that simple daily motor patterns of adults over the life course are developmentally altered in adaptation to age-related change

(Van Sant, 1989). More likely, however, individual behavior changes, such as reducing the more vigorous activities with age, are just as responsible for developmental changes as are actual maturational processes.

Education and Exercise

The phenomenon that Canadians are less physically active as they age may be determined, in part, by lower levels of education (Rudman, 1986b). Education has strong associations with physical activity level in both free-living and supervised exercise settings (Dishman, 1990). Many older individuals had only a few years of schooling and thus may lack knowledge or habits related to physical activity in public settings. For example, in 1911, only 80% of those aged ten to fourteen were attending Canadian schools (Harrigan, 1990). Boys and girls attended about equally, although young people often withdrew in their teens to work (Harrigan, 1990).

Today, about 60% of Canadians over the age of 65 claim to have Grade 9 or better education. The Canada Fitness Survey (Stephens & Craig, 1990) reports that 52% of adults with incomplete highschool education are inactive compared to 33% of those with a university degree. Furthermore, 89% of university educated adults, 65 years and older, spend over 3 hours per week on physical activity in their leisure-time compared to 71% of those who did not complete highschool.

The interest in advanced education and participation in sports activities also increase with economic status and level of education. This makes the following very clear: *The course for successful ageing is set predominantly in childhood and youth.* (Meusel, 1991, p.16)

If this is true, then the challenges of activating individuals in adulthood will continue for some time. Recent studies reveal that contemporary lifestyles of children are predominantly sedentary (Simons-Morton, O'Hara, Parcel, Huang,

Baranowski, & Wilson, 1990) and yet hyperactive behavior in school settings is believed to be the most common problem referred to child-guidance clinics in the United States (Alexander, 1990).

Baecke, Burema and Frijters (1982) reported highly significant relationships between level of education and leisure-time physical activity in younger males ($r = .38$; $p < .001$). Godin & Shephard (1986) examined psychosocial factors influencing intentions to exercise in a group of individuals ranging from 45 to 74 years of age. Education influenced intention to exercise by interacting with "subjective norm," a construct representing a subject's perceptions about social expectations. Less educated subjects were influenced by social norms, and more educated people tended to exercise independently of external influences.

Subjective Health and Exercise

Self-assessed health is considered perhaps the most important variable likely to explain late life exercise behavior. Individuals may simply not feel well enough to exercise. Yet the process by which a person comes to understand and evaluate personal health is, in itself, poorly understood.

Self-rating of health is thought to be a multidimensional construct which encompasses a global sense of well-being (Zautra & Hempel, 1984). There is surprising statistical support for such a simple and subjective scale. Maddox and Douglas (1973) found "self- and physician-ratings of health are predominantly congruous" (p.59). In fact several studies have found subjective ratings of health to be superior to objective measures of health in terms of predicting well-being, happiness, morale, and life satisfaction (Cockerham, Sharp, & Wilcox, 1983; Zautra & Hempel, 1984).

Mossey and Shapiro (1982) followed over 3500 randomly selected Manitoban residents aged 65 and over and found a risk of early mortality almost three times greater for individuals who had rated their health as "poor" only two years earlier.

Idler and Kasl (1991) studied mortality in over 2800 older adults with the mean age for females being 74.9 years. About 12% of the women rated their health as "excellent", 46.5% as "good", 33.7% fair, and 8.4% as "bad" or "poor". At the four year follow-up, Idler and Kasl found that "the odds of death increased at every lower level of self-evaluation of health" (Idler & Kasl, 1991, p. S60). Women who ranked their health as "bad" or "poor" were over three times more likely to die within the four year period as were women who had rated their health as "excellent". Idler and Kasl (1991, p. S64) concluded,

The knowledge that expressions of subjective health status are sensitive indicators of survival length should engender new respect among health professionals for what people, especially the elderly people they treat, are saying about their health.

Larson (1978) suggested that while physician ratings should provide the most objective evidence of the severity of illness in absolute terms, they may not accurately reflect the extent to which an individual's physical condition is actually debilitating. Furthermore, there is evidence to suggest that while physician's ratings may be age-biased in favour of younger adults, the "old-old" category (75+) of adults have been found to rate their health more positively than "young-old" groups (Ferraro, 1980). Gender bias and age bias may be operating since older groups are predominantly women, and older adults may have reduced expectations for optimal health. Thus deteriorating health may not necessarily be reflected in the subjective self-rating.

A majority of inactive elderly adults perceive themselves to have good to excellent health and do not believe that they need more exercise (Gunter &

Kolanowski, 1986). These beliefs persist in spite of the fact that the prevalence of illness and disability increases with age and is significantly greater for women than for men (Vallbona & Baker, 1984).

Charette (1988) states that only 25% of inactive Canadians actually have an activity limitation, and of these, more than half think that exercise will improve their health either moderately or a great deal, regardless of their activity limitation status. What can explain why older adults, who are physically inactive, and who state that exercise could improve their health, are still inactive anyway?

In most of the literature relating late life exercise behaviors to health outcomes, positive relationships are found. Exercise participation is related to better health, and better health is associated with increased levels of physical activity. The difficulty in the interpretation is which comes first? Do people exercise more because they have better health to start with, or do people who exercise actually create and/or perceive, better health? The problem of causality is partially answered in large population demographic studies such as that of Belloc and Breslow (1972) and the longitudinal study on college males by Paffenbarger, Hyde, Wing and Hsied (1986) which have linked habitual exercise in the lifestyles of large populations to favourable mortality outcomes. More answers and confirming evidence need to be sought, especially for women who, with a life-span advantage over males of 7 to 8 years, are possibly more concerned about health outcomes and quality of life than extending their life span.

Perceptions about one's health may be the germinating force leading to specific kinds of self-protecting behaviors. Possibly the prospects of chronic illness provoke certain women to action, while convincing others that it is time to slow down. Both strategies can be considered health protective even though

the behaviors are oppositional lifestyle choices. Such a dichotomy needs further exploration since women, in general, exceed males in all other personal health care behaviors except exercise (Verbrugge & Wingard, 1987) .

A plausible explanation for the reluctance of females to be diligent about promoting their health through exercise is that the way girls and women have been socialized over the life course has lessened their advocacy and belief in exercise and sport as valued behaviors (Csizma, Wittig, & Schurr, 1988). By late life, vigorous physical pursuits are not only seen as socially inappropriate, but also viewed as high-exertion (Winborn, Meyers & Mulling, 1988), and therefore potentially life and health-threatening.

Evidence is accumulating that adults who perceive their health as poor are more reluctant to adopt exercise than those who perceive good personal health. Morgan and colleagues (1984) studied an unspecified age group of General Foods employees and found that while male participants who enrolled in the fitness program perceived good health and positive beliefs about exercise, women associated exercise with poorer health. Furthermore, female exercise adopters did not improve their perceptions of health at retest, while male adopters did. In short, Morgan's team found that the exercise and health relationship differ for men and women.

In a randomized walking exercise intervention on older women, those who adhered to the two year exercise program were, at base-line, of lighter weight, already more active, and non-smokers (Kriska, Bayles, Cauley, LaPorte, Black Sandler, & Pambianco, 1986). However, the variable that best differentiated between compliers and noncompliers was the frequency of reported illness over the two year period. Women who adhered to the exercise program reported significantly less illness "~~emphasizing the fact that the limiting factors to physical activity~~

in this population may be quite different from factors limiting physical activity in the young" (Kriska et al., 1986, p.562).

Health Symptoms and Exercise Behavior

Although women are outliving their male counterparts by seven or eight years, aged women are vulnerable to one or multiple chronic conditions through much of the period of this extended life. A survey of Canadians in the mid-1980's found 55% of adults over 65 reporting arthritis/rheumatism, 39% reporting hypertension, 26% reporting heart trouble and 24% with respiratory problems (General Social Survey, 1985). "Normal aging" for elderly women typically follows this profile: almost half are physically limited in daily activity; 60% of women over 65 were screened out of random public physical fitness testing for reasons of health risk (Canada Fitness Survey, 1983); and 46% are institutionalized by age 85. Many are truly unfit and cannot complete even modified fitness tests of basic strength (O'Brien & Conger, 1988). This lack of basic strength is blamed for the majority of the falls experienced by one third of all adults over age 65 (Blake, Morgan, Bendell, Dallasso, Ebrahim, Arie, Fentem & Basse, 1988; Frontera & Meredith, 1989). One-third of women aged 65 years and up will have one or more vertebral fractures. As women survive into their eighties, one third are expected to experience a hip fracture (Nelson, Fisher, Dilmanian, Dallal, & Evans, 1991).

With widowhood, poverty and declining health as the norm for about half of all older women (Arendell & Estes, 1987), women over the age of 65 are more likely to report stress than men. Contributing to this stress are psychosocial

and physiological effects of motor-sensory deprivation due to physical inactivity (Winget & Derosha, 1986).

Marital Status and Exercise

An active life partner has been hypothesized to have a strong influence on the activity patterns of their mate. In 1976, Spreitzer and Snyder advocated a social learning perspective and suggested that the acquisition of the sport role resulted from exposure to role models and reinforcement from significant others. Using self-administered questionnaires with a systematic probability sample on 264 adults under the age of 61, these researchers found that female involvement appeared to be determined more by their spouses' degree of involvement than the extent to which women participated in their youth.

Having a spouse who is indirectly involved in sports tends to reinforce earlier encouragement from one's parents and to interact with perceived ability partly to explain the degree to which one is involved in sport as an adult. (Spreitzer & Snyder, 1976, p. 244)

Tait and Dobash (1986) claim that women consciously or unconsciously marry a male whose orientations in lifestyle are similar to their own. They suggest that "women who take part in sport perceive a very high degree of support from their nominated or significant male" (Tait & Dobash, 1986, p.268).

The relationship between marital status and cardiovascular risk behaviors was the focus of a study on 7,849 midwestern men and women (Venters, Jacobs, Jr., Pirie, Luepker, Folsom & Gillam, 1986). Separated or divorced persons reported higher levels of relaxation-enhancing behaviors such as smoking, drinking and higher levels of physical activity. Married men showed lower mortality rates over single men, but married women were not advantaged in this way over single women.

For women, "never having been married" was the most favourable status with respect to educational attainment and reported history of heart attack and stroke. Being married, or over the age of 40, were situations that were accompanied by less physical activity (Rudman, 1986).

Ishii-Kuntz (1990) studied the formal activities of elderly women and the determinants of their participation in senior's centers. Using a nation-wide probability sample of 1,051 women over the age of 65 (data collected in 1981), this research categorized variables as: "predisposing" (age, race, education, and marital status), "enabling" (income, employment status, health status, and transportation) and "need" (loneliness and living arrangement). The average age of the women were 73.2 and 62% were widowed. The major findings were that age, race and health status were influencing participation in voluntary organizations and senior centers. Elderly widows were more likely to participate in voluntary organizations than married women and loneliness had a positive impact on senior centre participation.

Motherhood, Children and Leisure-time Exercise

Motherhood and grandmotherhood are the most enduring social roles with which women identify (Moen & Huntington, 1991). Yet little research has examined the role of motherhood on women's exercise patterns in middle age and beyond. The number of children born, number of children raised in the household, the spacing of children, and the health of children cared for are plausible factors affecting women's leisure and physical activity patterns over much of the adult life course (Henderson, Bialeschki, Shaw, & Freysinger, 1990). The impact of family size on women's exercise patterns is likely to be a reflection of available leisure-time,

availability of financial resources and a mother's interest in being physically active in the play patterns of her family.

Leisure for women has been, and largely still is, home-based.

Since home is also a place, if not the place, of work for women, it is not surprising that work and leisure activities are often intertwined and indistinguishable (Henderson, et al., 1990, p. 10).

A Canadian time budget study by Shaw (1985) examined the distribution of leisure of 60 married women for a 48 hour period. While over 70% of gardening and animal-care chores were considered by the women to be leisure, only 4% or less of home chores and laundry were defined as leisure. Henderson and colleagues (1990) argue that women have typically been oppressed in most aspects of their lives, including leisure. Allen and Chin-Sang (1990) studied the meaning of leisure and work for 30 aging black women. When asked how their definition and experience of leisure had changed over the years, most women said they "had no leisure in the past" (p.737). Housework was clearly the predominant feature of their lives, but gardening was classified by many women to be a leisure activity. Even though housework may be the predominant physical activity for many women, Verbrugge (1986) has reported that homemakers are not particularly enthusiastic about their work compared to employed men and women. Furthermore, employed women usually liked housework less than their jobs.

An important example of family leisure is the holiday, at least for those who can afford it. Yet the family holiday is "often a breeding ground for arguments and family conflicts and where the domestic labour for women may actually increase..." (Deem, 1982, p.112). Leisure outside the home has often been viewed as something that mothers should willingly sacrifice.

As with today's contemporary women, even if pioneer women had been ~~physically inclined, traditional roles of child rearing, housekeeping and~~

domestic skills such as cooking and sewing, would have consumed much of their time and energy during their maternal years. Housewives with young children are likely to perceive little freedom in their lives because of constantly being "on call" (Meissner, 1977).

Children constrain women's leisure not just because of the considerable physical care required by babies and young children, but also because of their social and emotional needs. The responsibility of child care, which falls disproportionately to women in society, reduces women's leisure options and inhibits a considerable number of leisure activities... (Henderson et al., 1990, p.123)

Many pioneer women worked farmland or ranches or provided support systems for their husband's occupational pursuits. Home industry and responsibilities were often initiated in the adolescent years, no doubt heightened during the depression and war years, so that leisure-time physical activity may have been limited. Certainly the time required for skilled athletic development would not have been highly valued by society as the preferred way for average women to spend their time.

Women's time (each day and across their life span) was (and still is) perceived as time that could be interrupted for whatever needs or crises arose, particularly those needs related to the family, while the time of men was respected as private. (Henderson et al., 1990, p.25).

Deem (1982) has contended that leisure spaces are particularly difficult for women to find in their own home. When older, most females have established lifestyles without sport skills or habitual fitness activities, and the normal course of action is to taper activity in the later years, not increase it.

An interaction effect between income and number of children demonstrates the complexity of developing a simple understanding of exercise behavior and one's family situation (Fishwick & Hayes, 1989). This interaction effect indicates that as number of children increases for lower income persons, participation in individual physical activities decreases. For high income persons, participation

increases with more children. Women who have adequate financial resources may be better able to afford the time and cost of engaging in activities alongside their children. Children of middle class families may experience more instruction in lifelong activities such as tennis, swimming, skiing, skating, and golf. They, therefore, are in a better situation to participate in sports in which whole families can enjoy. Recent studies show, however, that parents typically pay less for their daughters' sports equipment, instruction, and training than for their sons'.

Work Role, Employment and Exercise

Changing patterns of activity involvement are thought to be the result of altered role transitions and altered opportunities across the life cycle (McPherson, 1984). Particularly relevant to leisure-time activity are the demands of an individual's employment and non-paid work. McPherson suggests that "the decisions concerning how to minimize costs and maximize rewards with respect to physical activity involvement are related to commitment, adherence, and the relationship between work and leisure and between work and family responsibilities" (1984, p.223).

Neither women's employment, nor domestic work role, have been studied extensively for their role in determining physical activity patterns. Life work is thought to be closely tied to level of education, marital status, number of children raised, health status, social class and so either types of work, as activity-promoting forces for women, are difficult to study in isolation. Morgan (1986) points out that it is physical activity of any kind, not athleticism, that is associated with quality and quantity of life. To date, no research on the

fitness and health outcomes of women's domestic and/or employment activities have been reported. However, employed women are apparently more physically active. Almost 60% of Canadian women in manager/professional occupations report they are active compared to only 44% of women in blue collar work (Government of Canada, 1984).

Recently, there has been information to suggest that employed women carry most of the domestic work load at home in addition to full-time engagement in employed labour. This means that leisure-time opportunities for employed women may be even more severely limited, and that opportunities for exercise may be lacking unless women undertake activity during their normal work day.

Fishwick and Hayes (1989) surveyed 401 adults aged 18 to 83 years of age to determine their involvement in recreational activities by age, race, gender and social class. In contrast to much of the literature, they found that women were not under-represented as leisure-time sports participants, but were vastly underrepresented as team sport participants possibly because time constraints made it difficult to schedule practices and games with other adults. In summary, Fishwick and Hayes emphasize that normative expectations channel women into "gender-appropriate" activities such as aerobics.

Steinhardt and Carrier (1989) have examined early and continued participation in a corporate work-site health and fitness program (Conoco Inc.). Using a broad array of variables representing socio-environmental factors, physical-behavioral factors and psychological factors, they obtained physiological and questionnaire data on 143 women aged 19 to 60 years old. They found younger employees were more likely to be "starters" in the program while those who adhered claimed more "attitudinal commitment" and perceived the health and fitness program was to be more convenient.

McPherson and Kozlik (1987) reviewed studies on Canadian leisure activities by age, and noted that participation rates drop severely after age 19 and again at age 64 - two points regarded as endpoints of labour force activity. At these transition points, men participated in sport activity to a greater degree than women, and rates of participation increased in a linear pattern with income and level of education. More study is needed to understand how paid work facilitates or undermines women's active leisure patterns, and how retirement from employment encourages or discourages future participation.

Socioeconomic Status and Exercise

Findings from Canada's Health Promotion Survey (1987) suggest that:

Canadians who rate their health as excellent are three times more likely to be in the highest income bracket than those who consider their health to be poor.

Canadians in the lowest income bracket are four times as likely to rate their health as only fair or poor as those in the highest income bracket.

However, direct information on the role of financial situation and older adult exercise is lacking. McDaniel (1989) points out that economic inequities tend to accumulate in old age and are exacerbated by a pension system that is not workable for many women. More research will be needed to tease out the interwoven elements of socioeconomic status, gender, educational level, occupational level and race which, in various ways, are likely to limit lifestyle choices, activity patterns and outcomes of good health.

SOCIALIZATION THEORY

In this section, discussion continues on the situational determinants of exercise. Socialization Theory is presented with particular attention paid to the situation of childhood and how experiences and opportunity may lead to early mastery and movement confidence. Because child socialization and child efficacy for physical skill are historical variables, for the purpose of this study, they are considered to be unalterable characteristics or "situational variables".

"Social system theories" reflect the dynamic interaction between society and individuals (McPherson, 1990). General sociological theory advocates the importance of social structure, social processes, social roles and the effect of the environment on human behavior (George, 1985).

Socialization is a lifelong process that enables an individual to participate in a society...Socialization is both a process and a product. As a process, socialization involves learning skills, traits, knowledges, attitudes, language, beliefs, norms, values and shared behavioral expectations associated with present or future roles. The process may vary because of such factors such as gender, socioeconomic status, community or ethnic differences, cultural differences, and individual differences in the lifestyle and values of socializing agents. (McPherson, 1990, p. 130)

One of the most significant social roles affecting human behavior is that created by gender. A wealth of evidence exists to suggest that males and females are socialized very differently from an early age, particularly with respect to aggressive play and choice of toys. Traditionally, females have had little encouragement to engage in vigorous and challenging forms of physical activity and sport (Lirgg & Feltz, 1989; Mangan & Park, 1987; Vertinsky, 1991). Females, from birth to death, have been socialized to be more passive physically, and in particular, are lured away from aggressive forms of sport (Zoble, 1973). Wakat and Odom (1982) note that "although infant males and females start out with roughly the same physical capabilities, they soon begin to experience different

courses of development, as set down by society according to what is appropriate for little boys and what is appropriate for little girls" (p.34).

Media interest and the public popularity of contemporary male professional sport heroes attest to important differences in gender support for physical activity which still persist today (Cole, 1991; Kane, 1989). Hall (1976) reports that women's attitudes toward activity are generally favourable, and concludes that socialization and opportunity are therefore most responsible for the inadequate participation of females.

Apparently, contemporary females still experience considerable role conflict in certain athletic settings and that the female in sport is still considered to be in man's territory (Csizma, Wittig, & Schurr, 1988). Since the 1970's, sport sociologists recognize that physical activity and sport are used as an important medium in which males are "masculinized" (DiIorio, 1989; Hall, 1985; Theberge & Donnelly, 1984).

Hauge (1973) wrote an early review paper of the influence of the nuclear family on female sport participation. She raised the possibility that a propensity toward tomboyish behavior might be affected by sibling order, family size, parental modelling, and childhood opportunity. As important as the family in socializing young people, is probably their school experience. Vertinsky (1992) presents a thorough summary and discussion of the challenges and opportunities physical educators face in providing gender equity in contemporary school settings. Thus with strong social forces operating at school and in the home, the socializing determinants for physical activity participation are highly likely to be different for men and women.

In addition to gender, age is another socializing force affecting human ~~behavior, and notably physical activity behavior.~~ For example, being old in the

1990's is the present identity of a particular social group who have experienced a certain social orientation to life and look upon retirement as "a well-earned rest". Furthermore, social stereotyping or "ageism" dictates late life expectations and behavior (Achenbaum, 1986; Palmore, 1990). Fraser (1989) has found that many disease processes such as hearing loss, vision loss, shortness of breath and joint immobility are simply accepted by many elderly as "normal aging".

Socialization theory, therefore, recognizes ageist practice as a social construction whereby adults are reinforced for more passive roles and age-expected behaviors (McPherson, 1990; Ostrow, 1982; Ostrow & Dzewaltowski, 1986; Teague, 1987), for learning helplessness (Brown & Inouye, 1978) and carrying out a self-fulfilling prophecy of age decline, frailty and illness (Edgerton, 1986; Waxler, 1980). Chronological age can therefore be hypothesized to play a role in explaining physical activity, exercise and sport behavior.

One's personal circumstances and socializing experiences are likely to play an important role in determining how active one would want to be over the life course (Labonte, 1983; Rudman, 1986). Sport socialization theory more specifically recognizes that individuals are socialized differently in physical activity settings often starting at a very early age. A number of studies support the hypothesis that early experiences in childhood physical activity create advantages for adult participation later on (Butcher, 1983; Dishman & Dunn, 1988; Howell & McKenzie, 1987; Spreitzer & Snyder, 1976; Powell & Dysinger, 1987; Sofranko & Nolan, 1972). Adams II and Brynteson (1992) reported that middle-aged adults exercised more frequently, and held higher health value for exercise, if they had simply more hourly exposure to physical activity training as college students. ~~Howell and McKenzie (1987) found varsity and nonvarsity sports~~

participation in highschool increased adult sports involvement for both men and women.

At least two studies do not support the early socialization hypothesis (Adams & Brynteson, 1992; Steinhardt & Carrier, 1989). Dishman and Dunn (1988) warn that the "available evidence on the relationship between childhood and adulthood exercise patterns is not compelling" (p. 186) because the associations come exclusively from cross-sectional and retrospective surveys with adults and is limited to sport and physical education experiences.

The Significance of Socialization for Childhood Physical Activity

A collection of studies have identified relationships among childhood activity opportunities, perceived physical ability and social support by one's parents, peers, male siblings, teachers (Greendorfer, 1983; Griffin, 1982; Weiss & Knoppers, 1982; Wood & Abernathy, 1989). Research indicates that physical play and recreation during childhood contributes to an awareness of one's physical world and enhances the ability to manipulate and control one's surroundings (Lewin & Olsen, 1985, p. 216).

Moore and colleagues (1991) researched the relationship between activity levels of parents and those of their young children aged four to seven. Caltrac accelerometers monitored children, mothers and fathers for more than ten hours per day for about eight days. Children of active mothers were 2.0 times as likely to be active as children of inactive mothers. The relative odds of being active for the children of active fathers was 3.5. When both parents were active, the children were 5.8 times as likely to be active.

Possible mechanisms for the relationship between parents' and child's activity levels include the parents' serving as role models, sharing of activities by family members, enhancement and support by active parents of their child's participation in physical activity, and genetically

transmitted factors that predispose the child to increased levels of physical activity. (Moore, Lombardi, White, Campbell, Oliveria, & Ellison, 1991, p.215)

Boutilier and San Giovanni (1985) summarize a number of studies which support the important role of early childhood physical activity in the development of role play, sense of group membership, fitness and motor skill, bodily awareness and improved self-concept. Although sex differences in motives for participation have been identified, with boys placing more emphasis on achievement, rewards and status, generally the motivational differences for boys and girls may no longer be so great (Gill, Gross, & Huddleston, 1983).

Powell and Dysinger (1987) reviewed the available literature on the association between childhood and adult physical activity patterns. In summarizing the available studies, they felt that the Harvard alumni study, which connected college sport to current activity patterns and absence of coronary disease (Paffenbarger, Hyde, Wing & Hsied, 1986), provided the strongest evidence supporting an association between youth and adult activity in males.

Butcher (1983) examined three categories of variables which influenced 661 adolescent girls: personal attributes, socializing agents, and socialization situations. For competitive interschool teams and intramural activities, certain personal attributes (movement satisfaction and self-confidence, independence, and assertive self-description) were most important. For community-organized activities, socializing agents (parental influence) and socialization situations (socioeconomic status) were most influential, while for the total activities participated in, the amount of sports equipment was crucial. Butcher noted that by Grade 10 there was a noticeable drop in girls' school physical activity participation, but not so in physical activity in the community setting. Three

types of social influence were family (parents and siblings), peers, and teachers or coaches.

The physical education teacher is better qualified than most to open the path towards successful ageing to individuals and society with their work. Should not the physical education teacher also learn and teach how sport activity is to be adapted not only to the immediate but also to the long-term interests of the individual! (Meusel, 1991, p.16)

Spreitzer and Snyder (1976) developed a path analysis model of early sport socialization from self-administered questionnaires on a middle aged population of 110 women and 154 men (mean age = 42 years), and an average education level of 13 years. From seven predictor variables, 46% of the variance in sport involvement in men and 40% of the variance among women was explained. From the results they formed a causal framework stated as follows:

Parents (especially the father) who are interested in sports tend to encourage their offspring to participate in sports, which markedly increases the likelihood of a youth's participation in sports. One's participation as a youth markedly affects how one perceives his/her athletic ability. This perception, in turn, has a strong impact on the degree of adult participation in sport. (Spreitzer & Snyder, 1976:244)

Howell and McKenzie (1987) found that participation in high school athletic programs was related to team sport activity later in adulthood with some gender differences. The effects of high school varsity sport experience on late life sport involvement was greater for men than for women, a finding similar to that of Spreitzer and Snyder (1976) who obtained a correlation of .25 between youth and adult sport involvement for males, but no relationship at all for females.

An interesting finding comes from Steinhardt and Carrier's (1989) study of men and women attending a health and fitness program in a large corporation. Their findings contradict research that indicates youth participation has positive effects on initial participation in a work-site program. Instead they found that the individuals who were among the first to participate in the

corporate fitness program appeared to have been sedentary as youth. They suggest "that those individuals who were active as youth may be less attracted to an organized program or perhaps less dependent on an organized program to exercise" (Steinhardt & Carrier, 1989, p. 123).

Childhood Situation: Opportunity, Mastery, Movement Competence

Growing evidence suggests that physical mastery, or an individual's self-concept of physical ability, may be the most important determinant of both affect and expectancy, and therefore, an important mediator of human motivation and movement behavior (Roberts, Kleiber & Duda, 1981). Evidence is lacking, however, at what stage in human development the self-concept of movement ability must be realized to be incorporated into one's identity.

Positive and early experiences with physical activity and sport seem to be important in some cultures. Raivio (1986) reports that interviews with Finnish female sport administrators, aged 29 to 60, indicate a similar childhood background; all ten women had mainly participated in outdoor activities with both boys and girls, and all but one had had a parent or close relative encouraging their participation in physical activities. Morgan (1986) found that former male highschool athletes reported significantly more positive attitudes towards activity and their estimation of personal physical ability in young adulthood, yet were not necessarily more active than former non-athletes. He concluded that former athletes appeared to base their subjective judgements of physical ability on an earlier reference point. Furthermore Morgan notes that former athletes still regarded themselves as athletes.

Dishman (1990) claims that organized sport experience in one's youth might contribute "knowledge, skills, and predispositions useful for activity in later

years and is amenable to large-scale public intervention" (p. 81). Thus, a causal relationship between skilled participation in childhood and adult activity would have strong implications for public health (Dishman, 1990). Yet no prospective study has been conducted to specifically show this relationship; prospective studies of childhood sport or physical education as a determinant of contemporary adult activity have not been reported. Rather, the numerous cross-sectional and retrospective studies that link youth sport history with contemporary physical activity must be viewed with caution. Thus, the question of whether physical activity determinants for the individual who begins habitual activity at middle age are the same as those of a person who was active since childhood remains unclear.

Research is consistently finding that perceived competence in physical skills is an important influence on the participation and motivation of children in sport contexts. Young participants in organized sports are found to have higher perceived competence, more persistence and higher expectations for future success than non-participant children (Roberts, Kleiber & Duda, 1981). Self-efficacy ratings and experience level in gymnastics were significant predictors of the actual success of boys aged 7 to 18 in competitive gymnastics settings. There is preliminary evidence that mastery of high-risk sport skill may even generate increased self-efficacy for other physical and social tasks (Brody, Hatfield & Spalding, 1988).

Yet what children say and do in the physical education setting may be highly sex-differentiated and a subtle socialization is part of a "hidden curriculum" (Griffin, 1982, p.84). Boys limit girls' opportunities to learn physical skill, and hence undermine their future confidence by hassling them, and interfere with ~~their own learning by clowning around.~~

Similarly, family members are thought to be powerful determinants of the activity behaviors of children. Parents, in particular, are key role models and may at first support the athletic achievements of a daughter. But "when parents decide that sport achievement is a threat to her social life and eventual marriage, they push the feminine role" (Hauge, 1973, p.19) to be more competitive in the social setting. There is a tendency for like-sexed parent to have more influence on a child's involvement than does the opposite-sexed parent (Snyder & Spreitzer, 1973). Years ago, Koch (1956) reported that girls with brothers more than two years older had a tendency to be tomboyish. Petruzzello & Corbin (1988) also advocate that experience and gender are important determinants of performer confidence. They conducted two studies on college-age males and females which indicated that even on gender-neutral motor tasks, females rate themselves with significantly lower levels of confidence. They concluded that the greater experiences and social rewards for males in physical activity raises their expectancies for success on new tasks.

It becomes increasingly clear that experience affects self-confidence. Successful experiences/mastery attempts can serve to enhance self-confidence. As such, the more experience one has at a variety of tasks in a variety of physical situations, the greater the possibilities are that self-confidence can be generalized to more situations. (Petruzzello & Corbin, 1988, p.182)

The construct *movement confidence* was employed for predicting children's physical performance and play decisions. Griffin and Keogh (1982) developed a working model which describes "movement confidence as both a consequence and a mediator in an involvement cycle" (p.213). Movement confidence was defined as an individual feeling of adequacy in a movement situation.

The confidence or assurance with which an individual approaches a movement situation should be an important determinant of what an individual will choose to do and how adequate the movement performance will be. (Griffin & Keogh, 1982, p.213)

The Griffin and Keogh Model of Movement Confidence assumes that a cognitive evaluation of self in relation to the perceived demands of a task is an antecedent to confidence. Utilizing a Movement Confidence Inventory (MCI), Griffin, Keogh and Maybee (1984) studied perceptions of movement confidence of 450 college-age students for performing 12 different movement and sport related tasks. In that study it became clear that movement competence was not a lone predictor of performance confidence; rather, it was accompanied by perceptions of potential pleasant and unpleasant movement experiences.

A playground movement confidence inventory (PMCI) and a stunt movement confidence inventory (SMCI) were developed to identify children who may be in need of special assistance in learning sport and physical activity (Crawford & Griffin, 1986; Griffin & Crawford, 1989). Griffin and Crawford (1989) noted that level of confidence varied according to the nature of the specific task and context. The Stunt Movement Confidence Inventory was able to reliably discriminate between high- and low-confidence children aged 9 to 11 on six "stunting" tasks.

The next major section to be addressed in this literature review introduces four prominent theories which have demonstrated utility in predicting health behaviors. The four theories are: The Health Belief Model, Health Locus of Control Theory, the Theory of Reasoned Action, and Social Cognitive Theory. The chapter concludes with the literature pertaining to the specific constructs of Social Cognitive Theory and their relationship to exercise behaviors.

BEHAVIORAL HEALTH PSYCHOLOGY PERSPECTIVES

Behavioral research in health psychology is concerned with attitudes and behaviors of adults regarding their health and independence. Some health professionals suggest that individual knowledge and beliefs about one's world are the main controlling determinants of one's behavior.

Research is needed on how health attitudes and behaviours are acquired, are affected by daily living, change as people grow older, and can be modified as scientific knowledge advances. (Health & Welfare Canada, 1990, p. 4)

Rosenstock's Health Belief Model is prominent in representing this second stance in many contemporary health behavior change studies⁶.

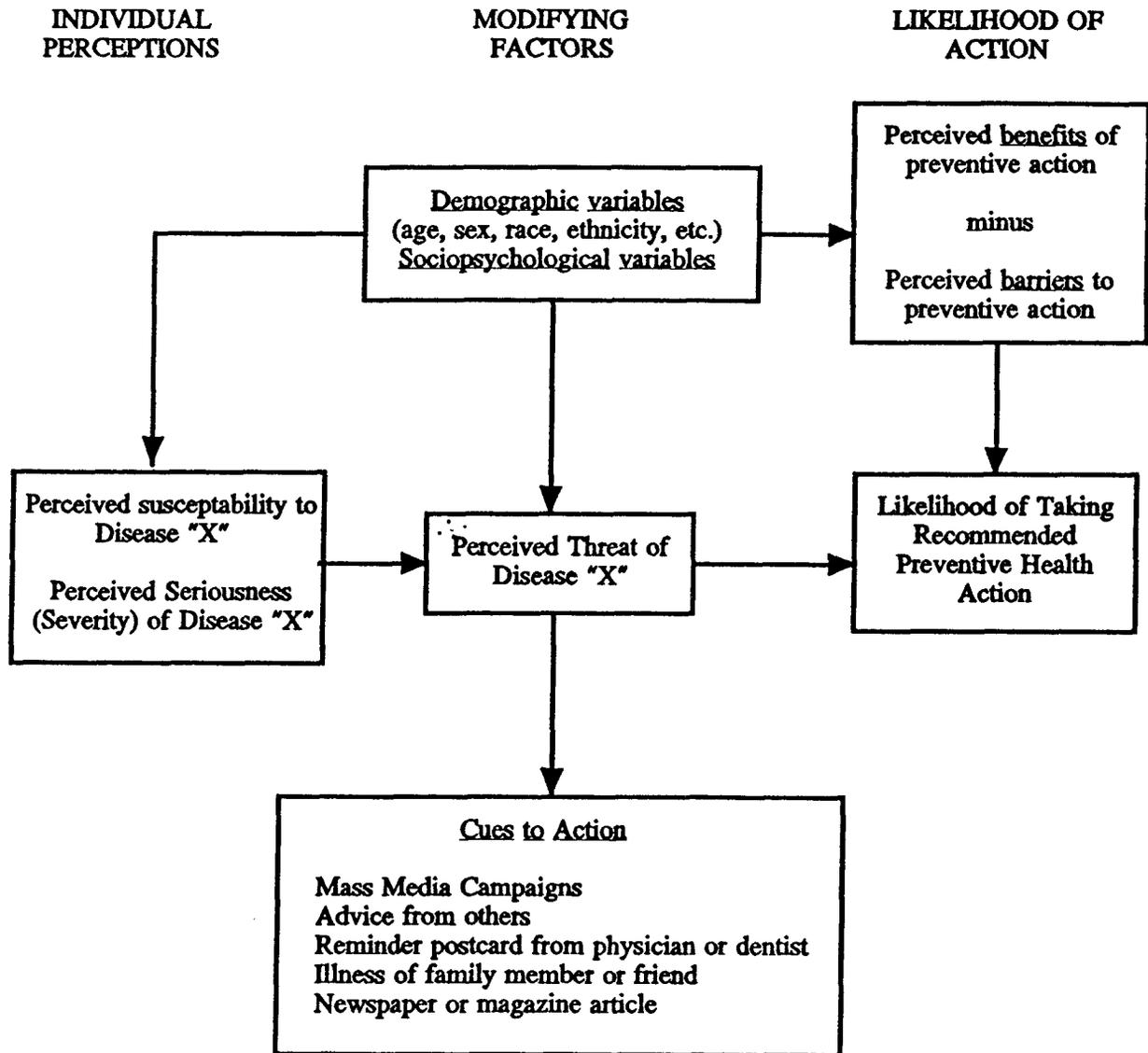
THE HEALTH BELIEF MODEL

The Health Belief Model (HBM) of Rosenstock, Strecher and Becker (1988) defines health behavior as "any activity undertaken by a person who believes him/herself to be healthy for the purpose of preventing disease". The model highlights cognitive mediating processes through an emphasis of the role of subjective beliefs or expectations held by the individual.

According to Rosenstock (1974) and Becker (1974), health-related action depends on individual perceptions about perceived susceptibility to a specific disease and perceived severity of the disease, environmental modifying factors such as cues to act, and likelihood of action based on perceived barriers and perceived benefits of taking preventive action (Figure 2.0).

⁶ A review of the role of self-efficacy in achieving health behavior change is provided by Strecher, DeVellis, Becker, & Rosenstock, 1986).

Figure 2.0 Basic Elements of the Health Belief Model



The Health Belief Model has served as a conceptual core for many compliance studies and has predicted health, illness, and sick-role behavior. Health beliefs have been positively associated with exercise adherence in older adults when there is more knowledge about the exercise regimen (Tirrell & Hart, 1980) and when individuals are knowledgeable about their actual health situation (Rakowski, 1984).

Janz and Becker (1984) report on a comprehensive review of 29 health-related investigations utilizing the Health Belief Model. Summary results provide substantial support for the HBM, with "perceived barriers" and "perceived benefits" proving to be the most powerful HBM dimensions in demonstrating associations with behavior.

There are a number of conceptual difficulties and inconsistencies associated with the Health Belief Model. First, health beliefs are understood to be a reflection on how knowledgeable people are about the consequences of their health behaviors. Blumenthal (1983) has acknowledged that the sole basis of evaluating people's beliefs is to assess their biomedical knowledge. Thus health beliefs based on personal experience, or beliefs based on social, psychological, and cultural foundations may be good predictors of behavior but are rarely examined. Kirscht (1974) was troubled by the fact that "supporting evidence for the utility of the Health Belief Model has come primarily, but not exclusively, from retrospective studies, and with reference to preventive behaviors (Kirscht, 1974, p.455). Yet, the Health Belief Model rests on the notion of beliefs causing behavior -- a time order sequence that is not often addressed in the research.

The Health Belief Model hinges on an individual's *perceived susceptibility* to a disease occurrence (Rosenstock, 1974). Yet some research suggests that ~~health beliefs are more predictive of health protective behavior in the well~~

elderly who perceive lower susceptibility to risk or health threats (Lindsay-Reid & Osborn, 1980; Segall & Chappell, 1989). These views do not support the Health Belief Model's readiness to act because of recognition of an illness threat (perceived susceptibility).

Perceived severity of a health problem is another belief assessed by the Health Belief Model; the original HBM has a disease-avoidance orientation. Individuals who are emotionally aroused by the provision of knowledge about the severity of their condition are predicted to initiate or adhere to preventive health practice. There are, however, potential shortcomings in using threat or knowledge of threat to promote health practice. Gintner, Rectanus, Achord, and Parker (1987) found that attendance at a blood pressure screening was cut in half when an illness-threat format was used to motivate participants. Participants were more likely to attend the screening when a wellness appeal was presented.

The structure and reliability of eight health beliefs were examined by Jette, Cummings, Brock, Phelps, and Naessens (1981). They identified six general health threats, perceived severity of five conditions, four perceived barriers to taking medications, four questions measuring general health concern, three items assessing trust in physicians, three items of perceived susceptibility, three items on perceived health status, and two questions about health locus of control. Factor analysis revealed that condition-specific measures of perception of susceptibility and severity and situation-specific measures of perceived barriers were empirically distinct from general measures of these beliefs. Their findings supported the theoretical assumption that HBM dimensions were sufficiently distinct to be considered deferent beliefs, but warned against mixing specific and general questionnaire items within the same index.

Norman (1985) reviewed over 600 research articles in an effort to determine what is known about people's health habits and practices. He states,

No one factor has been found to provide a sufficient basis for predicting health behaviour. People's health habits and practices are often daily actions which have been influenced by a host of cultural, social, psychological and biological factors. (Norman, 1985, p.3)

Norman claims that while knowledge and beliefs about the health consequences of behavior may have some impact on the way in which people behave, they do not, on their own, provide a strong basis for preventive health activities. This is because "it is an enormously complex task to present people with information in a way that will lead them to change their health beliefs" (p.3). Norman suggests that health education initiatives may well be futile considering the discrepancy between people's health beliefs and their actual behavior. His scepticism about altering people's beliefs in the hopes of altering their behavior mirrors the findings of Haefner and Kirscht (1970) who found that merely changing the participants' beliefs about health was not enough to alter behavior.

To date, little theoretical guidance has been given to the prediction of older adult exercise behavior, but two prominent theories have been explored (Dzewaltowski, 1989a, 1989b; Dzewaltowski, Noble & Shaw, 1990).

HEALTH LOCUS OF CONTROL THEORY

The third theory in behavioral health psychology which is potentially able to predict late life exercise behavior is the Health Locus of Control Theory. Rotter (1954, 1966) contends that a person learns or is conditioned operantly on the basis of his or her history of positive or negative reinforcement. The person also develops a sense of internal or external locus of control. Those with an ~~internal locus of control are more likely to self-initiate change, whereas those~~

who are externally controlled are more likely to be influenced by others. Therefore, locus of control refers to an individual's perceived influence in regulating outcomes.

Wallston and Wallston (1978) proposed that an individual's sense of control varies by domains of experience and actions, such as health experiences. **Health Locus of Control (HLC)** is defined as perceived control over one's health. "Internal" locus of control refers to perceptions that a health outcome is due one's personal actions, while "external" locus of control refers to perceptions that a health outcome is due to chance, external factors or the actions of others (Kist-Kline, 1989; Wallston & Wallston, 1978).

According to Health Locus of Control Theory, individuals exhibiting more control over their health (internals) would be more likely to be participating in health-promoting behaviors such as physical activity. Many studies have found that participants who claim to be more physically active tend to be more internally controlled (Bonds, 1980; Carlson & Petti, 1989; Kleiber & Hemmer, 1981; Lumpkin, 1985; Moore, 1980; O'Connell & Price, 1982; Perri & Templar, 1984-1985; Sonstroem & Walker, 1973). Internality may be found especially if they are in team sports (Lynn, Phelan, & Kiker, 1969; Kleiber & Hemmer, 1981). Health Locus of Control has only modest associations with exercise (Calnan, 1988; McCready & Long, 1985), specifically free-living physical activity (Dishman & Steinhardt, 1990). Sometimes health locus of control is not predictive at all of health behaviors (Calnan, 1988) or exercise behavior (Blair, Kohl, Pate, Blair, Howe, Rosenberg, & Parker, 1980; Dishman & Gettman, 1983; Kaplan, Atkins & Reinsch, 1984; Laffrey & Isenberg, 1983).

People who believe in chance tend to be older (Calnan, 1988; female (Calnan, 1988), less educated (Boyle & Sielski, 1981), and in manual occupations (Calnan,

1988). Recent research suggests that as soon as people learn that their health has deteriorated, they also exhibit more external perceptions of control (Waller & Bates, 1992). This loss of a sense of personal control for both success and failure is associated with depression (Mirowski & Ross, 1990).

THEORY OF REASONED ACTION

One prominent theory is Ajzen and Fishbein's Theory of Reasoned Action (1977, 1980), recently revised as the Theory of Planned Behavior (Ajzen, 1985; Ajzen & Madden, 1986). The formation of "intention" to act is central to this theory. According to this model, an individual's intention to perform a given behavior is a function of attitude toward the behavior, and normative beliefs about what relevant others think one should do, weighted by personal motivation to comply with those relevant others. Behavioral intention is viewed as a type of expectancy and is indicated by the person's subjective probability that she will perform the behavior in question.

In regard to predicting exercise intentions, the theory has been more useful in explaining exercise intentions in males (Godin & Shephard, 1987), in explaining exercise behavior compared to Kenyon's Attitudes Towards Physical Activity inventory (Godin & Shephard, 1986), but "has not identified a predominant cognitive profile of those who intend to exercise" (Godin, Shephard, & Colantonio, 1986). Riddle (1980) obtained success with Fishbein's model obtaining a high correlation ($r = .82$) between jogging behavior and further intention to exercise. However, Riddle noted that her most important finding was that "joggers had stronger positive evaluations of the beneficial consequences of regular jogging" while nonexercisers "were not as convinced" (p. 673). The

importance of these perceptions about the "consequences of exercise" is that "consequences" is not a theoretical element in the theory of reasoned action, but rather matches a component called outcome expectations in Social Cognitive Theory. Furthermore, recent attempts have been made, with some success, to improve the Fishbein-Ajzen model by adding the self-efficacy component of Bandura's Social Cognitive Theory (de Vries, Dijkstra & Kuhlman, 1988; Wurtele & Maddux, 1987). This new work has found that "self-efficacy has also a direct effect on behavior after controlling for intention" (de Vries, et al., 1988, p.273).

SOCIAL COGNITIVE THEORY

Social Learning Theory

Although Social Cognitive Theory arose from a behavioral psychology perspective, the theory incorporates important features related to socialization. Perry, Baranowski and Parcel (1990) trace the 50 year history of social learning theory noting that Miller and Dollard (1941) originally introduced Social Learning Theory to explain imitation of behavior among animals and humans. Rotter first applied early social learning principles to clinical psychology (1954), which in turn led to his development of the idea of "generalized expectancies of reinforcement" (1966).

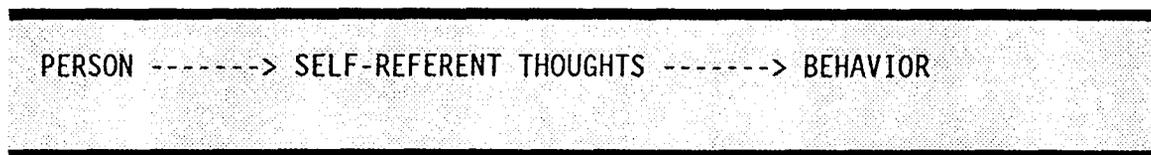
Building on Rotter's social learning theory, Bandura is credited for the contemporary development of Social Cognitive Theory (1977a, 1981, 1982, 1986, 1989; Bandura & Cervone, 1986; Bandura & Schunk, 1981). Social Cognitive Theory continues to evolve as a broad conceptual domain that incorporates many theoretical ideas and is employed by many areas of practice. Thus, with such

diversity, abuse is possible. Perry and colleagues (1990) point out a theoretical pitfall of research using SCT; that pitfall is "one concept was often explored while the others were excluded completely" (Perry et al., 1990, p. 180). For example, the concept of internal and external locus of control dominated social learning research at one time. Bandura stated that self-efficacy may be the single most important factor in promoting behavioral change. The emphasis on a single variable oversimplifies reality but is "a reflection of the structure of experimental research, which usually permits analysis of only a few variables at a time" (Perry et al., 1990, p. 180). Clearly, research which examines all of the main constructs of Social Cognitive Theory should be encouraged.

The Constructs of Social Cognitive Theory

Originally, social learning theory emphasized the role of self-referent beliefs or subjective expectancies held by the subject. Beliefs or subjective expectancies about the possibilities and consequences of personal action were considered to be the key mediating forces between a person and a specific behavior (Figure 2.1).

Figure 2.1 Basic Elements of Social Learning Theory



Recent years have witnessed a resurgence of interest in the study of self-referent phenomena. Bandura (1989) points to several reasons why self-processes have come to pervade many domains of psychology.

Self-generated activities lie at the very heart of causal processes. They not only contribute to the meaning and valence of most external influences, but they also function as important determinants of motivation and action. (Bandura, 1989, p.1175)

According to SCT, individuals' beliefs of self-efficacy are central to their decision to participate in physical activity. Efficacy expectations are defined as a person's judgements of their capability to organize and execute their skills and resources and that of the environment to perform an action that will lead to a designated outcome (Bandura, 1977, 1986). Specifically Bandura's theory claims that human action is guided by a core set of four beliefs: motivation to obtain a goal (Incentive to Act), beliefs that a certain behavior will be beneficial in reaching a goal (Outcome Expectations), a belief in one's ability to perform the action (Self-Efficacy), and finally, a perception that the action will be endorsed or "positively reinforced" (Social-Environmental Cues). Thus the four expectancies encompass internal and external factors that may affect individual behavior. In contrast, perceived behavioral control (in the Fishbein-Ajzen model) and perceived barriers (in the Health Belief Model) are assumed to reflect external factors (availability of time, facilities etc).

Exercise behavior, using a social cognitive perspective, is predicted to occur when an individual:

- 1) Highly values the outcomes of physical activity,
- 2) Perceives that specific forms of physical activity will lead to health benefits and that harmful outcomes are not likely,
- ~~3) Believes that they are physically able to do the specific activity, and~~

4) Perceives that they will be socially reinforced for participating.

To the extent that individuals "learn" what to value, what is risky for them, how competent they really are, and how much endorsement society will offer for their activity, SCT beliefs indirectly reflect the socio-environmental milieu, cultural learning, and past experiences of the individual. But individuals are not considered to be passive recipients of environmental influence. Inherent in SCT is the idea that people self-regulate their environment as well as their actions.

Bandura has described the nature and function of human agency as a "conceptual model of triadic reciprocal causation" (1986, p. 1175), also known as "reciprocal determinism" (Perry et al., 1990, p. 165). Self-functioning is viewed as a continuous interaction between environmental factors, beliefs and behaviors (Bandura, 1986) (Figure 2.2). The interaction is such that a change in one has implications for the others. According to SCT, the environment provides the social and physical situation within which the person must function and thus also provides the incentives and disincentives (expectancies) for the performance of behavior.

Figure 2.2 Bandura's Concept of Reciprocal Determinism



The Cognitive Determinants of Exercise: SCT

Self-referent perspectives are important to understand because attitudes, opinions and beliefs are formative and modifiable (Dishman, 1990). Health promotion initiatives and program experiences can profoundly and quickly transform individual perspectives and behavior and are claimed to have a significant impact on mortality outcomes even after age 70 (Kaplan, Seeman, Cohen, Knudsen & Guralnik, 1987).

Conceptual models to understand and explain the diverse determinants for participation in physical activity and exercise in the elderly are relatively undeveloped. Motivational theories which have had some success are now being combined for further strength in prediction (Sharpe & O'Connell, 1992). Incentives, attitudes, beliefs, expectancies, perceived barriers, cues to act, and self-perceptions are among the most common constructs used in contemporary theoretical models. Even in younger adult groups where there has been "a remarkable growth in applied interest about exercise adherence, the development of conceptual models leading toward a motivational theory of habitual physical activity has lagged far behind" (Dishman, 1988). In the forthcoming section, key studies pertaining to the cognitive elements of Social Cognitive Theory as applied to exercise behavior are reviewed. Earlier in this chapter, theoretical models which utilize these cognitive elements are addressed in detail. In Chapter 3, justification is made for the utility of Social Cognitive Theory in the explanation of older adult exercise behavior.

Incentives or Motives to Exercise

Developing an understanding about the mechanisms underlying exercise participation at every life stage poses a challenge. Many studies on motivation and exercise have concentrated on adherence, or the problem of keeping participants exercising once they have started. Less has been studied on the reasons why people start exercising, and little information is available on the motives behind the initiation or resumption of exercise regimens of older adults.

Despite a remarkable growth in applied interest about exercise adherence, the development of conceptual models leading toward a motivational theory of habitual physical activity has lagged far behind. (Sonstroem, 1988, p.123)

Sonstroem (1978) advanced one of the first models for prediction of exercise involvement. Key to his theoretical model, was the notion of "self-esteem". In predicting exercise participation, his model posits that self-perceptions of physical ability (Estimation) influence an individual's interest in physical activity (Attraction) and that Attraction provides the greater influence on exercise participation. Although Sonstroem's model has enjoyed only limited success in explaining the activity patterns of high school boys, it provides some important information: that is, people who are motivated to be more active will likely turn to those activities to which they are attracted, in which they feel competent and confident and through which their self-esteem is likely to be maintained.

But there are many participatory motives that could apply with older adults. An individual may seek exercise as a way to relieve boredom or stress and get out of the house, to socialize, to have fun, to maintain or learn physical skills, to follow doctor's orders, to demonstrate self-discipline, to experience

competition or self-measurement, to promote beauty and/or to obtain health and fitness benefits. Some research suggests that motives may differ by gender.

Finkenbergl (1991) used Kenyon's Attitudes Toward Physical Activity Scale and found, in college students, that males were significantly more motivated to exercise for competition, while females were more motivated to exercise for health and fitness. Similarly, O'Brien and Conger (1991) have found that older men and women participating in the Alberta Seniors Games seemed to be motivated by different expected outcomes. Male participants admitted they enjoyed maintaining a degree of public acclaim for sustaining their physical prowess into old age. In contrast, older women said that sport participation promoted their health and personal independence so that they could sustain more active caregiver roles within their families.

Godin, Shephard and Colantonio (1986) focused their study on middle-aged employees who expressed a willingness to exercise but actually did not exercise. The overall findings identified surprisingly little difference between cognitive profiles of inactive and active adults. Individuals who had intended to exercise, but didn't exercise during the two month period of the study, differed from fellow exercisers in perceiving a problem with "lack of time", and believing that exercise required more effort and provided less health value. The researchers suggested that motivation might not be the limiting factor for many inactive people; sedentary intenders might simply be confronted with more social and environmental constraints than those who are active. However, lack of leisure time as a barrier to exercise, does not seem to rank high among many aging adults, most of whom are retired.

Health as Incentive to Act

Of interest to this research is the expectancy of gaining health from participation in physical activity. The value of an expectancy is an important construct in Social Cognitive Theory and is seen as a key motive or incentive in explaining human behavior. Thus, health as an expected outcome of participation in physical activity must be valued in order to be considered to be an incentive. That is, those individuals who place a high value on maintaining their health, and who understand the role of regular moderate exercise in maintaining health, would be hypothesized to be more likely to be exercising. There is scant evidence to support this hypothesis. The Campbell's Survey (Stephens & Craig, 1990) reports that, by age 65, less than half of Canadian adults judged physical activity as very important to their health. In regard to their personal health promotion,

females attach more importance than males to all factors, especially body weight, a good diet, and rest and sleep, with *only one exception*: regular physical activity. (Craig & Stephens, 1990, p.43)

Karen Altergott, editor of Daily life in later life (1988), includes a chapter titled "Life course and the daily lives of older adults in Canada" written by Zuzanek and Box. They claim that, as a result of retirement, older Canadians gain approximately 38 extra hours of disposable time per week.

Paradoxically, although older adults possess greater amounts of free time, their rates of participation in leisure activities, and the number of leisure activities they engage in, decline after retirement. (Zuzanek & Box, 1988, p.153)

Substantial participation declines are noted to occur in the post-retirement period in sports, sport spectatorship, and outdoor recreation (especially for women), while activities affected little, or even slightly expanded, are visiting, reading, radio listening, watching television, playing cards, hobbies, pleasure driving, and physically less demanding forms of outdoor activities such

as walking. These, then, are the activities which appear to most interest older adults. Upon scanning the main activities chosen by seniors, few appear to have been chosen for their "health value".

Rather, the recreational activities of the older Canadians often seem to have been selected instead for their social and entertainment value. Thus one might question the assumption that health value acts as an "incentive" in explaining older adult involvement in physical activity. First, many older adults may not be aware of the health-promoting effects of exercise participation. Second, older adults may see less relevance to sustaining or taking up health-promoting activities as age advances, particularly if they believe that such efforts are only likely to contribute to short-term gains. They may indeed feel that their "life time" is running out and they are too late to realize any significant gains from serious participation in physical activities (O'Brien & Conger, 1991). They may feel that the finite life-span may cut short the fruits of long-term gains from an exercise program, and thus undermine perceptions of "health value" to be gained from regular exercise participation. Perhaps there comes a point in the life course when people stop doing "the right thing", because they perceive that life will soon end anyway. In those circumstances, older adults may be motivated to undertake activities primarily for pleasure and entertainment.

Outcome Expectations

Expectations about positive or negative consequences (benefits or risks) are important to the actions taken by individuals according to both Social Cognitive Theory and the Health Belief Model. The ability to envision the likely outcomes

of prospective actions is one way in which anticipatory mechanisms regulate human motivation and action. "People strive to gain anticipated beneficial outcomes and to forestall aversive ones" (Bandura, 1989, p.1180). However, the effects of outcome expectancies on performance motivation are partly governed by self-beliefs of efficacy. In activities in which the level of competence dictates the outcomes, the types of outcomes people anticipate depend largely on their beliefs of how well they will be able to perform in given situations. The association of outcome expectations and efficacy are such that "when variations in perceived self-efficacy are partialled out, the outcomes expected for given performances do not have much of an independent effect on behavior" (Bandura, 1989, p.1180).

Positive outcome expectations, in physical activity settings, would require that the individual would have to believe that the outcomes of participation would be personally beneficial and the risks of participation would be reasonably low. According to Bandura's interpretation, perceptions of risk would then be predicted to be higher for individuals who have low self-efficacy for physical activity, and perceptions of benefits would be predicted to be higher for those who exhibit high self-efficacy for physical efficacy.

More information and discussion about the perceived benefits and risks of exercise are provided in Chapter 3.

Self-Efficacy and Movement Confidence

Introduction: Self-Efficacy

Self-efficacy is the most studied component of social cognitive theory and it has received a good deal of interest from researchers attempting to understand the social-psychology of exercise behavior. Perceived self-efficacy appears to

play an influential role in ways that affect motivation and "intention" for involvement in physical activity and sport. Since physical activity is often conducted in public settings, and performance is visible to any observer, confidence to perform may be particularly important in the exercise setting.

Bandura (1977a) has defined self-efficacy as the strength of an individual's perceived self-confidence or belief that he or she can successfully complete a task through the expression of ability. Although those who view themselves as having high ability for a task are also apt to feel efficacious for performing it, simply possessing the ability to perform a task does not guarantee a high degree of self-efficacy. In addition to efficacy perceptions, Schunk and Carbonari (1984) claim that "ability" involves effort, luck and task difficulty - three additional elements that can explain the success or failure of personal actions. Furthermore, competent behavior is unlikely to occur if social, psychological or structural barriers exist, or if there are inadequate incentives (Bandura, Adams & Beyer, 1977).

Without aspirations and active involvement in activities, people are unmotivated, bored, and uncertain about their capabilities. Life without elements of challenge can be rather dull. (Bandura & Cervone, 1986, p. 111)

Self-referent perceptions of efficacy are at least partly responsible for the kinds of challenges which people choose to undertake, how much effort they will spend on an activity, and how long they will persevere in the face of difficulties (Bandura, 1986).

Social cognitive theory claims that discrepancies between performance feedback and personal standards lead to self-dissatisfaction which then serves as a powerful motivational inducement for enhanced effort. Those who distrust their capabilities are easily discouraged by failure, whereas those who feel assured of their competence to achieve a goal will intensify their efforts when

their performances fall short, and persevere until they succeed (Bandura & Cervone, 1986). Dzewaltowski (1989b) therefore suggests that a measure of efficacy in the exercise setting should "examine individuals' efficacy toward coping with difficult situations and still adhere to an exercise program" (p. 254). Recent research suggests that task-specific efficacy measures are superior predictors of behavior over general efficacy measures (Bandura & Cervone, 1986). Thus self-efficacy in exercise research has been defined in many ways such as self-rated confidence to adhere to an exercise program, or confidence to sustain exercise for 60 minutes.

The need to be specific in the assessment of efficacy expectations has required researchers to develop their own measures to deal with their particular research question. Consequently, the available research on efficacy and exercise at times appears to be haphazard. Some studies merely verify what Bandura's theory has already demonstrated. Others add some interesting information but direction is lacking.

Barriers to Perceived Efficacy to Exercise

The Campbell's Survey (Craig & Stephens, 1990) indicates that barriers and lack of perceived control interferes with the desire of 70% of 65+ Canadian women to regularly exercise. In general, males at all ages felt they had more control over their life situations than did females. The major gender differences in perceived barriers were a greater emphasis by females on family time pressures, lack of energy, and lack of ability. Lack of a partner and lack of ability were important explanations among those who resisted or lapsed in their activity programs.

Davis-Berman (1989) has provided evidence that physical self-efficacy in aging women may be undermined by the effects of depression. Thirty percent of the variance in depression scores were explained by a physical self-efficacy score.

Research by Kelly (1987) serves to remind us that efficacy for specialized tasks may be undermined by numerous barriers largely outside of individual control]. Kelly studied leisure in aging adults and identified two kinds of activity which distinguished adults with the highest levels of life satisfaction: "those providing a context for interaction with valued others and 'high investment' activities" (Kelly, 1987, p.111).

High investment activities are those that have been developed over a period of time, require some acquisition of skill, and are most likely to yield outcomes of an enhanced sense of competence, worth, and personal expression" (Kelly, 1987, p. 112)

Kelly suggests that the low rates of participation in exercise, sport and outdoor recreation for those age 55 and above reflect the likelihood that real health and physical ability limitations are operative. Exercise and sport settings are high-investment activities that call for special facilities, supervision and guidance, companions, specialized equipment and high levels of effort and skill - requirements and resources which may be harder to fulfil as people reach advanced age. Therefore, social contexts become more limited to family and neighbours and locales of activity become limited to the private residence.

Along the same lines, Godin, Shephard & Colantino (1986) found that sedentary adults (average age 39) who had positive intentions to exercise perceived regular exercise to be "tiring", "time-consuming" and placed less value on "being healthy". The major perceived obstacles of intenders to exercise participation was "lack of time" and "perceived exertion". Both of these factors

can be linked to one's efficacy to carry out a program of exercise.

Waller and Bates (1992) studied self-efficacy beliefs, multidimensional health locus of control and lifestyle behaviors in 57 healthy elderly subjects (mean age 74.7) with a view to determine who could benefit most from health promotion programs. Most of the subjects were characterized by an internal locus of control belief (91.2%), high generalized self-efficacy (57.9%) and good health behaviors. Waller and Bates (1992) suggested that individuals with an internal locus of control and high generalized self-efficacy are more likely to benefit from a health education program than those with an external locus of control and low self-efficacy, but this suggestion was not examined directly in their study.

Woodward and Wallston (1987) examined age, desire for control, information and general self-efficacy in 116 adults aged 20 to 99. They found that individuals over 60 years of age desired less health-related control than did younger adults, and preferred that health professionals make decisions for them. Perceived self-efficacy was lower for individuals over 60 years of age. The findings suggest that "those individuals most at risk for chronic illnesses and hospitalization are also those who are most likely to fail to take an active role in their health care" (p.3).

The Role of Habit and Previous Physical Activity

In a random sample of 136 University of Toronto employees, Godin, Valois, Shephard & Desharnais (1987) examined, among other factors, the influence of past behavior on subsequent behavior. Three measures of "habit" were used: Immediate Past Behavior (weekly score using MET units to quantify activity level), Past 4 Months Behavior, and Adulthood Behavior (frequency of getting sweaty during leisure time as an adult). They found that "distal" exercise behavior (three weeks and two months later) was predicted by both intention to exercise and

Immediate Past Behavior. The important role of "habit" was highlighted in this study. Godin and colleagues concluded that if a person has never engaged in a particular behavior, it remains uniquely under the control of behavioral intentions. However as the behavior is repeated, the importance of the habit increases, with a corresponding diminution in the importance of behavioral intention.

...the decision to adopt an active life-style, over the previous habit of being sedentary, requires more "girding up of loins" than the decision to continue to exercise for an individual who has a well-established habit of exercising. Consequently, a process of change has to take place, this requiring "will" in order to compete and resist the forces of the old habit in establishing a new habit. (Godin et al., 1987)

While the role of "habit" has received only preliminary attention in predicting current exercise behavior, habitual activity may have some bearing on advancing intention into actual action. In this study, the notion of "habit" was accommodated in the variable "movement confidence" which combined self-efficacy ("I am sure I can do this") with habitual experience ("I have done this a lot").

The Role of Efficacy on Exercise Behavior

A number of contemporary studies are linking physical self-efficacy, perceived movement competence, or self-rated physical ability to predictions of exercise behavior, physical fitness and adherence to fitness programs. For example, self-efficacy has been found to be the most powerful and statistically significant correlate of both walking and vigorous exercise among ill and healthy groups alike (Hofstetter, Hovell, Macera, Sallis, Spry, Barrington, Callender, Hackley & Rauh, 1991).

Ryckman, Robbins, Thornton, and Cantrell (1982) developed a general Physical Self-Efficacy Scale (PSE) in order to identify an individual's perceived physical self-confidence. While this instrument demonstrated adequate reliability and

validity in predicting general self-efficacy in sport, McAuley and Gill (1983) did not find this to be a useful instrument in evaluating female college performer's efficacy for gymnastics performances. Rather, the Perceived Physical Ability (PPA), a sub-scale of the PSE was more situation-specific and offered better prediction of performance outcomes.

Duda and Tappe (1989) studied 145 adults aged 25 to 81 years of age with the purpose of examining motivational differences in exercise by gender and age. Sense of physical competence was assessed with the Perceived Physical Ability subscale of the Physical Self-Efficacy Scale (Ryckman et al., 1982). They found that older and younger physically active adults did not differ in perceived physical self-efficacy and health status. However, middle-aged and elderly adults tended to engage in exercise more for the positive consequences on health status than young adults. Males engaged in exercise more for competition than females while females exercised more for fitness reasons. There was also a trend for females to exercise more for affiliative reasons than males. Women tended to view themselves to be less physically able, perceive greater significant other support for their involvement in exercise, and believe that one's fitness status is primarily of fate or chance occurrences (externality). Duda and Tappe concluded that exercise has different meanings to young, middle-aged and elderly men and women noting that perceptions of efficacy and social support for exercise were the major differences between men and women.

Ryckman's Perceived Physical Ability (PPA) scale was used to examine the relationship between perceived physical ability and indices of physical fitness (Thornton, Ryckman, Robbins, Donelli & Biser, 1987). The males in the study (aged 17 to 64) generally were more physically fit relative to the females (aged 18 to 64), yet there was no difference between their PPA as predicted. They

concluded that their findings did not support the predictive utility of perceived physical ability where actual indices of physical ability were involved.

Efficacy expectations were originally thought to be specific to particular behaviors and not necessarily generalized to other behaviors. However, evidence exists in one study that efficacy for exercise may be generalizable. Kaplan, Atkins and Reinsch (1984) examined specific versus generalized efficacy expectations for exercise in older patients with chronic obstructive pulmonary disease (COPD). All subjects (mean age was 65 years) were given a prescription to undertake two daily walks. The experimental group of the randomized design received three months of supervised training and advice while the control group received only advice. After three months, the experimental group had significantly increased their activity level, their perceived efficacy for walking and also efficacy expectations for other similar physical behaviors in comparison to the control group. Their results suggest a "bidirectional" type of causation or a "reciprocal-causal" model meaning that "efficacy and performance attainments may affect each other in reciprocal fashion" (Kaplan et al., 1984, p.239).

Dzewaltowski (1989b) conducted a study comparing Bandura's Social Cognitive Theory to Fishbein and Ajzen's Theory of Reasoned Action. The theories' constructs were assessed on 328 physical education students prior to collecting data on the total days exercised over an 8 week period. With all the variables in a regression equation, the Theory of Reasoned Action could only account for 6% of the variance in exercise behavior. When Social Cognitive Theory variables were entered into the equation, they accounted for 14% of the variation. Dzewaltowski (1989a) concluded "it may be that those who exercise are confident that they can exercise despite uncontrollable factors" (p.266).

Self-efficacy has been used to predict over-exertion during programmed exercise in 40 men; The men were recovering CAD patients with an average age of 55 years (Ewart, Stewart, Gillilan, Keleman, Valenti, Manley & Keleman (1986b). Patients' confidence in their ability to jog various distances was measured with a jog self-efficacy (SE) scale before an eight-week group exercise program was begun. Ambulatory heart rate monitoring disclosed significant noncompliance with exercise prescriptions: 33% of patients exceeded their prescribed range of 70 to 85% of maximum treadmill heart rate for at least 10 minutes of the 20 minute exercise bout. Another 25% spent 10 minutes or longer exercising below the prescribed range. "Overachievers" were patients who overestimated their ability to jog, while "underachievers" were those who overestimated their exercise heart rate. Jogging SE proved superior to treadmill performance, depression measures and Type A personality measures in predicting patient adherence to exercise prescription.

The Role of Exercise on the Development of Efficacy

The literature generally supports Bandura's theory that efficacy and performance strengthen each other in reciprocal causation (Kaplan et al., 1984). Previous successful performance leads to stronger efficacy expectations, and stronger efficacy perceptions increase the likelihood of successful performance. Marcus and colleagues (1992) found that higher levels of self-efficacy for exercise accompanied higher levels of exercise activity in blue collar employees. Results indicated that employees who had not yet begun to exercise, in contrast to those who exercised regularly, had little confidence in their ability to exercise. Stewart and King (1991) suggest that exercise may enhance a sense of mastery or control through the operation of two mechanisms.

Regular exercise may provide people with an enhanced sense of their ability to handle problems. Regular exercise may also provide a model of control (e.g. "I obtain improved health by exercising") that may generalize to other life domains. (Stewart & King, 1991, p.113)

However, no differences in a sense of control were found in at least one randomized study of a twelve-week aerobic exercise and strengthening program for 15 men and women aged 61 to 86 compared to a social activity control group (N = 15) or a waiting list control group (N = 18) (Emery & Gatz, 1990).

One of the best studies done on self-efficacy and exercise behavior was recently reported by McAuley, Courneya & Letturich (1991). Fifty females and 50 males (average age of 54) were examined for the effect of acute and long-term exercise on self-efficacy responses in sedentary adults. Three measures of self-efficacy were employed to determine subject's beliefs in their physical capacities as related to exercise and fitness. Specifically, the efficacy scales represented subject confidence to be able to succeed with 1) increasing numbers of sit-up repetitions in one minute, 2) cycling longer at increasing work loads, and 3) walk-jog successive quarter-mile distances within 4 minute intervals. Subjects participated in a 5 month aerobic exercise program, three times per week in one hour sessions. Both males and females demonstrated significant increases in efficacy following acute exercise. Females, who had demonstrated initially lower self-perceptions than males, made dramatic increases in efficacy during the exercise program, equalling or surpassing those of males. Increased self-efficacy closely accompanied the actual measured physiological gains in performance as expected. McAuley and associates concluded that their results are encouraging since sedentary individuals in their middle years were able to make significant health-related gains through a relatively low-impact activity such as walking.

The effects of running the treadmill only three weeks following myocardial infarction (MI) on subsequent physical activity were evaluated in 40 consecutive men with a mean age of 52 years (Ewart, Taylor, Reese & DeBusk, 1983). The men were examined for self-perceived ability to walk/run distances from one block to five miles, climb stairs from several steps to four flights, engage in sexual intercourse from one to 20 or more minutes and handle objects from 10 to 75 pounds. Patients' confidence in their ability to perform these activities were assessed before and after a symptom-limited treadmill test of aerobic fitness. Significant increases in self-efficacy occurred after the treadmill test for activities most similar to the test: walking, stair climbing and running. Another finding supports Bandura's specificity of SE and suggests that physical efficacy perceptions can be quickly improved by successful performance on a related activity.

In another study by Ewart and colleagues (1986b) examined 43 men with coronary artery disease proposing that highly specific estimates of personal capabilities mediate adoption of new or difficult exercise settings. Correlational analyses of self-efficacy in relation to strength and endurance tests strongly supported the contention that the adoption of novel activities is governed by highly specific self-perceptions. The pattern of findings suggest that favourable appraisal of one's athletic ability increases motivation to pursue sport, leading to greater participation, increased skill, more positive self-appraisal, and consequently, higher motivation.

Hogan and Santomier (1984) examined the effects of participation in a learn-to-swim program on the self-efficacy of older adults. The subjects were 38 volunteers 60 years of age or older. This study was quasiexperimental in that ~~it utilized a non-randomized control group. As such, the study is vulnerable to~~

the confounding effects of self-selection. As expected, significant changes in post-test efficacy were found, but more importantly, this efficacy generalized to other performance-related situations. Open-ended questioning indicated that other aspects of their lives had been affected such as "now able to handle a trip to China", "my walking has improved" and "chores are more easy". Such generalized efficacy outcomes are not in agreement with Bandura's theory that efficacy expectations are specific.

A ten week exercise program containing 69% women aged 55 to 80 was conducted by Howze, DiGilio, Bennett, and Smith (1983). "High-attenders" were those who attended 15 or more sessions out of the 20 two-hour sessions. "Low-attenders" were less confident of their physical abilities and were more worried about injury. Ninety-two percent of the participants said that they "felt better in general" and felt more physically fit after the program. Howze and colleagues suggested building self-confidence by progressive exercise which provided successful participation all along the way.

Feltz (1988) has examined gender differences in the causal elements of self-efficacy on a "high-avoidance" motor task (the back dive) in college age students. Feltz proposed a respecified model of Social Cognitive Theory that included both self-efficacy and previous performance (experience) as direct predictors of approach/avoidance behavior on the dive. The diving efficacy scale asked the subject to rate the degree of confidence he or she felt about accomplishing the back dive successfully for each of four board heights. Each rating was made on a 10-point scale from 0 (great uncertainty) to 10 (great certainty). Actual performance was measured by two trained observers using an objectively designed performance evaluation. Females attempting the back dive ~~reported higher levels of state anxiety and autonomic arousal (high heart rates)~~

than males on their first attempts. In perceiving heart rate changes, males tended to underestimate while females tended to overestimate their increases in heart rate. No sex differences were found in self-efficacy scores, and both males and females significantly increased self-efficacy perceptions from Trial 1 to Trial 2. Thus previous performance and self-efficacy measures were both strong predictors of subsequent performance for males and females.

The reciprocal nature of efficacy and performance is confirmed in one other study. Barling and Abel (1983) studied self-efficacy beliefs and tennis performance in 40 active males (26.6 years). Three 10-item scales assessed self-efficacy strength ("I can play most of my strokes correctly"). Two judges evaluated actual tennis performance (inter-rater $r = .91$; $p < .001$ in all 12 rated skills). Tennis players who had higher self-efficacy for tennis were rated as the most skilful performers, meaning the relationship between efficacy and performance holds even when performance is evaluated by others.

Environmental Cues for Physical Activity: Social Support

The objective of this section to review the known inter-relationships of physical activity, aging and social support systems. Understanding the impact of various social reinforcements on individual and group behavior holds promise for cost-effective, community-level intervention.

Ageist Practice in Communities

Ageism, or the explanation of behavior by age considerations alone, is thought to be a powerful social element governing the present active living choices for adults as they age. One major theory of aging rests on this

discriminating assumption: disengagement theory endorses the withdrawal from social participation as a natural and healthy course of aging (Cumming & Henry, 1961). Others would argue that disengagement is not at all a choice, but rather is aggressively driven by the political economy of age stratification, with certain privileges being denied, and access to social participation limited, based simply on the age of individuals. Examples of age discrimination in physical activity are: limited access by the elderly to high-demand public sport facilities, few opportunities to receive expert coaching and instruction, disinterest by the media and general public, and a lack of publicly organized events and activity programs representing the broad interests of older adults (Curtis & White, 1984).

Ageist practice socializes older adults into a narrow range of "appropriate" activities, even though those activities may not represent those in which older adults have developed lifelong skill or interest (McPherson, 1984). Views that older adults should exert themselves less as they age, and should become less competitive at the activities they do, are consistent with the social forces that are present in much of contemporary society. When these social forces are evident, it becomes clear to older adults that social acceptance is lacking for them to demonstrate many of the varieties of athletic excellence. Ageism is probably the most obstructive form of adult socialization preventing older adult participation in some of the most valued forms of physical activity.

Social Support

Of interest to the present research are studies which 1) identify the types of people who lack interest and desire to exercise, and 2) the kinds of physical and cultural environments which promote more physical activity. Among the

prominent relationships between socio-environmental context and optimal health is a powerful construct called "social support."

Many studies have already demonstrated with clarity that social support is important to the maintenance of good health (Pilisuk & Minkler, 1985), including reduced psychological distress (Holahan & Moos, 1981), and reduced mortality in elderly populations (Blazer, 1982). Exercise scientists are similarly beginning to appreciate the significance of social support in physical activity settings. Indeed, while physical activity settings may be among the most important *sources* of social contact and support in the lives of older adults, other forms of social support must apparently already exist. For older adults to live actively, some degree of social support may be an *essential prerequisite*.

Defining and Measuring Social Support

The scientific measurement of social support is a recent phenomenon requiring clear operational definitions. Social support has seen a rapid evolution of conceptual meaning ranging from individualized emotional and affective dimensions to large, contextual features of a particular society (Esdaile & Wilkins, 1987). Most measurement to date has addressed social support at the "micro" level. For example, an early definition of social support was given by Cassel (1976) as the gratification of a person's basic social needs (approval, esteem, succorance). Cobb (1976) conceived social support to be information leading a person to believe that they were cared for, esteemed and belonging to a network.

The measurement of a multidimensional construct such as social support is difficult, if only because there are now a legion of available instruments which ~~tap into emotional support, tangible support, informational support and support~~

provided to others at both perceptual and enacted levels. Social support, as a *quantity*, can be measured objectively as the number of social contacts one has, or the number of phone contacts or visits from friends in the past week. The *quality* of social support can be subjectively assessed with perceptual rating scales about the adequacy of one's support network.

Physical Activity as Social Networking

Recreation centres, senior's groups, sport clubs and even shopping malls provide positive settings in which to engage in socializing and physical activity (Graham, Graham & MacLean, 1991). Within these social settings, both formal and informal structures can provide instrumental aid, information and advice. In addition, such settings supply one of the biggest benefits of leisure activity - companionship (Ishii-Kuntz, 1990; Tinsley, Teaff, Colbs & Kaufman, 1985). Institutionalized elderly are known to place high priority on the social context of physical activity, although they also hope that exercise will also enhance their health and fitness (Mobily, Lemke, Drube, Wallace, Leslie, & Weissinger, 1987).

Women have, in the past, been less likely to take advantage of these existing community networks for participation in physical activity and sport. Even though finding companionship for activity has occurred with more frequency for males (Curtis & White, 1984), women do not necessarily choose to exercise at home alone. From young adulthood on, females are found more often in caregiving and domestic situations which may limit their ability to formalize social networks outside the home environment.

According to a national survey on women with disabilities, physical limitations and medical concerns were not considered to be their primary limitations to activity participation.

The primary changes that would encourage greater participation in physical activities were accessible facilities that are closer to home, knowledgeable instructors, people with whom to participate, and more available information on programs. (Fitness Canada Women's Program, 1990).

Social encouragement from other adults may be lacking for older women with limitations. Almost half of the women surveyed said they alone were responsible for getting involved in activity while family and friends were influential in activating only 13% of respondents.

For older adults, ease of transportation to physical activity settings and costs of participation may be practical barriers to obtaining the support they need to be more active. Many elderly women never learned to drive the family car or can no longer afford to maintain a car and therefore limit their activities to whatever is available in their neighbourhood.

Role of Group Cohesion

Social support and group cohesiveness have been studied with a view to understanding why people begin physical activity, why some maintain their involvement and why others stop participating altogether. Dishman (1984) has noted that after six months, over half of those who begin an exercise program have already dropped out. As might be expected, people who do not adhere to a specific fitness or sport setting are less personally attracted to the group's task and to the group as a social unit (Carron, Widmeyer & Brawley, 1988). The literature underscores the need for an awareness of how the social and physical environment can affect the elderly individual's sustained involvement in group activity, as well as the need for understanding how activity engagement may

relate to the individual's evaluation of the environment and of the self (Barris, 1987). In other research, a series of six studies examined the behavioral and cognitive procedures which would enhance adherence to a 3-day-per-week walking/jogging program in sedentary adults (Martin, Dubbert, Katell, et al., 1984). Overall, the results of the studies confirm the importance of social support, including instructor feedback and praise during exercise.

Role of Companionship

Lack of social support for older women in the form of sport opportunities and companionship is one of the key findings of a study by Curtis and White (1984). Using a sample of 33,762 native-born Canadians who filled out a nine-page survey questionnaire, they found that older females participated in fewer sport activities than younger women, but participated more frequently in the past year. Only 10 percent of women over age 60 had at least one physical recreation which they had pursued one or more times on an annual basis.

Problems in finding others with whom to participate was a problem for over 20% of the elderly women, and they were the one age group who had the most problems with finding companionship. Older women had twice as much difficulty as same-age men with finding companionship, yet at the same time, reported that time conflicts in activities were only half the problem that men had experienced. Ishii-Kuntz (1990) reports that widowed women, in particular, are likely to be seeking companionship and social opportunities in senior's centers.

The Role of Spousal Support

One hypothesis is that women who have active life companions, active partners or active spouses are more likely to be physically active themselves

(Snyder & Spreitzer, 1973). Having a spouse who is indirectly involved in sports is thought to reinforce earlier encouragement from one's parents and to increase one's perceived ability to be involved as an adult (Spreitzer & Snyder, 1976).

In analyzing family influence on sports involvement, researchers have claimed that there is considerable similarity of activity patterns between a couple.

Evidently, they mutually reinforce one another's interest in this sphere of leisure behavior. Explanations of this finding might lie in the mate selection process where a common interest in sports might serve as an additional inducement for the match; also, the findings might suggest that a strong interest in sports on the part of one spouse is gradually transmitted to the partner. (Snyder & Spreitzer, 1973, p.252)

Other research suggests that "women who take part in sport perceive a very high degree of support from their nominated or significant male" (Tait & Dobash, 1986). This evidence notwithstanding, compared with men, women aged 45 and older reported less support from their spouse and experience less encouragement to be active with advancing years (Stephens & Craig, 1990). Furthermore, Hauge (1973) has suggested that "middle class men look outside the home for sport companions almost twice as frequently as the women do" (p.25).

One of the few available studies on the role of spousal support to exercise adherence is unfortunately available only in relation to men. Myocardial patients were studied for drop-out rate from an exercise program over a seven year period (Andrew, Oldridge, Parker, Cunningham, Rechnitzer, Jones, Buck, Kavanagh, Shephard, Sutton & McDonald, 1981). Of all the determinants being considered, spouse approval was the most significant finding. The drop-out rate of those with little or no support from their wives was three times greater than in those men with positive spousal encouragement.

Ishii-Kuntz (1990) examined how predisposing, enabling and need factors influenced elderly women's participation in voluntary organizations and senior

centers. A nationwide probability sample provided data which indicated that age, race and health status influenced participation. Elderly widows were more likely to be involved in voluntary organizations than married women, with loneliness being a major factor leading to seniors center participation.

The Role of the Physician

The cautionary warnings that one must always consult a physician before taking up any interest in physical activity may be doing more harm than good.

Certainly anyone who is doubtful about one's personal state of health should consult a physician. In principle, however, there is less risk in activity than in continuous inactivity. In a nutshell, our opinion is that it is more advisable to pass a careful medical examination if one intends to be sedentary in order to establish whether one's state of health is good enough to withstand the inactivity. (Astrand, 1986, p.4)

Evidence suggests that ordinary people will not get extraordinary advice from a physician about how to start an exercise program. Moreover the "see your physician" prescription may prevent many adults from ever getting started since a chain of dependency is then formed (O'Brien Cousins & Burgess, 1992). Becoming more physically active depends on seeing the doctor, and it also depends on what the doctor has to say. Because of time constraints, physicians often do not discuss their attitudes and knowledge about exercise with their patients. The dependency continues as one then seeks out an activity program in which exercise needs are met. If the program is good, one may become dependent on a highly prescriptive program and the motivational skills of its leader in order to be certain to adequately exercise.

Regular pulse rate checking serves to remind people that they may be at risk of something going wrong with the heart, and consequently individuals may become too anxious to exercise on their own. This scenario is an example of how some

forms of social support can backfire and become barriers to individualized and independent involvement in physical activity.

Health promoters have begun to examine the interest and competency of physicians to provide encouragement for their patients' activity patterns. It has been noted that physicians who have graduated since the late 1960's are more likely to believe in the importance of regular aerobic exercise, but overall, only about one-quarter of physicians have been found to think engagement in aerobic activity three times a week is very important to health (Wechsler, Levine, Idelson, Rohman, & Taylor, 1983). Internists are more likely to ask about exercise behaviors than general practitioners (53% to 31%) and all physicians are more likely to ask about smoking, alcohol and other drugs, than they are likely to ask about diet, exercise and stress (Wechsler, et al., 1983). Only 3 to 8 percent of physicians thought they were "very successful" in helping patients achieve changes in various health behaviors, but 21 percent were optimistic about their ability to help patients increase exercise.

Surveys of physicians in Massachusetts and Maryland indicated that just less than 50 percent of primary care physicians routinely inquire about their patients' exercise practices (Wechsler et al., 1983). In an exercise intervention study on women aged 55 to 80, only 5% of the participants noted that regular exercise had been recommended to them by a physician (Howze et al., 1983). In another study, only 27% of the physicians felt that exercise was "very important" for the average person. Thus "a large proportion of physicians are not fully convinced of the value of exercise for health" (Powell, Spain, Christenson, & Mollenkamp, 1986). Whether physician inquiries include in-depth questions about intensity, duration or frequency of exercise is not known, nor do we know how physicians alter their questioning with younger and older individuals.

Current views on the athletic potential of older adults, and older women in particular, are considered to be overly conservative even by health promotion experts and exercise physiologists. Most professionals may be concerned more about the risks of participation for more frail elders and the potential for harm and litigation outcomes than they are for raising activity levels of the entire community (DeLorey, 1989).

Added to this professional conservatism, there has been a persistent myth among older adults advocating the scientific concept of "conservation of energy." Retirement, for many, means that it is time to take a long-deserved rest from lifelong physical work demands. The social norm for retired individuals has been rather passive leisure pursuits, and it is difficult to change expectations about activity choices if the participant is perceived to be already more ambitious than others of the same age. Particularly if an adult has been physically inactive in recent years, physicians and friends are unlikely to try to convince him or her that now is the time to start exercising.

The Role of Friends and Family

The number of close friends which a person has appears to be significantly associated with the pursuit of general preventive health behaviors such as non-smoking behavior and exercise (Calnan, 1985). While companionship for physical activity is considered to be a reinforcing factor (Biddle & Smith, 1991), in recent decades, time pressures are evident, at least in middle age families. Inflationary pressures and changing attitudes towards the social roles of men and women have seen the rapid rise of two-career families and what some call the "death of leisure" (Posner, 1991). Over half of the adult female population is ~~in the labour force full-time; this means that there has been a significant~~

change in the workload patterns of women. About one quarter of Americans at work are spending 49 hours or more each week on the job (Kilborn, 1990). It has been estimated that women average 66 to 75 hours per week at combined job and family responsibilities as compared with 42 to 49 hours per week 50 years ago (Edwards & Hill, 1982). The implications of this for women's physical activity patterns is that many women have too little leisure time in which to be physically active, and friendships and social networks may also become more difficult to sustain under these kinds of time pressures.

The next chapter identifies the theoretical framework for the study based on the literature that has been outlined in this chapter. The theoretical framework discusses the selection of Social Cognitive Theory as the most suitable starting point and then justifies a system of synthesis of theories. The 16 constructs of importance to a Composite Theory of late life exercise are presented and the next chapter concludes with a visual working model for this study.

III. THEORETICAL FRAMEWORK

Introduction

The review of literature, in the previous chapter, has identified as many as 16 constructs from different theoretical models which have demonstrated predictive relationships with exercise behavior. One purpose of this study was to develop a theoretical framework which would have utility in explaining late life exercise for older women. This chapter begins with an explanation of why the Health Belief Model and Theory of Reasoned Action have not been adopted in this study. Next, the chapter presents a rationale for synthesizing 10 constructs from social epidemiology and Socialization Theory with six cognitive constructs from Social Cognitive Theory and Health Locus of Control Theory. This is not a new model, but rather a more comprehensive application of Social Cognitive Theory, and provides an opportunity to clarify the interpretation of SCT theory. By combining situational variables with cognitive variables, the Composite Model will offer a test of the power of cognitive beliefs to reflect the individual and society from which they form. An illustrated model of the Composite Model is found on page 3-6. Further discussion on each construct of the model is found in the remaining sections of the chapter.

Selection of the Most Suitable Theoretical Perspective

Since older women may lack efficacy for physical skills and fitness exercise, assessing their perceptions of physical ability was believed to be important to the prediction of late life exercise behavior. Neither the Theory of Reasoned Action, nor the Health Belief Model assess these perceptions about efficacy. The self-efficacy element of SCT, as well as the theory's other self-

referent beliefs, appear to hold the most promise for the explanation of older women's exercise behavior. In addition, health locus of control is a logical addition to a framework which is attempting to explain a health behavior such as late life exercise.

Dzewaltowski (1989b, 1990) has twice shown that Bandura's Social Cognitive Theory is a superior predictive model to the Fishbein-Ajzen model in the explanation of exercise in older adults. Dzewaltowski (1989b, 1990) has compared the ability of SCT with the Theory of Reasoned Action to predict exercise behavior over a seven-week period (1989b), and four-week period (1990), in college-age physical education students. The Theory of Reasoned Action explained only 6% (Dzewaltowski, 1989b) and 10% (Dzewaltowski, Noble & Shaw, 1990) of the variance in exercise behavior while two SCT variables predicted 16% of exercise behavior variance (Dzewaltowski, 1989b), and could explain 7% more variance after controlling for all the variance explained by the Theory of Reasoned Action (Dzewaltowski, et al., 1990). In a separate study attempting to explain female exercise behavior, intention scores emerged as the only significant predictor, accounting for only 9% of the variance (Wurtele & Maddux, 1987). Dzewaltowski concluded that "the theory of reasoned action did not account for any unique variance in exercise behavior over the social cognitive theory constructs" (1989b, p. 251), and that "the social cognitive theory constructs were better predictors of physical activity than those from the theory of reasoned action and planned behavior" (Dzewaltowski et al., 1990, p.388).

A further reason to reject the Theory of Reasoned Action was that intentions to exercise, and planned behavior to exercise may not be particularly relevant to the elderly who may possess "constricted future expectations" and may ~~expect to have limited time in which to enact their intentions and plans~~

(Rakowski & Hickey, 1980, p.287). Since the main goal of this study was to identify important determinants of current exercise behavior, Social Cognitive Theory was selected as the more suitable theory.

The Application of Social Cognitive Theory

Social Cognitive Theory conceptualizes that environmental events, personal factors, and behavior all function as interacting determinants of each other. People can exert some influence over their life course by their selection of environments and construction of situations (Bandura, 1989).

Social cognitive theory subscribes to a model of emergent interactive agency. Persons are neither autonomous agents nor simply mechanical conveyors of animating environmental influences. (Bandura, 1989, p.1175)

This perspective of individual activity and reactivity supports the central thesis that "self-referent thoughts mediate the relationship between knowledge and action" (Schunk & Carbonari, 1984, p.230). However, some experiences and contextual elements of one's life cannot be easily altered and are thought to make significant contributions to one's control beliefs. Therefore one's cultural context and personal situation are thought to alter the subjective value of an expected outcome and the subjective probability (or expectation) that a particular action will achieve that outcome.

To date, all of the cognitive mechanisms from Bandura's social cognitive theory (1986) have not been applied in concert to explain exercise motivation (Dzewaltowski, 1989b, p.252). Furthermore, SCT has not been tested directly for its ability to explain exercise behavior alongside the cultural context and personal situation of the individual. A test of this interpretation is attempted in this study, since both situational factors and cognitive variables are all ~~independent explanatory variables for late life exercise behavior. Multiple~~

regression analysis permits simultaneous analyses of multiple independent variables. If cognitive determinants account for all of the variance in exercise behavior, and situational variables do not compete for power of explanation, then the interpretation of Schunk and Carbonari (1984), that cognitive beliefs are adequate proxy for personal and environmental circumstances, will be confirmed. If socio-environmental factors offer unique explanation in addition to cognitive variables, then support will exist that human behavior may be affected by significant mechanistic forces. A third possibility exists. Situational variables may over-ride all cognitive explanation, meaning that sociocultural environment and personal situation are the most important controlling determinants of leisure-time physical activity. The latter finding would force a conclusion that there is little potential for behavioral intervention, since the situational environment would then be the only route to improving the activity patterns of elderly women.

A theoretical framework was sought which would attend to the cognitive beliefs of the older woman about exercise. If a woman places little value on the health outcomes of exercise, feels unskilled in popular fitness pursuits, has few friends or little social reinforcement to be more active, perceives the risks to be of more import than the benefits, and believes that she cannot improve her health or life outcomes by her involvement, then she would not very likely be a physically active individual. On the other hand, a physically active woman may be one who wants to live a long and healthy old age, who feels that physical activity is a low-risk and sure way to promote this goal, who feels physically confident to participate in fitness pursuits, and who knows that she will be encouraged to do so by others. This is the multi-hypothetical stance governing this study.

The Synthesis of Theory: The Composite Model

Three main theoretical perspectives - Social Cognitive Theory, Social Epidemiology, and Health Locus of Control Theory provide important elements for construction of a Composite Model of exercise behavior. The model is "a composite" in the sense that the structure combines biological, social and psychological constructs found across the research to be potentially explanatory of a health behavior such as leisure-time physical activity. Moreover, the triangular model of ENVIRONMENT (situational attributes) - PERSON (cognitive beliefs) - BEHAVIOR (leisure-time physical activity in the past week) proposed by Bandura (see Chapter 2-78) is preserved.

For ENVIRONMENT, the Composite Model provides a detailed socio-environmental context; features such as age, health, ethnicity, education, socioeconomic status, family size, marital status, and work role are potential forces which can provide windows of opportunity or overwhelming barriers to human beliefs and behavior (see Chapter 2-39).

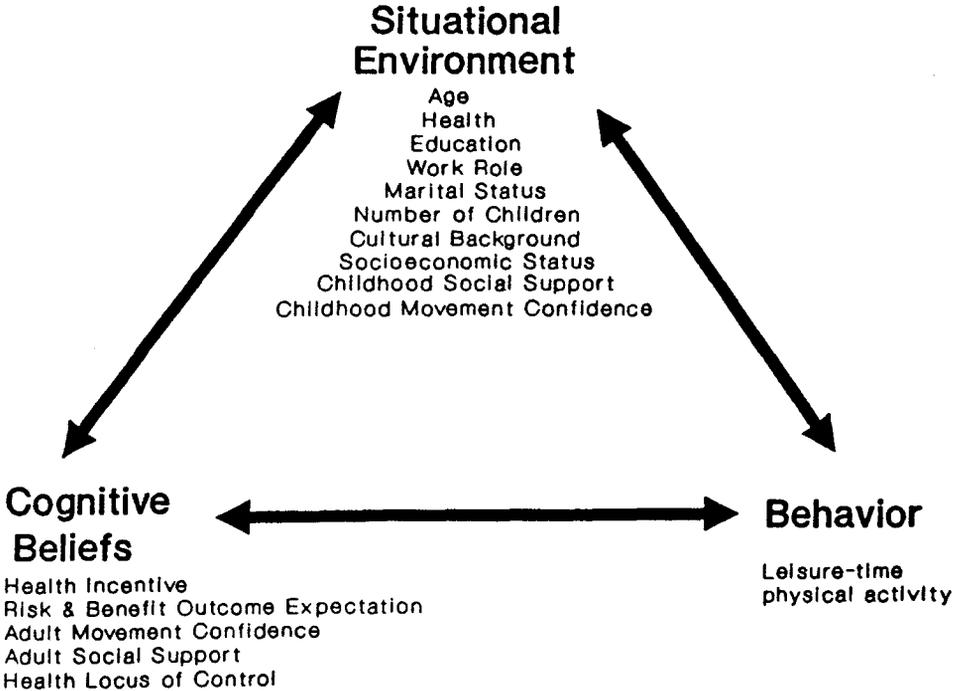
Representing the PERSON, the Composite Model presents four key constructs of Social Cognitive Theory which have demonstrated predictive ability in health behavior research: 1) the incentive to take action, 2) positive and negative expectations about the outcomes or consequences of the action, 3) socio-environmental cues which encourage the action to take place, and 4) self-efficacy to successfully undertake the action. In the Composite Model as it is applied to late life exercise behavior, the incentive to take action is the *motive to live a long and healthy life*. Self-efficacy is interpreted as *adult movement confidence* to undertake six fitness types of exercise. *Perceived social support to exercise* represents the "environmental cue" or reinforcement for late life

exercise. Outcome expectations are interpreted as *perceived risks* and *perceived benefits* of participation in fitness types of exercise. The model adds an important cognitive construct, *health locus of control*, which has demonstrated success in predicting preventive health behaviors.

In addition to eight situational variables, *childhood movement confidence* and *childhood social support* are included in the model to represent past mastery experiences and early situations of opportunity. If retrospective childhood measures predict late life exercise, tentative evidence will be provided that older adult exercise participation may be rooted in early development and socialization of people. Adding the early origins of efficacy and environmental cues were thought to theoretically strengthen the Social Cognitive Theoretical model for its application in explaining adult physical activity (Figure 3.0).

In the next section, the sixteen constructs of the Composite Model are presented along with acknowledgement of the literature which supports their inclusion as explanatory variables of exercise behavior. The ten life situational variables are presented first, followed by the six cognitive variables. A summary of the theoretical framework concludes the chapter.

Figure 3.0 The Composite Model of Elderly Female Physical Activity



Life Situational Variables

An hypothesis advanced to explain women's lack of participation in regular and vigorous exercise is that "personal and societal barriers or obstacles in the lives of women make it difficult for them to exercise" (Yoshida, Allison & Osborn, 1988). Dishman (1990) documents as many as 44 variables that are possible determinants of exercise behavior (Dishman, 1990, p.93). Under "personal attributes," education, white-collar occupation, past exercise participation, and perceived good health are positively linked to current activity behavior. Under "environmental factors," past family influences and school programs are predictive of physical activity. In another study, Yoshida and colleagues (1990) report that lack of time due to work, cost and access to programs, family size and family responsibilities are structural barriers to regular exercise for women (Yoshida, et al. 1988).

Chapter 2-37 reviews the ten situational variables most likely to explain late life exercise behavior. In brief, the research literature has found that physically active women tend to:

- 1) *be younger* (Brooks, 1988; Ishii-Kuntz, 1990; Mobily, Lemke, Drube, Wallace, Leslie & Weissenger, 1987; Maddox & Eisdorfer, 1962; Ostrow & Dzewaltowski, 1986), *not middle-aged* (Unkel, 1981),
 - 2) *be single or widowed* (Altergott, 1988; Brooks, 1988; Canada Fitness Survey, 1983; Fasting & Sisjord, 1985; Ishii-Kuntz, 1990);
 - 3) *be better educated* (Brooks, 1988; Godin & Shephard, 1987; Health & Welfare Canada, 1988; Sallis, Haskell, Wood, Fortmann, Rogers, Blair & Paffenbarger, 1985; Unkel, 1981; Yoshida et al., 1988);
-

4) *be employed or 5) have good income and higher socioeconomic status* (Boothby, Tungatt, & Townsend, 1981; Brooks, 1988; Calnan, 1986; Eggers, 1988 (negative association with employment); Gale, Eckhoff, Mogel, & Rodnick, 1984; Health & Welfare Canada, 1988; Stephens, Jacobs & White, 1985);

6) *be generally healthier and fitter* (Boothby et al., 1981; Burckhardt, 1988; Ishii-Kuntz, 1990; Kolanowski & Gunter, 1988; Thomas, S.P., 1990), or *believe they are in quite poor health* (Morgan, Shephard, Finucane, Schimmelfing & Jazmaji, 1984; Rechnitzer, 1989);

7) *be geographically / culturally / racially differentiated* (Ishii-Kuntz, 1990; Stephens, Jacobs, Jr., & White, 1985; The Perrier Study, 1979);

8) *have smaller family size* (Fishwick & Hayes, 1989; Yoshida et al., 1988);
and more freedom and time (Fasting & Sisjord, 1985; Yoshida et al., 1988);

9) *have lifelong habits and competencies for physical activity* (Fishwick & Hayes, 1989; Godin, Valois, & Shephard, 1987; Rikli & Busch, 1986); and,

10) *have been encouraged at a younger age in physical activity* (Greendorfer, 1983; Greendorfer, Blinde, & Pellegrini, 1986; Greendorfer & Lewko, 1978).

Other important explanations for late life exercise are likely to come from psychobehavioral constructs of Social Cognitive Theory and Health Locus of Control Theory. Six cognitive beliefs were chosen for representation in the Composite Model and are discussed below. For more information on Social Cognitive Theory and Health Locus of Control, the reader should consult Chapter 2.

The Cognitive Variables

In this study, the PERSON is linked to the behavioral variable (the criterion) of LEISURE-TIME PHYSICAL ACTIVITY (exercise level in the past week) through five beliefs about health and exercise: four SCT beliefs and health locus of control (Figure 3.1):

Figure 3.1 The Cognitive Variables related to Social Cognitive Theory and Health Locus of Control Theory

- * HEALTH INCENTIVE (Incentive to Act)
- * RISKS / BENEFITS (Outcome Expectations)
- * MOVEMENT CONFIDENCE (Efficacy expectations)
- * SOCIAL SUPPORT (Environmental cues)
- * HEALTH LOCUS OF CONTROL

The following section interprets the cognitive constructs as they are applied to this study.

Health Incentive

Bandura's "incentive to act," behavioral goal or motive is represented in this study as the incentive to live a long and healthy life (Health Incentive). Setting goals for maintaining or improving health is considered to be a key determinant in explaining why adults might take up health-promoting exercise in late life. For example, individuals who highly value their health, and also value

the future effects of physical activity, are hypothesized to make a significant effort to maintain or initiate a more active lifestyle.

"By representing foreseeable outcomes symbolically, future consequences can be converted into current motivators and regulators of behavior" (Bandura & Cervone, 1983).

The capacity to exert self-influence by setting personal challenges and re-evaluating one's own goal attainments provides an important cognitive mechanism of motivation (Bandura & Cervone, 1986). "Motivation through pursuit of challenging standards has been the subject of extensive research on goal setting" (Bandura & Cervone, 1986, p. 92). Motivation based on standards involves a cognitive comparison process.

When people commit themselves to explicit standards or goals, the perceived negative discrepancies between performance and the standard they seek to attain create self-dissatisfaction that serves as a motivational inducement for enhanced effort. Activation of self-evaluative reactions by internal comparison requires both personal standards and knowledge about one's performance level. (Bandura & Cervone, 1986, p.92, 93).

If this study finds that older women with health problems are more active than healthy women, this could be interpreted as a self-dissatisfaction with one's health. Social Cognitive Theory would hypothesize that falling short of one's personal health goals would then act as additional motivation for engaging in health-promoting forms of physical activity.

Few studies have examined the hypothesis that values for sustained health may predict exercise behavior. One study has particular relevance to the health-value hypothesis. Petersen-Martin and Cottrell (1987) used the Rokeach Values Survey and the Martin Index of Health Behavior with 83 males and female students aged 17 to 49. Twenty-five percent of the sample ranked health as their most important, or second most important value, and 43% of the sample ranked health in their top four values. Petersen-Martin and Cottrell expected that people with higher self-concept might exhibit better health behaviors, but this outcome was

not supported. Only one significant difference was found between persons with differing values for health. "Persons who placed a high value on health exercised more than persons who placed a low value on health" ($p = .006$)(Petersen-Martin & Cottrell, 1987, p.8).

For older women, the motivation to live a long and healthy life seems to be a logical prerequisite to pursuing health-maintaining behavior. Logically, women who feel that they have little reason to live much longer, or to expect better health, may have less incentive to achieve health-promoting levels of physical activity. Supporting the association between value for health and health behavior, Kristianson (1985) has found that respondents who reported good preventive health behavior in a mail survey, also valued health more than did those who reported poor preventive health behavior. She warns that health value is more likely to be predictive of behavior involving a direct, rather than an indirect risk to health, such as drinking and driving, or wearing adequate clothing for the weather.

Outcome Expectations of Late Life Exercise

While susceptibility to risk of illness and disease is under-rated by most people (Weinstein, 1984), perceptions about susceptibility to harm from exercise participation is common (Del Monte, 1985; Heitmann, 1982; Lindsay-Reid & Osborn, 1980; Monahan, 1986; Waller, 1985a, 1985b). Women in particular seem to downplay the benefits of physical activity and have heightened anxieties about vigorous exercise even though incidents of sudden death are almost universally a male phenomenon (Ragosta, Crabtree, Sturner & Thompson, 1984). The reader is referred

to Chapter 2 for extensive reviews about the known risks and benefits of physical activity for adults of all ages.

Exercise is a complex, time-consuming and high effort behavior - one that at times requires discipline and commitment. Active adults may already have developed certain positive expectations about the value of exercise in their lives which is adequate compensation for the effort involved. Similarly, inactive adults may have developed negative outcome expectations that act as barriers to their participation. Social Cognitive Theory hypothesizes that beliefs about the expected positive and negative consequences of exercise would be important determinants of exercise participation. Bandura (1989, p. 1178) states that,

people avoid potentially threatening situations and activities, not because they are beset with anxiety, but because they will be unable to cope with situations that they regard as risky. They take self-protective action regardless of whether they happen to be anxious at the moment. (Bandura, 1989. p. 1178)

Explored in the Composite Model guiding this research study are the importance of the perceived health benefits and the perceived health risks of participating in fitness-type of exercise situations. In this study, older women are asked to evaluate their expected risks and benefits in six exercise settings which are reflective of community program offerings or at home fitness activities. SCT would hypothesize that the perceived risks and benefits, representing negative and positive expected outcomes of exercise, would be important determinants of exercise participation. More specifically, SCT would support the hypothesis that adults who perceive personal benefits from participation in exercise, and who perceive little risk of harm, would be more likely to be physically active.

Part of this construct reveals the public and private knowledge that ~~individuals have acquired about these activities and also reflects their~~

perceived ability to participate safely. Even though the health benefits of regular exercise may be publicly known, several researchers claim that older women may feel particularly vulnerable to injury or exaggerate the risks to health in physical activity settings (Calnan & Johnson, 1985; Heitmann, 1982; Siscovick, LaPorte & Newman, 1985).

Perceived Benefits and Risks of Exercise Participation

While there is little evidence to support the idea that older adults may be aware of the benefits of physical activity, participation in Seniors Games and general physical activity is on the rise. Interest in more intense activities seems to be growing as evidenced by various community and regional sport developments in which older women and men are seeking strenuous physical challenges that require months of conditioning, technical skill, first-rate equipment and expert instruction (O'Brien Cousins & Burgess, 1992; U. of Agers, 1990).

The perceived benefits of physical activity participation may be distorted for women who have been warned throughout their lifespan about the reproductive consequences that accompany physical exertion on the body (Vertinsky, 1990). The social justification for women to exercise has primarily been for weight control, perhaps not so much for health reasons as for beauty's sake. Traditionally, female beauty has been considered an important precursor to successful partnering with men, and successful partnering with men has been, until recently, the only route to elevated social status for women. Thus a female's greatest perceived benefit may be maintaining her "physical attraction" despite natural aging processes. Believing that her youth cannot be retrieved and with physical strain

ever more present, many older women may see little benefit in undertaking vigorous physical activity.

Some activities may be perceived to be more beneficial for older adults than others, although it is doubtful that adults are necessarily attracted to programs solely on the basis of these differences. For example, participation in safely implemented high-risk activity is thought by programmers to be superior to low-risk activities in fostering cooperation, confidence, self-esteem and a sense of empowerment, but older adults may not necessarily agree (Alessio, Grier & Leviton, 1989; O'Brien Cousins & Burgess, 1992). Still, recreational programming for older adults has not been well researched in terms of the role of adventure and risk-taking on positive/negative outcomes. As yet, there is no way to tell if increasing the challenges and interest level of older adults provides comparable increases in perceived benefits that would make participation worthwhile.

Data providing information on the perceived (and actual) benefits and risks are nonexistent, even for the six most frequently utilized activities in the United States - walking, jogging, swimming, cycling, calisthenics and racquet sports. Empirical data about the most common activity for all ages, walking, is absent. Furthermore, dose-response, or how much exercise is associated with how much benefit/risk, needs to be explored in more detail.

Such effects need to be explored at various points in the life span and the benefits and risks cannot be considered in isolation. It may be necessary to study them separately, but the overall effect of physical activity on the health of the population requires that both be known, both be studied with equal care, and that both be considered dispassionately. The potential overall beneficial impact of physical activity on health will be poorly served if activity patterns are recommended indiscriminately for all groups without regard for the subgroup-specific benefits and risks. (Powell & Paffenbarger, 1985, p.121)

Defining Perceived Risks of Exercise Participation

According to Giovacchini (1983), "safe behavior" is defined as 'freedom from unreasonable risk or significant injury under reasonable foreseeable conditions of use'. He further defines "risk" as 'the chance of getting hurt, losing, failing, or placing one's self in a dangerous or hazardous condition'. This kind of definition, if applied in the sport and physical activity setting, may be interpreted to mean that every activity has one or more risks associated with it, or at least a situation of zero risk is unlikely in most human undertakings.

Risk perceptions are thought to vary depending upon one's point of view, value system and personal priorities. As such, risk is meaningful only as it is self-defined, and therefore risk is as real as is the person's perceptions who is defining it. The problem with such self-defined risk is that highly motivated individuals are often unrealistically optimistic about their personal susceptibility to hazards while sedentary adults are often negatively biased about their personal odds (Weinstein, 1984). These "why it won't happen to me" perceptions appear to be highly resistant to change, even when new scientific information is provided that should counter that view.

Estimates about personal risk are likely carved out of past experience and one's perceived competence in a given situation. For example, a physically capable older woman may be wary of carrying out her daily walk in an unfamiliar city while another woman may judge the traffic and pollution to be more detrimental than the benefits of a walk. Still another may worry that getting breathless or provoking angina is her primary risk or may worry about falling on icy pavement if the weather is inclement. These are examples of risk perceptions that create self-defined barriers to a regular walking program.

The fact that everyone faces risks and hazards does not mean that we are all accurately evaluating risk and making good decisions about personal safety. On one hand, the hazards confronting people in daily life are often externally controlled, and on the other, various risks are difficult to compare. As an example, just "being old" could be considered to be a risk.

"Being old, for instance, is risky in that it introduces potential costs and dangers, but the attitude to 'being old' is likely to be of a different order from attitudes to climbing stairs" (Brearley, Hall, Jeffreys, Jennings & Pritchard, 1982, p.53).

The present activities of older adults are thought to be a reflection of their beliefs about expected outcomes and self-perceptions of ability. For example, about 70% of older Canadians claim to be walking and gardening, but less than 20% claim to be swimming or cycling (Stephens & Craig, 1990). Of all age groups, older adults are more likely to exercise alone (about 60%) and at home (40%). The reasons for these findings are not clear. Perhaps older adults are more inclined to walk and garden because their energies would then be applied constructively to no-cost transportation or to accomplishing tasks around their home.

A number of possible psychological, social and situational barriers may be operating to prevent many older people from participating in cycling and swimming, or in activities outside of their homes. Many older adults do not own swimsuits or bicycles; for many, lycra swimsuits and 21 speed dirt bikes are too expensive and beyond their needs. Swimming requires convenient pool facilities while cycling requires paved terrain and good weather. In Canada, neither the facilities, nor the weather, are often suited to participation.

The elderly probably associate greater risks with these activities. They may fear traffic and the speed needed on roadways and possibly are concerned about their ability to balance safely on bicycles; in swimming, adults must own

acceptable attire and be prepared to undress in public places. Older women are vulnerable to stares from young people in the locker room and on the pool deck. Further they must be confident about moving in water, even if the water temperature is below their comfort level; they must feel able to swim well if that is the perceived expectation. With severe Canadian winters the norm in most parts of the country, these two activities are not likely to be very inviting for older adults as year-round activities.

For older adults, understanding about the need for daily exercise is apparently improving, but overall, specific knowledge about the benefits and risks of different exercise behaviors is lacking. When asked about why they exercise, adults often can only reply that they "feel better" or "look better" (Canada Fitness Survey, 1982).

Adults of all ages are warned to consult their physician before increasing activity or taking up any new activity, and therefore the health-promoting message may be drowned out by this acknowledgement of what is likely a very small risk. The conscious effort by individuals to assess the nature and scale of the possible hazards in order to make self-protective decisions is likely made "in an environment composed of all gradations of ignorance and fear" (Zuckerman, 1983, p.v).

Physical activity has been found to become less structured and more casual with age (Stephens & Craig, 1990). Ironically people may become more and more independent from supervision in the exercise setting at the very life stages where they may also feel that they are at increased risk in exercise. However, casual participation does guarantee a sense of personal control over the "pace" of an activity and likely reduces perceptions of risk by removing social pressures to "keep up" (O'Brien & Burgess, 1992).

Females participate at about half the rate of males in organized sport, and participate at about twice the rate of males in supervised activity (Stephens & Craig, 1990). This finding suggests that social support for safe participation in activity settings is required more by women while males seek support for activity in higher risk settings. Yet, considering body fat patterns, males are at greater risk than women. Men are much more likely to weigh too much for their height and to have abdominal rather than low-trunk fat which place them at increased risk of cardiovascular disease (Stephens & Craig, 1990). Still, men over the age of 45 are more likely than women to report obtaining encouragement for activity participation and are more likely to report a sense of control over their ability to participate in regular activity. Females, on the other hand, are more likely to report family pressures and a lack of energy as significant barriers to being active (Stephens & Craig, 1990).

Sofalvi and Airhihenbuwa (1992) have researched the impact of the media on public beliefs about health issues. The media has been keen to report incidences of sudden death in the exercise setting, such as the death of exercise advocate, James Fixx. Educators concerns for contraindicated exercises combined with media interest on rare fatalities during exercise shows why certified fitness leaders tend to reinforce participation in supervised classes and give reason for reluctant exercisers to avoid physical activity altogether.

Behaviors based on risk assessment and behaviors related to health enhancement both seek to avoid personal harm. But while physical activity participation may have biological relevance to self-protection from disease, many individuals participate for entirely different social or psychological reasons (Thuen, Klepp, & Wold, 1992). Clearly specific, scientific information on the ~~actual and perceived risks accompanying different types of exercise intervention,~~

in certain populations vulnerable to joint and cardiac stress, is badly needed. Without this information, misinformed outcome expectations will continue to undermine social support initiatives for increasing activity in aging adults.

Age and Risk Perception

A common perception exists that the elderly are afraid or incapable of acting for themselves. They are considered helpless and hesitant with little to offer the community. Sadly, many behave according to ageist expectations and social labels and perpetrate the self-fulfilling prophecy (Edgerton, 1986). Although older people are stereotyped as being more cautious, some research does not bear this out (Brearley, Hall, Jeffreys, Jennings, & Pritchard, 1982). In Littlewood's (1989) study on the elderly, 19% agreed with the statement that "regular exercise can do you more harm than good". While such data only scratches the surface of the risk perceptions of aging adults toward the risks and benefits of exercise, these findings do lend support to the idea that lack of involvement in health-promoting exercise may indeed have much to do with people's overall assessment of benefit and harm.

This study will be among the first to specifically assess the perceived risks and benefits of six forms of late life exercise in women as described in the next chapter on methodology.

Movement Confidence (Self-efficacy)

Among the mechanisms of personal agency, "none is more central or pervasive than people's beliefs about their capabilities to exercise control over events that affect their lives" (Bandura, 1989, p.1175). Perceived self-efficacy is a

cognitive factor which appears to play an influential role in personal agency in ways that affect motivation. As such, self-efficacy, or "people's judgements of their capabilities to organize and execute courses of action required to attain designated types of performances" is the most studied component of social cognitive theory (Bandura, 1966, p.391).

Self-efficacy beliefs affect thought patterns in self-aiding or self-hindering ways. A strong sense of efficacy is required to remain task-oriented in the face of judgemental failures. "Those who have a high sense of efficacy visualize success scenarios that provide positive guides for performance" (Bandura, 1989, p.1176). Thus self-referent perceptions of efficacy are at least partly responsible for the kinds of challenges which people choose to undertake, how much effort they will spend on that activity, and how long they will persevere in the face of obstacles (Bandura, 1986, 1989).

"When faced with difficulties, people who are beset by self-doubts about their capabilities slacken their efforts or abort their attempts prematurely and quickly settle for mediocre solutions, whereas those who have a strong belief in their capabilities exert greater effort to master the challenge" (Bandura, 1989, p.1176).

Maintaining motivation for life pursuits is thought to be fostered by adopting challenges in accordance with one's perceived capabilities and having informative feedback that supports these perceptions of capability. Thus, experiences of mastery strengthen perceptions of efficacy. Even cognitive imagery (mental simulations) in which individuals visualize themselves competently executing an activity can enhance performance. Therefore, perceived self-efficacy and cognitive simulations affect each other reciprocally. A high sense of efficacy fosters cognitive images of effective actions, while successful experiences with efficacious courses of action strengthens self-perceptions of efficacy (Bandura & Adams, 1977).

Schunk and Carbonari (1984) acknowledge that competence is conceptually similar to self-efficacy, but ability is only one of the possibilities along with effort, luck and task difficulty that can explain success or failure of personal actions. Although those who view themselves as having high ability for a task are also apt to feel efficacious for performing it, simply possessing the ability to perform a task does not guarantee a high degree of self-efficacy, nor is competent behavior likely to occur without adequate incentives (Bandura, 1977a, 1977b).

The "self-efficacy" element of Social Cognitive Theory has been highly successful in the explanation of a host of health and behavioral outcomes even though the tools for assessing efficacy have varied from study to study (Strecher, DeVellis, Becker, & Rosenstock, 1986). People must have a robust sense of personal efficacy to sustain the persevering effort needed to succeed in physical activity, exercise and sport settings. Self-efficacy, the belief that one is able to perform a specific activity, is the most powerful and statistically significant correlate of both walking and vigorous exercise among a number of adult groups (Hofstetter, Hovell, Macera, Sallis, Spry, Barrington, Callender, Hachly & Rauh, 1991). Of interest to this study, perceived self-efficacy in the physical activity setting has predicted:

- 1) *positive mental health, self-esteem, and stress management* (Davis-Berman, 1989; Holahan & Holahan, 1987; Holahan, Holahan & Belk, 1984; Rogers, 1987; Ryckman, Robbins, Thornton, & Cantrell, 1982; Sonstroem, 1976; Wells-Parker, Miller, & Topping, 1990);
 - 2) *pain management* (Litt, 1988);
-

- 3) *over-exertion* (Ewart, Stewart, Gillilan, Kelemen, Valenti, Manley & Kelemen, 1986; Ewart, Stewart, Gillilan, & Keleman, 1986) and strenuous performance (Bandura & Cervone, 1986);
- 4) *skilled motor performance* (Brody, Hatfield & Spalding, 1988; Crawford & Griffin, 1986; Feltz, 1988; Griffin & Crawford, 1989; Griffin & Keogh, 1982);
- 5) *competitive sport performance* (Barling & Abel, 1983; Feltz, 1988; McAuley & Gill, 1983; Roberts, Kleiber, & Duda, 1981; Weinberg, Gould, & Jackson, 1979; Weinberg, Yukelson, & Hackson, 1980; Weiss, Wiese, & Klint, 1989);
- 6) *explanations of competitive sport performance* (Duncan & McAuley, 1987);
- 7) *eating and other preventive health behavior* (Sallis, Pinski, Grossman, Patterson, & Nader, 1988; Waller & Bates, 1992);
- 8) *attendance at a fitness program* (Howze, DiGilio, Bennett, & Smith, 1983);
- 9) *physical fitness and activity behavior* (Atkins, Kaplan, Timms, Reinsch, & Lofback, 1984; Dzewaltowski, 1989; Ewart, Taylor, Reese & DeBusk, 1983; Hofstetter, Hovell, Macera, Sallis, Spry, Barrington, Callender, Hackley, & Rauh, 1991; Kaplan, Atkins, & Reinsch, 1984; Marcus, Selby, Niaura, & Rossi, 1992); and
- 10) *indices of physical fitness* (Neale, Sonstroem, & Metz, 1970; Thornton, Ryckman, Robbins, Donelli & Biser, 1987).

Furthermore, efficacy in physical activity settings may be directly observable by others (Keogh, Griffin, & Spector, 1981), enhanced by experience and practice (Hogan & Santomier, 1984; Kaplan, Atkins & Reinsch, 1984; McAuley, Courneya & Lettunich, 1991) and even generalizable to other performance related settings (Hogan & Santomier, 1984). Efficacy expectations for exercise situations are stronger for males and younger adults (Duda & Tappe, 1989).

Social Support to Exercise

Of interest to this study are the socializing forces or cues that might be perceived by an older woman relative to her exercise behavior -- perceptions of endorsement, approval, advocacy or encouragement for physical activity. In broad terms, these socializing forces could reflect the processes of the family and the community, as well as the larger forces of society, in influencing differing roles, age norms, behaviors and lifestyles of men and women (Hobart, 1975; McPherson, Curtis, & Loy, 1989).

Expectancies about how others may view a behavior brings into play a socially normative variable called social support affecting whether one might participate in late life physical activity, exercise and sport. In this study, the local environment is considered to be a source of immediate social supports, such as friends and family. Social feedback from friends, family, and significant others provide cues for reinforcement and discrimination (Perry et al., 1990). In this respect, social support can be thought of as a "social efficacy to be physically active." For women, affiliative benefits have been emphasized as important personal incentives for physical activity involvement (Duda & Tappe, 1989).

Social support to exercise in late life is thought to be an important "environmental cue" for older women since some of those who plan to meet their fitness requirements with their choice of daily exercise may well experience:

- 1) disapproval from their spouse (Andrew, et al., 1981; Dishman, 1986; Perusse, LeBlanc, & Bouchard, 1988; Snyder & Spreitzer, 1973; Stephens & Craig, 1990; Tait & Dobash, 1986);
- 2) lack of peer interest and companionship (Hauge, 1973);

- 3) discouragement by the immediate family (McPherson, 1982; Spreitzer & Snyder, 1973; Spreitzer & Snyder, 1983); and
- 4) inadequate encouragement from physicians (Dishman, 1986; Gray, 1987; Powell, Spain, Christenson, & Mollenkamp, 1986; Wechsler, Levine, Idelson, Rohman & Taylor, 1983).

Health Locus of Control

Combining Health Locus of Control Theory with Social Cognitive Theory has been advocated as an important theoretical step (McCready & Long, 1985). Despite inconsistent findings in the literature, health locus of control is theoretically important to include in the model guiding this study for this reason: an older woman may be highly motivated to live a long and healthy life, but if she perceives she has little control over her health (external HLC), she is unlikely to take on a health-promoting behavior such as exercise.

A fatalistic attitude was uncovered in a survey by Littlewood (1989) in which 69% of the elderly agreed with the statement "there is no point worrying about a heart attack - you can't prevent it". Loss of appetite (43%) and constipation (40%) were as much associated with ageing as was mental illness (42%). If elderly people see certain health events as inevitable functions of aging, they are therefore less likely to act on them. With application to the study of late life exercise behaviour, health locus of control theory would hypothesize that older adults who keenly value their health and longevity, and who believe that they have some degree of positive control over their health by

participating in exercise, would be more likely to be found engaging in late life physical activity.

Summary of the Theoretical Framework

A Composite Model of explanation has been proposed for this research which explores the situational and cognitive determinants of late life exercise in women over the age of 70. The Composite Model provides some advantages over other models in that:

- 1) a comprehensive assembly of beliefs derived from Social Cognitive Theory and Health Locus of Control Theory are examined.
- 2) a comprehensive list of personal and situational variables are explored.
- 3) several types of social support have been incorporated.

A detailed explanation of the application of this model are provided in the next chapter on study design.

IV. DESIGN OF THE STUDY

This chapter includes the detailed methodology used to test the Composite Model and includes: survey questionnaire construction; measurement and validation of the outcome variable; discussion of the interpretive variables; measurement and coding of life circumstance variables and cognitive mediating variables; the pilot study; the sampling procedure; the data collection protocol; a second sampling procedure; and procedures used in the data analysis.

Survey Questionnaire Construction

Description

The survey instrument was a booklet composed of questions which were designed to assess the many constructs of the Composite Model: 1) the ten situational variables (age, marital status, education, economic status, health, school location, work role, number of children, childhood movement confidence and childhood social support for physical activity); 2) the five theoretical elements (health incentive, perceived risks and benefits, adult movement confidence, adult social support, and health locus of control); and 3) measurement of the leisure-time exercise in the past week.

Questionnaire construction was guided by Statistics Canada's Development and Design of Survey Questionnaires (Platek, Pierre-Pierre, & Stevens, 1985) with consideration given to the older adult reader wherever possible. For example, a larger than normal reading size font was used to assist readers, some of whom were likely to have visual difficulties. The questionnaire, stapled inside a bright pink cover, included a title page with an explanation of the study, a

carbon-backed consent form and 22 pages of questions, well-spaced, to facilitate reading (see Appendix A).

The questionnaire conformed to the requirements of the Human Ethics Review Committee of the University of British Columbia (see Appendix B). A number of instruments were included in the questionnaire which have been widely used. Their validity and reliability are reported later in this chapter. Instruments designed for this study have a reported test-retest reliability and concurrent validity value.

The outcome variable, *exercise status in the past week*, was assessed using a newly designed instrument. The Older Adult Exercise Status Inventory combines a number of positive attributes from other seven-day recall instruments used. A review and critique of the literature pertaining to these instruments can be found at the end of the Review of Literature. The inventory provides more detailed assessment of physical activity than most instruments and accounts for the unique activities of older adults as recommended by Washburn, Jette, and Janney (1990).

To facilitate comparisons among studies, Gordis (1979) recommends uniform wording of questions. Standardized questions such as those used on the Canada Fitness Survey (1983) and the General Health Survey (1985) assessed life situational measures on items such as *age, PARQ health symptoms, number of medications, self-rated health status, marital status, and education*. In addition to these, I designed questions on cultural background: *country of main schooling, socioeconomic status, employment activity, number of children and childhood social support* to be physically active. I assessed *childhood movement confidence* using the format of a validated stunt movement confidence inventory and creating a new instrument called "Movement Confidence as a Child."

I designed four of the six instruments used for the cognitive measures of the study: *health incentive*, *perceived risks with exercise*, *perceived benefits with exercise*, and *social support* to be physically active. Adapting the format of a stunt movement confidence inventory, I created a new instrument called "Movement Confidence Now" to assess *adult movement confidence*. *Health locus of control* was measured using a validated instrument which has been widely used in health promotion research.

The Older Adult's Exercise Status Inventory

Description

Exercise status (ENERGY) in total kilocalories was the criterion measure used for this study. For this study, a seven-day recall instrument is designed to assess the type, duration, frequency and level of intensity of the physical activities of older adults (See Appendix A).

The design brings together the strengths of a number of instruments which had been used in prominent epidemiological research projects (Blair, 1984; Paffenbarger, Hyde, Wing & Hsieh, 1986; Canada Fitness Survey, 1988; Taylor, Jacobs, Schucker, Knudsen, Leon & Debacker, 1978). In general, the Older Adult's Exercise Status Inventory (OA-ESI) used in this study compromises some instrument brevity for increased detail and rigor than in other studies which have used the seven-day self-report. The OA-ESI is among the first physical activity assessment tools to quantify the specific exercise patterns of adults over age 70.

The Canada Fitness Survey (1988) used an inventory called "Physical Activity in Your Spare Time" for recording the activities of individuals over an entire year. This inventory excludes many activities where seniors are active

such as curling, line dancing, horseshoes and darts. Another criticism of this inventory is that recall over a full year may be too difficult for adults of any age. Still, the column-row style combined with a seven-day recall format appeared to have merit. Compared to the CFS Inventory and the Physical Activity Index (PAI) used by Paffenbarger, Wing and Hyde (1978), the OA-ESI is age-relevant and more comprehensive in documenting types of exercise participation.

As with the CFS Inventory, the OA-ESI examined exercise as a form of leisure behavior, and therefore did not include domestic work, nor employed work activity as part of the weekly energy estimate. The work energy of women on domestic tasks has, unfortunately, received little interest by researchers. At least two studies claim that domestic activity accounts for much of women's daily physical activity and must be documented in the future (Cauley, LaPorte, Sandler, Schramm & Kriska, 1987; Mattiasson-Nilo, Sonn, Johannesson, Gosman-Hedstroem, Persson & Grimby, 1990).

The OA-ESI is a two-page inventory which prompts subjects with categories organized in columns by the seven days of the week and organized in rows by a list of 38 physical activities. The 38 activities were considered age-appropriate since they were chosen for the list from personal observation and experience with the activities available to older women in Edmonton and Vancouver.

The 38 activities provided a comprehensive list of leisure-time physical pursuits likely to closely reflect older adult's types of exercise involvement. Two open categories called "Other" accommodated any other activities that were not already included on the main list. These exercise categories acted as memory prompts and were listed alphabetically from "aerobic fitness class" to "walking (no sweating)". Aquacize activity was subdivided into "vigorous" and "gentle", while cycling, gardening, jogging and walking were subdivided into "sweat-

inducing" and "no sweating". The purpose of the sub-categories was to reduce error in estimating the intensity of a particular activity and thereby improve the estimate of the criterion variable, weekly energy spent on exercise. To aid precision, subjects were asked to report the "time spent in minutes" for each activity on each day.

Reliability of the OA-ESI

As a test of reliability, the OA-ESI was administered twice in a four-week period to 16 older women from Edmonton (mean age of 67). Pearson Product Moment correlations (r_p) were used for interval and ratio data; Spearman Rank order correlations (r_s) were used for ordinal variables such as school location, marital status, education, and work role. Out of several self-reported activity measures, only mild exercise demonstrated poor reproducibility ($r_p = .114$; n.s.) and undermined the reproducibility of the total amount of exercise reported ($r_p = .340$; $p = .198$). Moderate exercise was reported more consistently ($r_p = .756$; $p < .001$) while vigorous exercise was only moderately reliable ($r_p = .505$; $p < .05$). (See The Pilot Study).

Ironically these inconsistent findings for mild exercise patterns provide support for construct validity. The initial survey and retest were conducted in the four weeks of September during which the pilot sample entered various fall sport and fitness programs. Thus substantial changes in the nature of physical activity occurred over the four-week pilot study. Many of the women in the pilot study were re-initiating participation in structured, supervised and vigorous forms of exercise and forfeiting some of their less structured and milder summer activities at that time of year. In this regard the piloted questionnaire was sensitive to these changes in activity patterns of the 16 women. In doing so,

self-reported activity as measured by the OA-ESI appeared to demonstrate weak reproducibility, but, at the same time, validated the known changes in participation. This phenomenon provided a degree of confidence that the seven-day recall had adequate sensitivity to be administered to a larger sample.

Validity of the OA-ESI

The Older Adult's Exercise Status Inventory (OA-ESI) used in this study integrates the best assessment strategies of the other validated survey instruments for physical activity and thus is considered to retain adequate validity. Moreover, as a simple record of daily exercise involvement, the OA-ESI has demonstrated adequate construct validity in the pilot study by representing what was known to be seasonal changes in exercise patterns (see the above "Reliability of the OA-ESI").

Concurrent validity is demonstrated by examining the correlations of ENERGY in kilocalories with other concurrent activity indicators on the same OA-ESI survey. For example, ENERGY (total of weekly kilocalories based on self-report) had a correlation of $r_p = .403$ with LIFESTAT, a subjective question about lifelong activity status similar to that used by Godin, Valois, and Shephard (1987). This question was worded, "How would you describe your physical fitness activity over your entire life course?" (See page 4 of the questionnaire in Appendix A). The five response choices were reduced to two for dummy coding: 1 = Currently active, 0 = Not currently active.

To another subjective question used by Godin & Shephard (1982), "How often did you participate in vigorous physical activities long enough to get sweaty within the past four months?", the present ENERGY score correlated $r_p = .411$

($p < .0001$).

Exercise activity has been shown to decline with age and poorer health status. In this study, ENERGY supported this relationship with an $r_p = -0.226$ ($p < .0001$) with age and $r_p = .222$ ($p < .0001$) with a positive health self-rating. These relationships provide evidence for construct validity.

Use of the OA-ESI

The F.I.T.T. formula is used in Canada by fitness and lifestyle counsellors to account for frequency, intensity, type of exercise and time spent on exercise. All four variables are considered useful measures of exercise involvement and therefore were considered to be essential measures in this study. Thus the Older Adult's Exercise Status Inventory specifically assessed: *type* of exercise reported, *intensity* of exercise reported (MET units), total *duration* of exercise (hours of activity), and total number of exercise sessions (*frequency*). The *type* of exercise reported was used two ways: first to provide descriptive information on the activity preferences of older women, and second, to estimate more accurately the energy expenditure of each type of activity.

"Amount of exercise in the past week" was calculated using reported metabolic charts giving MET units for physical activities (Cantu, 1980; Passmore & Durnin, 1955; Taylor, Jacobs Jr., Schucker et al., 1978; Wilson, Paffenbarger, Morris & Havlik, 1986). The MET is the ratio of working metabolic rate to resting metabolic rate and is a convenient method of expressing energy expenditure (Sallis et al., 1985). It can be thought of as the ability of an individual to tolerate multiples of their resting energy level (Astrand, 1992, personal communication).

One MET = 1 kcal/kg/hour, an equivalent of one kcal of energy expended by a 60 kg. person sitting for one minute. MET units account for the intensity of

the activity, the duration of the activity as well as the body weight of the individual (if they are not too different from 60 kg.). For sake of convenience, many studies assume an average body weight of 60 kg., meaning that the average individual, sitting at rest, spends about 60 kilocalories per hour or 1.0 kilocalorie/kg./hour, or 1.0 MET.

From the information provided on the OA-ESI, a number of dependent measures were identified: total energy in kilocalories spent on reported exercise in the past week (TOTKCAL); total kilocalories spent on reported exercise but adjusted for individual body weight (ENERGY); total kilocalories spent in three intensity categories of exercise, from mild (<4 METS), and moderate (4 to 5.9 METS) to vigorous forms of exercise (>6 METS). These three exercise intensity measures were called MILDKCAL, MODKCAL and VIGKCAL. Also the total number of hours of activity (ACTHOURS) and total number of separate exercise sessions (TOTSESS) over the seven days were counted.

There is some debate whether the weight of an individual should be used in the calculation of energy expenditure, since the MET unit is meant to be a metabolic ratio, independent of body weight. The work/rest ratio method assumes that a task performed by a heavy person raises metabolic rate to the same extent as the same task performed by a person weighing less, even though the caloric expenditure might be different (Reiff, Montoye, Remington, Napier, Metzner & Epstein, 1967). In the Five City Project, researchers suggested that the measurement of exercise in "kilocalories per kilogram per day was not an acceptable measure for overweight populations" (Sallis et al., 1985, p. 95). Being overweight added to the energy estimate of exercise and was considered to negatively affected the reliability of their self-report data.

In the present study, however, the MET units were calculated according to individual body weight (according to personal advice from Dr. R. S. Paffenbarger, Jr., April 19, 1991). Thus the duration of each activity reported in minutes was recorded along with the individuals's body weight (kg) so that total kilocalories spent on exercise accounted for portions of an hour as well as individual differences in body size.

Where the reported MET estimates differed in the literature, the more conservative estimate was used. The MET unit was multiplied by the individual's reported participation time in hours over the seven days *for each activity* and adjusted for body weight in kilograms.

$$\begin{aligned} \text{ACTIVITY STATUS (KCAL)} &= \text{Duration} \times \text{Intensity} \times \text{Body Weight} \\ &= X \text{ minutes}/60 \text{ (hours)} \times \text{MET unit (kcal/kg/hr)} \times \text{weight (kg)} \\ &= \text{kilocalories} \end{aligned}$$

Totals for mild, moderate and vigorous exercise categories were calculated. All three categories were then summed, thereby providing a seven-day Exercise Status (ENERGY) measure in the form of kilocalories spent on exercise in the past week.

$$\begin{aligned} \text{EXERCISE STATUS (ENERGY)} &= \text{Reported Mild Activity} + \text{Moderate} \\ &\text{Activity} + \text{Vigorous Activity} \end{aligned}$$

The MET units used for the 38 activities in this study are in Table 4.0.

Table 4.0
Metabolic Units of 38 Activities

Activity Type	MET Unit ⁷
Aerobic Fitness Class	6.0
Aquafit/Aquacize Class (Vigorous)	7.0
Aquafit/Aquacize Class (Gentle)	4.0
Badminton	5.5
Bicycling outdoors	4.0
Bicycling indoors (sweat-inducing)	6.0
Bicycling indoors (no sweating)	4.0
Bowling (any kind)	3.5
Calisthenics	4.5
Canoeing or kayaking	3.5
Curling	3.0
Dancing (Square, tap, folk)	6.0
Dancing (Ballroom, ballet)	5.5
Dancing (Line, Hawaiian)	5.0
Darts, Billiards, Pool	2.5
Gardening (sweat-inducing)	6.0
Gardening (no sweating)	4.0
Golf	5.0
Gymnastics or rhythmic	6.0
Hiking hilly terrain	7.0
Horseshoes	3.5
Jogging (sweat-inducing)	8.0
Jogging (no sweating)	6.0
Rebounding (trampoline)	6.0
Rope skipping	8.0
Rowing (machine)	6.0
Skating (ice or roller)	7.0
Stair climbing for fitness	8.0
Stretching exercises	3.5
Swimming (gentle)	5.0
Swimming (non-stop lengths)	10.0
Table Tennis	4.0
Tai Chi	3.5
Tennis	6.0
Walking (sweat-inducing)	4.0
Walking (no sweating)	3.0
Weight Training	6.0
Yoga	3.5

⁷ The metabolic estimates were compiled using reported metabolic charts as described on page 4-7.

Interpretive Variables

A number of questions were asked to provide support and understanding of the criterion variable. These were as follows:

Normal Activity Level (TYPICAL)

Subjects were asked "How typical was this past week in terms of your normal activity level?"

- more activity than typical
- quite typical
- less activity than typical

These were dummy-coded into "typical week" (0) or "not a typical week" (1).

Change in Activity Level (CHANGE)

A second question assessed changes in level of physical activity in the past five years. Response choices were:

- Significantly decreased
- Somewhat decreased
- Not changed
- Somewhat increased
- Significantly increased

With dummy-coding, responses which indicated no change or an increase in activity were labelled "no decrease" (0) and "decreased" (1).

Participation in the Past 4 Months (PAST4MON)

A question from Gaston Godin's (1982) survey instrument (unnamed) from the School of Physical and Health Education at the University of Toronto was included. Since a number of studies have reported stronger relationships between concurrent criteria when subjects self-report more vigorous forms of exercise,

it was logical to include a question which captured such vigor. Subjects were asked "How often did you participate in vigorous physical activities long enough to get sweaty with the past four months?" Response categories were:

- not at all
- less than once a month
- about once a month
- about 2 to 3 times a month
- about once a week
- two or more times a week

Godin, Jobin and Bouillon (1986) reported on a concurrent validation study for this question on 32 male and 29 female volunteers aged 19 to 66 years. A two-week test-retest reliability coefficient was .64. Values of maximum oxygen intake, body fat and muscular endurance, expressed in percentiles of appropriate age and sex categories, were used as concurrent criteria validity. Correlation coefficients between reported physical activity in the past four months were $r = .38$; $p < .001$ for maximum oxygen intake, $r = .43$, $p < .01$ for body fat and $r = .54$, $p < .001$ for muscular endurance. This is in agreement with Siconolfi and co-workers who also demonstrated that a simple "sweat" question taken from Paffenbarger's Physical Activity Index Questionnaire had concurrent validity of $r = .60$ with self-reported physical activity over the past week (Siconolfi, Laseter, Snow, & Carleton, 1985).

In the pilot study, no relationship was found between test and retest of this question on 16 older Edmonton women ($r_s = .048$; $p = .861$). The reliability appeared to have been undermined by substantial changes in exercise patterns due to the time of year.

Life Situational Measures

Introduction

The role of an individual's life circumstances in creating opportunities and incentives, and in creating obstacles and barriers, are recognized as possible determinants of exercise behavior. The literature reviewed in Chapter 2 suggests that habitual physical activity patterns are likely if the individual is male, younger, economically secure, of a higher educational level, of lower body mass and in good health.

Less is known about the role of ethnicity and cultural background, marital status, family size and domestic/employment status although they are thought to be circumstances that are likely to be important at certain life stages in explaining activity patterns. In the following section, the contextual variables used in this study and the instruments chosen to measure them are identified along with their eight-character computer label in brackets. Test-retest Pearson correlation coefficients are also included from the pilot study on 17 older women.

Age (AGE)

Age was obtained by subtracting the year of birth from 1990 as reported in the question "In what year were you born?" (Test-retest r_p (AGE) = .998; $p < .0001$).

Culture (SCHOOLC)

Cultural background was obtained from a checklist of countries which respondents used to reply to the question, "In which country did you complete most of your schooling as a child?"

- (1) Canada
- (2) United States
- (3) Britain
- (4) Japan
- (5) Germany
- (6) China
- (7) Italy
- (8) Scandinavia
- (9) Other

Culture was dummy-coded as "English-speaking country" (1) which included those schooled in Canada, Britain and the U.S. and "foreign language speaking country" (0) which included all other countries. Test-retest r_s (SCHOOLC) = .926 ($p < .0001$).

Socioeconomic Status (COMPSES)

Three questions were asked:

- 1) Do you feel financially secure for the remainder of your life? (SECURE)
- 2) Are you able to handle unexpected expenses with no worry? (NOWORRY)
- 3) Which of the following financial assistance do you receive? (INCOME)
 - () None
 - () Guaranteed Income Supplement (GIS)
 - () Spouse's Allowance/ Widowed Spouse's Allowance

To the first two questions, respondents answered "yes", "not sure" or "no". These were dummy coded as "Yes" = 1, and "Not sure" or "No" = 0. The women reporting receipt of the Guaranteed Income Supplement (GIS) and or Spouse's Allowance were expected to have more marginal financial resources since their economic status would have already been determined by the Government of Canada. Dummy coding for question 3 was: "No GIS" = 1; GIS/Allowance = 0. Test-retest reliabilities were: r_s (SECURE) = .778; $p < .0001$; r_s (NOWORRY) = .763; $p < .001$; r_s (INCOME) = .562; $p < .03$.

These three economic indicators were standardized and pooled using principal components analysis to provide a composite indicator of socioeconomic status:

$$\text{COMPSES} = .867 (\text{No financial worry}) + .866 (\text{feeling secure}) + .364 (\text{no GIS}) / 1.637 (\text{eigenvalue}).$$

Marital Status (MARITAL)

Five standard categories were provided for marital status: single (never married), common-law partner, married, widowed, and separated/divorced. Test-retest r_s (MARITAL) = 1.0. These were re-coded into dummy variables of "partnered" (1) and "unpartnered" (0).

Education (EDUCATIO)

Eight forced-choice categories covered various levels of years and type of schooling from:

- 1) No schooling
- 2) Grade 1 to 4
- 3) Grade 5 to 8
- 4) Some high school
- 5) Completed high school
- 6) Business or trade school
- 7) Some university or college
- 8) University or college degree(s)

Test-retest r_s (EDUCATION) = .797; $p < .0001$. These eight levels were dummy-coded into "less than highschool graduation" (0) and "at least highschool graduation"

(1).

Work Role

The survey asked: "What kind of work situation best describes you from age 35 to 65? (Pick only one).

- (0) No paid employment
- (1) Part-time or intermittent full-time employment
- (2) Steady full-time employment

The test-retest r_s (WORKROLE) = .886; $p < .0001$. Dummy coding scored never-employed women a (0), while women reporting part- or full-time employment scored (1).

Family Size: Number of Children (CHILDREN)

The question "Which domestic situation best describes your adulthood?" provided choices of "on my own", "homemaker, no children", and "Mother of ____ children". A domestic role variable (not used in the regression analysis) was coded "mother" (1) or "no children" (0). The number of children was the number reported. Test-retest r_p (CHILDREN) = 1.0.

Health Variables

Self-Rated Health (HEALTH)

In this study respondents were asked to describe their current state of health from (1) "poor", (2) "fair" (3) "good" to (4) "excellent". Ratings ranged from 1.0 to 4.0. Test-retest reliability for self-rated health of 16 older Edmonton women in the pilot study obtained an r_p (HEALTH) = .506; $p < .046$. The scale, while considered reliable and valid in younger populations, may be less useful in the very old. For example, some of older adults might increase activity levels to combat a known disease, while others might significantly decrease activity to "reserve their strength".

Physical Symptoms (SYMPTOMS)

The Physical Activity Readiness Questionnaire (PAR-Q) is a yes-no screening device used by Fitness Canada to eliminate high-risk exercisers. Five questions evaluate physical symptoms of "heart trouble", "frequent pains in your heart and chest", "often have spells of severe dizziness", "doctor has said your blood pressure is too high" and "other good physical reasons why you should not exercise...". An individual who scores a "yes" (1) on any single item is considered to be at higher level of risk for fitness exercise participation than a "no" (0) response and is recommended for exclusion from physical fitness testing (Fitness Canada). Symptoms were additive so that total symptoms reported ranged between 0 to 5. The test-retest reliability in the pilot study of older women was .667 ($p < .005$).

Perceived Well-Being (TOTPWB)

A 14 item, seven point Likert scale type of instrument (strongly agree to strongly disagree) called the Perceived Well-Being Scale (Reker & Wong, 1984) assessed physical and psychological well-being. Scores could range from 14 to 98. The pilot study obtained a test-retest r_p (TOTPWB) = .565; $p < .02$) over a four week period. The scale included two subscales: psychological well-being (PWBPSYCH) and physical well-being (PWBPHYS). Reliability of the subscales were .604 for PWBPSYCH ($p < .05$) and .590 for PWBPHYS ($p < .05$).

Medications (MEDICINE)

Subjects were asked how many prescription medicines they were taking that required a written prescription by their doctor. Scores could range from 0 to 7

(seven medications or more). A test-retest reliability of .857 ($p < .0001$) was obtained in the pilot study.

The Composite Health Index

Since health was represented by four variables (self-rated health, PARQ, number of medications and the Perceived Well-Being Scale), a composite variable was created using weights derived from Principal Components Analysis. The composite health variable correlated $r_p = .324$; $p = .0001$) with Exercise Level as calculated from the equation:

$$\text{COMPOSITE HEALTH} = .801 \text{ Well-Being} - .782 \text{ PARQ} + .749 \text{ Self-Rated Health} - .740 \text{ Medicine}/2.362$$

Body Mass (Quetelet Index) (HEIGHT; WEIGHT; BODYMASS)

Body height and weight were self reported and converted to metric for use in a formula to calculate a body mass index. This variable was used in the descriptive data only. Body mass is only an indicator of proportional or relative weight, not fatness. In sedentary people however, body mass is usually considered an indicator of adiposity. Body mass index was calculated as follows:

$$\text{BODYMASS} = \frac{\text{Weight} \sqrt{\text{kilograms}}}{\text{Height}^2 \text{ meters}^2}$$

Childhood Movement Confidence (CHILDMOV)

This variable was viewed as a measure of predisposing context, rather than a current mediating variable. The 'Movement Confidence As A Child' (MCC) scale retrospectively evaluated *childhood movement confidence* as perceived confidence and experience to engage in six childhood physical skills. Childhood Movement Confidence, in this study, is a measure of self-efficacy which is reinforced by "habit" or at least considerable *experience* with successful performance.

The MCC scale was adapted from a contemporary instrument called the 'Stunt Movement Confidence Inventory' (SMCI) which assessed a) perceptions of personal competence for performing a task, b) experience in performing a specific task, and c) perceived potential for physical harm during the performance (Griffin & Crawford, 1989). However, "perceived movement confidence as a child" (CHILDMOV) is built on Griffin and Crawford's theoretical model with some alteration. The MCC scale used in this study omitted Griffin and Crawford's measures for "perceived enjoyment" and "potential for harm" since they were already represented in the Integrated Model with Bandura's construct "outcome expectations (perceived benefits and risks of exercise). As with Griffin and Crawford's study, the skills were portrayed in picture form (See Appendix A).

In this study, for each of the six recalled physical skills, individuals were first asked about their movement confidence in childhood: "How sure are you that you could have done this as a youth?" and this was scored "Very sure" (4), "Pretty sure" (3), "Not very sure" (2) and "I know that I couldn't" (1). Secondly, the survey asked "how many times would you have done this as a youth?" and this was scored "I have done this a lot" (4), "I have done this a few times" (3), "I tried it once" (2), and "I've never done this" (1). Scores for ~~childhood movement confidence and experience were summed and averaged (Range =~~

1 to 4 for each of six exercise skills). Thus MCC scores could range from 6 to 24.

Test-retest reliability over four weeks was examined in the pilot study on older women and the MCC scale produced an extremely strong coefficient of r_p (CHILDMOV) = .951; $p < .0001$.

The SMCI has components of *Harter's Perceived Competence Scale for Children*, an instrument which had originated from her factor analysis of various elements of competence (Harter, 1982). She hypothesized that perceived competence

...should be positively related to one's intrinsic motivational orientation to prefer challenge, to be curious, and to engage in independent mastery attempts. (Harter, 1982, p. 94)

Higher order factoring revealed that perceived cognitive competence was strongly related to preference for challenge ($r = .57$), to independent mastery ($r = .54$), and moderately related to curiosity ($r = .33$). These four variables formed a distinct factor with high loadings of .76, .87, .80 and .79 respectively. Emphasis was placed on this factorial (construct) validity which remained stable across this grade range.

Harter found stable patterns in Grade 3 to 6 children who consistently (over 6 different samples) identified four theoretically meaningful components: cognitive competence, social competence, physical competence and general self-worth. The internal consistency of her physical competence scale across all samples was .77 to .86 while test-retest correlation was .87. Teacher's ratings of physical competence correlated .62 with pupils' own self ratings. Discriminant validity was supported in that participants of school athletic teams scored significantly higher on perceived physical and social competence.

That same year Griffin and Keogh (1982) published a significant theoretical paper proposing a movement confidence model incorporating three elements: self-

assessed competence, potential for enjoyment and potential for harm. The elements of competence, enjoyment and harm were incorporated into the *Playground Movement Confidence Inventory* (PMCI) published by Crawford and Griffin in 1986. The PMCI was tested with 250 fifth-grade students using a cluster sampling procedure. A test-retest reliability coefficient was .78 with the Grade 5 school children.

The PCMI was validated using significant discriminant functions ($p < .05$) which classified subjects above chance levels into experience/confidence cells on the basis of systematic response variation to the movement confidence model. Classification accuracy ranged from 77.87% to 92.62%. Cross-validation of the PMCI was achieved through splitting the original n into estimation (60%) and holdout (40%) samples. The function values obtained from the estimation sample were applied to the holdout sample with the following classification results: a validity coefficient ($r = .9768$) was obtained with 84.65% classification accuracy or a 49.51% improvement over basic chance.

Using the same response format, but different physical skills, the SMC I scale was then designed. Meant for contemporary boys and girls, SMC I used "stick" drawings of people performing risky physical stunts such as skateboarding over a ridge and cycling over a hill (Griffin & Crawford, 1989). Test-retest correlations with the SMC I were .82 for self-report experience and .80 for self-reported confidence with the task. Test-retest correlations for competence, enjoyment and harm were .88, .79 and .85 respectively.

For the empirical cross-validation procedures, discriminant analysis was used to determine total scale classification power. Regression weights developed on one group (an estimation group) were applied to a second group (a holdout sample). Application of the regression weights derived from the estimation sample

to the holdout sample data set resulted in a validity coefficient of $r = .98$ with an 88.2% classification accuracy.

In this study the MCC scale retained the SMCI rope climb and bike riding with slight modification (feet on the rope and no aerial phase on the bike) and replaced the SMCI roller skating, skate boarding, stilts and pogo stick jumping with other challenging play elements that would have been available to some young girls in the early twentieth century. The MCC represented six physical challenge categories of trunk strength, arm strength, aquatic activity, leg power, hip flexibility and balance.

Childhood Social Support to Exercise (CHILDSOC)

Four questions with five-point Likert scales were designed to retrospectively examine *childhood social support* for exercise. Four recall questions were asked relative to: 1) family athleticism (FAMSPORT), 2) personal encouragement by a parent, teacher or friend (CHLDHELP), 3) childhood opportunity to participate in vigorous physical activity in one's free time (OPPORTUN) and 4) enjoyment of physical education, exercise and sport at school (PEFUN). The scales represented important theoretical elements in the literature. In the pilot study, the scale for childhood social support in physical activity demonstrated good reliability ($r_p = .785$; $p < .0001$).

The Cognitive Variables

The Integrated Model of Exercise Behavior suggests that there are five beliefs or cognitive perceptions that one might consider in deciding whether to engage in exercise in their later years. These are: Health Incentive, Movement Confidence, Social Support, Outcome Expectations (Perceived Risks and Benefits) and Health Locus of Control. These five beliefs were measured as follows:

Health Incentive (MOTIVE)

A variable called *Health Incentive* represented Bandura's theoretical element called "incentive to act." This construct assumed that if older adults were exercising, it was for reasons of maintaining or improving health and longevity. Health Incentive was measured by four statements about prolonging health and longevity. These were:

"I don't really care how much longer I live" (LIVECARE)

"I am motivated to avoid illness any way I possibly can" (AVOIDILL)

"I am trying to live as long as I possibly can" (LIVELONG)

"I am trying to stay healthy as long as I possibly can" (HLTHLONG).

Four-point Likert scales were used to score responses: Strongly agree (4), Agree (3), Disagree (2), and Strongly disagree (1), except the first statement which was reverse-scored. Scores could range from 4 (low motive to live a long and healthy life) to 16 (high motive). The scale showed adequate test-retest reliability in the pilot study ($r_s = .559$; $p < .03$).

Adult Movement Confidence (ADULTMOV)

The 'Movement Confidence Now' (MCN) scale evaluated *adult movement confidence* as perceived confidence and experience in six adult physical fitness activities. The MCN scale was similar to the MCC scale but had wording to reflect the present tense, and evaluated whether each of the six specified fitness activities were done in the past year. Scores for adult movement confidence and experience were summed and averaged (Range = 1 to 4). Therefore the MCC and MCN scales would each provide scores between 6 (low confidence + low experience averaged) and 24 (high confidence and high experience averaged). The MCC and MCN scales were approximately matched for representative physical categories of trunk strength, arm strength, aquatic activity, leg power, hip flexibility and balance as described in Table 4.1.

Table 4.1

Movement Skills Estimating Movement Confidence and Past Experience

Movement Category	MC as a Child ^a	MC Now ^b
1. Trunk strength	Swing by the knees (KNEECONF; KNEEEXP)	Curl-up 10 times (CURLCONF, CURLEXP)
2. Arm strength	Rope Climb (ROPECONF; ROPEEXP)	Knee push-ups 5 times (PUSHCONF; PUSHEXP)
3. Aquatic activity	Dive into deep water (DIVECONF; DIVEEXP)	Aquafit class (50 min.) (AQUACONF; AQUAEXP)
4. Leg power	Jump from high object (JUMPCONF; JUMPEXP)	Brisk walking (20 min.) (WALKCONF; WALKEXP)
5. Hip flexibility	Splits (SPLITCONF; SPLITEXP)	Toe touch (FLEXCONF; FLEXEXP)
6. Endurance, balance	Ride a two-wheel bike (BIKECONF; BIKEEXP)	Cycle for 20 min. (BYCCONF; BYCEXP)

^a Movement Confidence as a Child is a recall measure.

^b Movement Confidence Now is a current measure

The MCN scale represented activities which contemporary seniors would likely find in their communities in exercise programming for older adults. Where possible, MCN items attempted to closely represent the MCC child activity in adult form. For example, stationary exercise cycling (as an adult) matched outdoor bike riding (as a child), aquafit exercises (as an adult) matched diving and swimming in deep water (as a child), jumping from a high box (as a child) was replaced by the leg power required for brisk walking (as an adult), and a sitting forward stretch (as an adult) represented flexibility to do the splits (as a child).

Validity was not directly tested, because the MCN scale was a modified version of a previously validated instrument (the SMCI). Furthermore, the MCN scale used clear illustrations of the performance requirements of the activities which should have maintained face validity. Test-retest reliability for the MCN scale was $r_p = 0.799$; $p < .001$ in the pilot study.

Adult Social Support to Exercise (ADULTSOC)

Prospectively, four items, matching *childhood social support* were worded along the same lines to assess *adult social support* for exercise: 1) family support (FAMSUPP), 2) encouragement by at least one person to be active (ADULTHLP, 3) peer involvement in physical fitness activities (FRIENDACT) and 4) physician endorsement for vigorous activities in late adulthood (DOCSUPP). Each question used a forced-choice format ranging from 1 to 5 (strongly disagree to strongly agree). Total scores could range from 4 (low support) to 20 (high support).

In the pilot study, reproducibility was poor for the adult social support scale. It appeared to be undermined by substantial seasonal changes in the physical and social activity of the pilot group from August to September. Consequently the test-retest reliability for adult social support was low and non-significant ($r_p = .372$; $p = .156$).

Perceived Risks and Benefits of MCN Exercises

The fifth cognitive mediator in Social Cognitive Theory was the *Outcome Expectation*. In this study, the risks and benefits as outcomes from current exercise participation were rated as perceived outcomes. An example of one of

the six items was "Please rate the possible risk to your health of doing a 50 minute aqua-fit class".

Five-point continuous Likert scales "(1) low risk...(3) moderate risk...(5) high risk" and "(1)low benefit...(3) moderate benefit...(5)high benefit" accompanied each adult exercise in the MCN instrument. This provided six ratings of perceived risk and six ratings of perceived benefits which were then separately summed to represent "Total Perceived risk" (TOTRISK) and "Total Perceived Benefit" (TOTBENE).

Open ended statements concluded each exercise section of the MCN scale with: "The major risk for me would be....." and "the major benefit for me would be.....".

In the pilot study, the perceived benefits of the six adult movement skills were reproduced within a four week period with r_p (BENEFITS) = .837; $p < .001$. This was an encouraging indicator that the scale was highly reliable. However, perceived risks of the six movement skills gave an r_p (RISKS) = .266 and did not reach significance. This finding is hard to explain, but may indicate a sensitivity of the perceived risk scale to the seasonal change in activity that the women experienced between test and retest. The mean risk declined from 10.15 to 8.39 at retest - a reduction in perceived risk that may have accompanied their renewed involvement in activity.

Health Locus of Control (TOTHLC)

Health locus of control was added to the theoretical model as a fifth cognitive variable because recent studies suggest that individuals would not be likely to undertake health promoting behavior if they felt they were unable to promote their health.

The Health Locus of Control Scale (HLOC) of Wallston, Wallston, Kaplan and Maides (1976) uses eleven Likert items (6 points from strongly agree to strongly disagree) to assess internal versus external sense of control over one's health. Internal locus of control is an attributional style whereby an individual perceives that they are in control of an outcome. External locus of control is found in individuals who believe that an outcome is due to fate, chance or luck. The original 1976 scale was used for this study because it was shorter than the 1978 version and more statements were relevant to health and exercise.

The HLC scores range from 11 to 66 with lower scores meaning "internality" and higher scores meaning "externality". According to locus of control theory, "internals" would be more likely to take steps to better their personal condition than would externals. Therefore, in a program designed to modify health-related behaviors, one might expect internals to be more successful than externals whose beliefs are leaning toward helplessness. Internality has been associated with higher levels of leisure-time and sport behavior in women (Bonds, 1980; Calnan, 1988; Carlson & Petti, 1989; Dishman & Steinhardt, 1990; Kleiber & Hemmer, 1981; Laffrey & Isenberg, 1983; Lee, 1980; McCreedy & Long, 1985; Perri & Templer, II, 1984-85;), but externality seems to accompany aging and declining health (Calnan, 1988; Kist-Kline & Lipnickey, 1989; Lumpkin, 1985).

Wallston et al. (1976) reported a mean score of 35.57 (sd = 6.2) for college students with internal reliabilities of .72, .54, .50, and .40 on various college and community populations. The scale was reported to have a concurrent validity of $r = .33$ with Rotter's I-E scale. Moreover the scale was claimed not to discriminate by gender nor reflect a social desirability bias.

The Pilot Study

In mid-December, 1989, three anonymous women in their late nineties were interviewed using the prototype questionnaire as an interview guide. Next, Gladys Hartley, a retired professional figure skater and dance teacher, critically evaluated the initial questionnaire for readability and comprehension. Finally, the questionnaire was also reviewed by Dr. Gloria Gutman, Director of the Simon Fraser Gerontology Centre, as well as the members of the Research Supervisory Committee. I made numerous revisions according to their advice during the first half of 1990.

At the end of August, 1990, the questionnaire was piloted with 18 older women from the "U. of Agers" Women's Gymnastics Team (average age 68) at Hinton, Alberta during the Alberta Seniors Games. Subjects in the pilot study repeated the same questionnaire two to four weeks later in Edmonton and these were mailed back to me at the end of September. A serious car accident forced one woman into hospital so that only 17 women were retested. After the second administration of the questionnaire, statistics on the reliability of the subjects to reproduce the same information were calculated. Test-retest correlation coefficients and probability levels for all variables are reported in Table 4.2. Pearson Product Moment correlations (r_p) were used for interval and ratio variables; Spearman coefficients (r_s) were used for marital status, education, work role, and school location.

Women were 100% reliable in reporting marital status and number of children. The majority of measures were highly reliable with many correlations in the range of .70 to 1.0. The criterion variable, moderate exercise, was highly reliable ($r_p = .756$, $p < .001$). Weak and non-significant correlations were found

in five of 24 variables: total amount of exercise; amount of mild exercise reported; adult social support; perceived risks; and health locus of control.

Lack of reliability in reported exercise was initially a concern. However reproducing these women's activity patterns during the particular four weeks of the pilot study proved to be difficult under the circumstances. Since the U of Agers fall classes resumed after the summer recess (in the interim period of the administration of the two questionnaires), it is not surprising that these three variables demonstrated an inconsistency. The questionnaires were, however, reflective of these altered activity patterns in the early fall.

Indeed, closer examination of the test-retest data for total weekly exercise level indicated that variance more than doubled from test to retest ($S^2 = 392.1$ to 968.2). Although moderate exercise reported was highly reliable, it was evident from the self-reports that some women engaged in less mild activities and more vigorous activity in late September than in late August. The altered exercise status reported on the second questionnaire coincided with renewed involvement in the fall gymnastics program. The timing of the retest, then, is probably responsible for the decreased and inconsistent reporting in the mild exercise category ($r_p = .114$) and the increased and inconsistent reporting in the vigorous exercise category ($r_p = .505$). Although the total of mild activity reported showed a decrease at the retest, this change was insignificant ($t = 0.541$; $p = .597$). Therefore it appears that low test-retest coefficients may be more an issue of real lifestyle changes than a reflection of the quality of the survey instrument.

Changing activity patterns may also explain the inconsistent reporting in perceived social support, perceived risk and health locus of control.

~~Examination of the means indicated no significant change in level of social~~

support from test to retest; however, the variability was reduced noticeably on the second questionnaire ($S_1^2 = 21.116$ and $S_2^2 = 6.729$). In other words, at the time of the second questionnaire, the women perceived more similar levels of social support. It is possible that a few women perceived less social support during the summer months when the group was on recess, and that by late September, everyone was back together and perceiving similar social incentives to exercise together.

In terms of perceived risk, a similar phenomenon occurred. Perceptions of risk at the retest were significantly reduced ($t = 2.570$; $p = 0.26$) and variance reduced ($S_1^2 = 5.074$, $S_2^2 = 3.912$). The reduced risk perceptions accompanying the resumption of seasonal exercise programs reported on the second questionnaire might be related to the resumption of the supervised activity program. Therefore it is possible that reliability in reporting risk perceptions was undermined by real changes in perceived level of risk that occurred over the month of September.

The lack of consistency in reporting mild exercise, social support, perceived risk and locus of control were in conspicuous contrast to the high and significant correlations of all the other variables examined and appeared to be due to known seasonal changes in lifestyle.

Table 4.2

Correlation Coefficients and Significance Levels for Test-Retest Data

TYPE OF MEASURE	TEST-RETEST CORRELATION	PROBABILITY LEVEL
Age	$r = .998$	$p < .0001$
Marital Status	$r_s = 1.000$	$p < .0001$
Number of Children	$r = 1.000$	$p < .0001$
Education	$r_s = .792$	$p < .0001$
Work Role	$r_s = .886$	$p < .0001$
School Location	$r_s = .999$	$p < .0001$
Height	$r = .998$	$p < .0001$
Weight	$r = .679$	$p < .004$
Self-rated Health	$r = .506$	$p < .046$
PARQ Symptoms	$r = .667$	$p < .005$
Perceived Well-Being	$r = .565$	$p < .028$
Number of Medications	$r = .856$	$p < .0001$
Childhood Social Support	$r = .785$	$p < .0001$
Child Mov. Confidence	$r = .951$	$p < .0001$
Health Incentive	$r_s = .660$	$p < .025$
Adult Mov. Confidence	$r = .779$	$p < .001$
Adult Social Support	$r = .372$	n.s.
Perceived Risks	$r = .226$	n.s.
Perceived Benefits	$r = .837$	$p < .001$
Health Locus of Control	$r = .472$	$p < .077$
Mild Exercise	$r = -.114$	n.s.
Moderate Exercise	$r = .756$	$p < .001$
Vigorous Exercise	$r = .505$	$p < .046$
Total Amount of Exercise	$r = .340$	$p < .198$

Selection of the Sample

The Population

Women who were born in 1921 or earlier were the target population of this research. One difficulty in surveying older adults is that a substantial minority are simply not well enough to participate. This study purposely excluded the very ill and institutionalized older women - women who represent about 8 to 10% of this age cohort. Also excluded were women who had adequate health, but were not venturing into their community at the time of the study. Thus, the bias inherent in studying the well-elderly further exaggerates the statement:

If gerontology has a central message, it is that those who have survived to old age often represent a special case. (Branch & Jette, 1984, p.1128)

Prohibitive costs required that the study be limited further to situations where surveys could be distributed and collected without mailing. Thus the population under study was delimited to women, age 70 and over, who could be found in Metropolitan Vancouver regularly attending community programs.

There were a number of difficulties associated with surveying this target population. First, Canadian women in this age group feel vulnerable to exploitation by business groups, and indeed, in the Vancouver area, to two universities who are interested in gerontological research. Many of the women refused to fill out the survey questionnaire because they had "already been researched to death".

Second, there were a number of women who had never been involved in survey research before and were immediately suspicious of the intent of the study. Several looked at the survey briefly and could not see any personal value to their involvement in this type of research. Often a second explanation would convince some women to take part, especially if one of the "ring-leaders" of a

particular group appeared to endorse the project. Although the survey was anonymous and did not ask them for specific income levels, several women felt that it was "too personal" for them to participate.

Almost 20% of the questionnaires were returned empty and eventually "recycled" to other volunteers. Follow-up phone calls to those women who changed their mind about participating revealed the following excuses: the survey was too much bother; they felt simply too busy to participate; the questions were "too personal;" exercise was of no importance at their age; the survey questionnaire was lost or thrown out; the questionnaire was left at the program site; they had forgotten to fill out the survey; they couldn't remember anything about the study; the questionnaire was too long; they came down with an illness or serious accident; their spouse had become seriously ill; they were not exercising and therefore did not feel worthy of participation; they had filled it out and thought it had been returned, and so on.

Sampling Procedure

The Strategic Sample

The purpose of the survey was to examine and explain the physical activities of elderly women who were mobile in their communities. With this purposive sample, I intended to survey all eligible women who were willing to participate.

The sampling procedure first required identification of all community facilities where seniors could be found in formal and informal programs and social groups. All available seniors programs publicized in the City of Vancouver Community Resource Directory for Seniors, Fall Recreation Program Guide '90, The Vancouver Courier Fall Program Guide '90 and the B.C. Tel Yellow Pages were

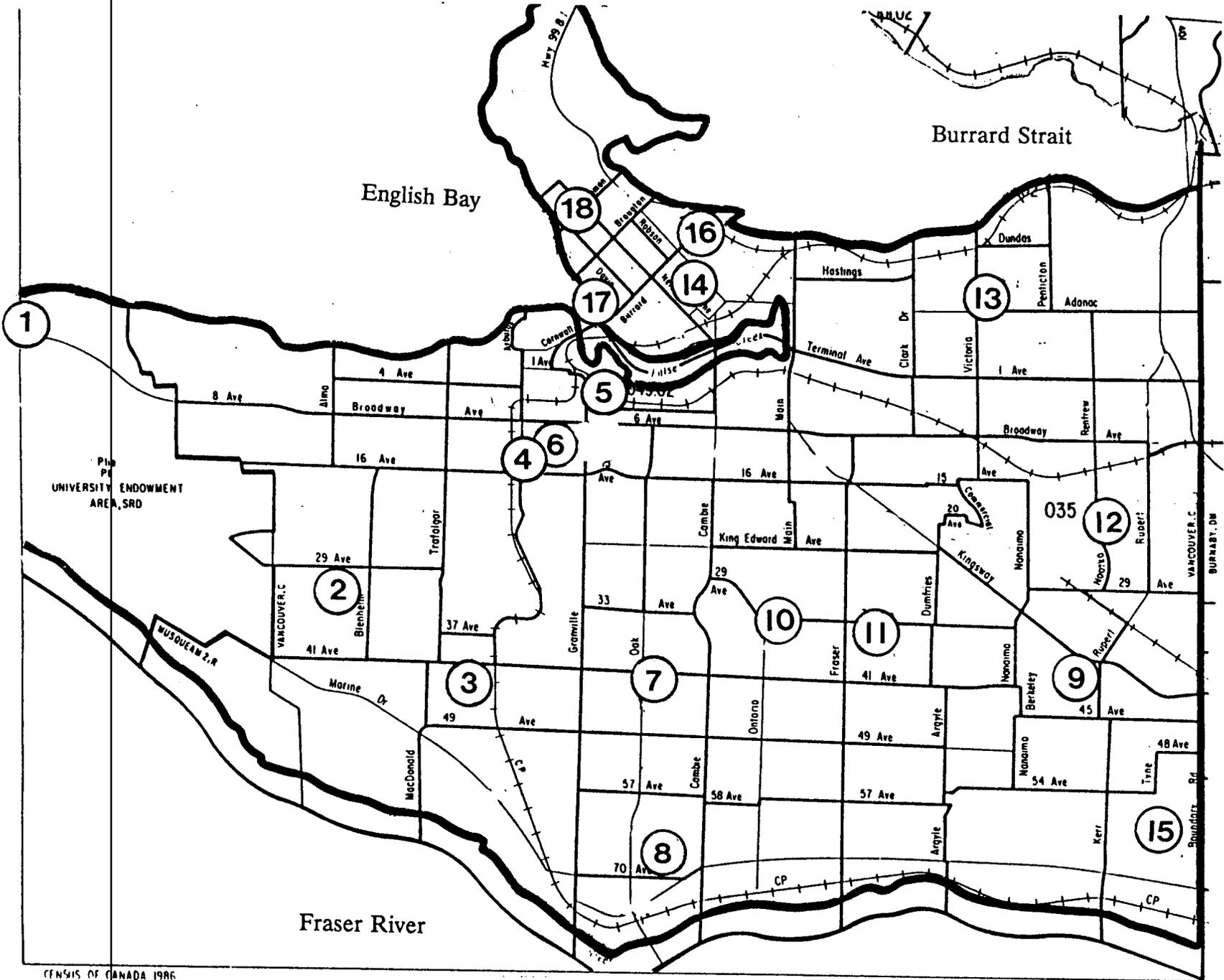
documented. From these public resources, a comprehensive list of 120 older-adult facilities (program sites) and seniors residences (but not extended care centres) was identified for Greater Vancouver. This list was then reduced to 69 sites by delimiting to only those located in the Metropolitan Vancouver city boundaries. These metropolitan boundaries were Georgia Straight on the north, the Pacific Ocean on the west, the Fraser River on the South and Boundary Road on the east (See Figure 4.0).

Rubin and Babbie (1989) note that in field research "controlled sampling techniques are normally inappropriate" (p.343). Although a probability sample would have been appropriate, it was not possible for this survey due to the cost. However, the principle of geographic representativeness was utilized.

As with other cities, Vancouver has west to east bands of high, middle and lower socioeconomic status. To improve socioeconomic representativeness of the sample and to increase its heterogeneity, I employed a geographic clustering strategy. The 69 program sites were individually located on a City of Vancouver street map. Based on visual proximity to one another, I assigned sites to one of 18 clusters with three or four sites per cluster. A random numbers table (Havilcek & Crain, 1988) was used to randomly select a representative site from each cluster. In this way 18 visitation sites were selected from the 18 clusters.

To verify that the clusters and sites were distributed from all sections of the city, two roadways were identified which divided the city into quadrants. Oak Street is a major road dividing the city in half vertically from north to south (Figure 4.0). Nine (50%) of the selected sites were west of Oak Street and the other half were to the east. King Edward Boulevard divides the city approximately in half horizontally. In the two northern quadrants, there were ten sites, while eight sites were located in two southern quadrants.

Figure 4.0



City of Metropolitan Vancouver: The 18 Research Sites

Two site managers were not willing to participate and were replaced by two other sites, each randomly drawn from the same geographic cluster. On average, the clusters incorporated facilities within a one to two mile radius. The smallest geographic cluster was in the dense downtown area of old Vancouver near north Commercial Avenue. The Lions Den Seniors Centre represented this cluster which had four program sites in a 0.5 mile diameter area. The largest cluster was in south-east Vancouver with four programs spread over the area approximately 3 miles long and 1.5 miles wide. This cluster was represented by Champlain Heights Community Centre (Table 4.3).

Table 4.3

Geographic Clusters and the Randomly Selected Sites

CLUSTER	GEOGRAPHIC AREA	SITE NO.	SITE SELECTED
1	Point Grey	9	UBC Aquatic Centre
2	Dunbar	43	Dunbar Community Centre
3	Kerrisdale	48	Kerrisdale Seniors Centre
4	Kitsilano South	39	Canadian Memorial C.C.
5	Kitsilano North	44	False Creek C.C.
6	Vancouver General Hospital	52	Mount Pleasant C.C.
7	Shaughnessey	4	Golden Age Club
8	Langara	51	Marpole-Oakridge C.C.
9	Killarney	50	Killarney C.C.
10	Queen Elizabeth Park	35	Riley Park Rec. Centre
11	Kensington/ Trout Lake	47	Kensington C.C.
12	Boundary	56	Renfrew Park C.C.
13	Commerical/PNE	17	North Health Unit
14	Grandview	34	Lions Den Rec. Centre
15	S.E. Marine Drive	30	Champlain Heights C.C.
16	City Harbour	60	YWCA
17	Downtown	8	Vancouver Aquatic Centre
18	West End	33	West End C.C./ Barclay

Second Sampling Procedure: Convenience Sample

A decision to employ a second sample was made after rigorous efforts to obtain a strategic sample size of over 400 women. The decision was made to survey more older women through a convenience sample with the help of university students. Two graduate level education classes and one undergraduate psychology class were approached. These students were studying survey research techniques (education) and gerontology (psychology). The course coordinators approved my visitation to their courses for research purposes and instructors announced the project to their students as an optional educational experience.

In each class, I explained the objectives and requirements of the study in about 15 minutes. I specifically asked each student to consider taking responsibility for seeing that one questionnaire was filled out by an older female relative such as an aunt or grandmother, or by someone they knew in their neighbourhood who was over age 70. The students were told that the survey could be given orally or left with the subject for a few days. A return date was established and I left time for questions. Many students were enthusiastic about contributing to a research project and accepted one or more questionnaires. For the education students, oral administration of the questionnaire was required by the instructor so that students could experience guided interviews.

Geographic area was not limited in the convenience sample and a few students recruited subjects from locations as far as Nanaimo and the interior of B.C. The majority, however, obtained subjects within the Greater Vancouver area.

The quality and completeness of the questionnaires from the convenience sample was generally superior to the strategic sample because the surveys were individually administered to a cooperative neighbour or relative. In most cases, ~~the subject was well-known to the student, and the survey experience was enjoyed~~

by both individuals. Consequently, there were few items with missing data. Despite the good response for most students, a few students did not succeed in finding a single volunteer. Discussion with the students revealed that they had made an adequate effort in this regard, and this served to confirm that obtaining information from elderly populations is sometimes difficult.

The students returned the questionnaires to me within four weeks time. I compared the descriptive statistics of the two research samples and the pilot sample (Table 4.4). T-tests compared the convenience sample with the strategic sample for demographic differences in age, education, self-rated health, reported medical symptoms, number of medications, marital status, number of children, socioeconomic status, and activity status (Table 4.5). T-tests also assessed for differences in five cognitive mediators and the criterion variable (Current Exercise Status).

The convenience sample (N=47) did not differ significantly in demographic characteristics from the strategic sample, except for education and socioeconomic status. The convenience sample reported a significantly lower average educational level and a significantly higher socioeconomic status (Table 4.5). This was an interesting finding because lower educational level is not usually accompanied by with higher socioeconomic status.

Table 4.4

Descriptive Characteristics of the Two Research Samples and the Pilot Sample

ELDERLY WOMEN	CONVENIENCE SAMPLE	STRATEGIC SAMPLE	PILOT SAMPLE
SAMPLE SIZE	47	280	17
AGE	77.7	76.4	66.5
EDUCATION	31.9% > High School	56.7% > High School	94% > High School
HEALTH	MEAN= 3.0 ("GOOD") 81% GOOD OR BETTER	MEAN= 3.1 ("GOOD") 78% GOOD OR BETTER	MEAN=3.3 ("GOOD")
BODYMASS	24.1	24.0	23.1
MARITAL STATUS	51.1% Widowed 34.0% Married 19.4% Other	55.4% Widowed 25.4% Married 19.2% Other	17.6% Widowed 64.7% Married 17.7% Other
CHILDREN	2.83	1.86	no data
SES (ASSISTANCE)	43.5% G.I.SUPPLEMENT	40.6% G.I.SUPPLEMENT	17.7% GIS
PARQ SYMPTOMS	27.7% No Symptoms 25.5% Heart Problems 10.6% Angina 10.6% Dizzy 40.4% High B.P.	42.1% No Symptoms 29.8% Heart Problems 14.6% Angina 15.3% Dizzy 41.0% High B.P.	76.5% No Symptoms
SCHOOL LOCATION	75.0% Canada 13.0% Britain 2.1% U.S. 2.1% Germany 2.1% Scandinavia 6.1% All Others	71.4% Canada 14.3% Britain 3.9% U.S. 1.4% Germany 2.5% Scandinavia 6.4% All Others	64.7% Canada 5.9% Britain 17.6% U.S. 11.8% Scandinavia
LIFELONG ACTIVITY STATUS	6.5% = Never 22.0% = Not Anymore 2.2% = Just Recently 19.6% = Intermittent 22.0% = Always	17.3% = Never 14.0% = Not Anymore 9.0% = Just Recently 26.3% = Intermittent 33.5% = Always	0.0% = Never 0.0% = Not Anymore 11.8% = Just recently 29.4% = Intermittent 58.5% = Always
EXERCISE IN THE PAST 4 MONTHS	12.8% Sweat 2 or more times per week 64% never sweated	21% Sweat 2 or more times per week 50.4% never sweated	87.5% Sweat 2 or More times per week 0% never sweated
EXERCISE STATUS (KCAL)	733 kcal	1576 kcal	2150 kcal

The two samples differed on one cognitive mediator; the convenience sample was significantly different in perceived social support ($T = 2.861$; $p < .005$) with the strategic sample reporting higher levels of support. The convenience sample also approached significance in perceived movement efficacy by reporting less efficacy than the strategic sample.

Comparing exercise status, or energy expended on exercise in the past week (Table 4.4), the original pilot sample was highly active, averaging 2150 kcal per week. The strategic sample (1578 kcal/week) reported twice the activity of the convenience sample (733 kcal/week). When the samples were merged, the average weekly exercise level was 1496 kcal. Other studies have found that older women average between 1050 to 1200 kcal per week in self-reported exercise (Cauley et al., 1987; LaPorte et al., 1983). Thus the combined sample was more active than has been found elsewhere. The convenience sample was more representative of census data of Vancouver women in this age group for educational level and marital status.

Graphed frequency distributions of the original strategic sample were not visibly altered by adding the convenience sample nor were regression analyses identifying the key predictors of current exercise status substantially different. The samples were therefore pooled to make a total sample of 327 subjects. The convenience sample made up 14.5% of the pooled sample.

Table 4.5

Results of T-Tests on Key Variables Between the Strategic Sample and Convenience Sample

VARIABLES	Strategic Sample (SAMPLE 1)			Convenience (SAMPLE 2)			T Statistic	Probability
	N	MEAN	S.D.	N	MEAN	S.D.		
Age	272	76.4	5.347	46	77.8	6.019	-1.456	p = 0.146
Education	277	4.7	0.441	47	3.7	0.500	2.281	p = 0.023*
Health	277	3.1	0.999	47	3.05	1.009	0.682	p = 0.496
Symptoms	278	1.0	0.996	47	1.23	1.012	-1.413	p = 0.159
Medications	278	1.4	0.968	47	1.9	1.151	-1.845	p = 0.066
Bodymass	266	24.0	0.987	45	24.1	1.083	-0.147	p = 0.883
Marital Status	280	-0.01	0.442	47	0.084	0.486	-1.379	p = 0.169
Children	276	1.86	1.905	47	2.4	1.836	-1.729	p = 0.085
Composite SES	271	-0.098	1.632	46	0.404	1.346	-1.976	p = 0.049*
Work Role	276	0.670	0.471	47	0.787	0.414	-1.600	p = 0.111
Well-Being	266	77.5	1.008	47	76.7	0.965	0.404	p = 0.687
Adult Efficacy	246	14.6	1.002	47	13.4	0.965	1.759	p = 0.080
Health Locus of Control	268	40.6	1.025	47	40.5	0.855	0.145	p = 0.884
Health Motive	279	3.5	0.997	47	3.4	1.023	0.678	p = 0.498
Current Social Support	272	12.5	0.998	46	10.7	0.931	2.861	p = 0.005*
Perceived Benefits	123	18.2	0.979	30	16.6	1.076	1.273	p = 0.205
Perceived Risks	144	13.8	0.983	36	15.6	1.046	-1.617	p = 0.108
Current Exercise Status (kcal)	266	1577.7	1459.93	47	733.4	762.920	3.405	p = 0.001*

* Denotes that the two samples were significantly different from each other.

Data Collection Protocol

To organize the data collection process, I created a research file listing each program site, contact name, address and phone number. Information about each site included the weekly schedule of all the available seniors programs currently offered at a single agency, a contact name for each program, helpful information gathered from the site coordinator, a record of agency approval forms and a record of the actual programs visited. Using the agency name, I organized the file alphabetically to facilitate the retrieval of information for setting up formal visitations with agencies. A few days before the visit, I confirmed the previous arrangements by phone with the agency coordinators and adjustments were made if necessary.

In early October, 1990, I contacted all the agencies both by letter and telephone explaining the purpose of the study and requesting approval for the research to proceed. Accompanying the letter was the agency approval form and a stamped self-addressed envelope for the prompt return of the approval forms. I verified visitation schedules either in person, or on the telephone, with the agency coordinator. A few agency coordinators requested to see the questionnaire and meet with the investigator before approving the study. These meetings were carried out with no rejections of the study.

Once a site was approved by the agency as a data collection point, full participation sampling occurred on a volunteer basis. Some of the selected sites were very large facilities, such as Kerrisdale Seniors Activity Centre and the West End Community Centre, with estimated registration of over a thousand seniors each in their annual membership. Other centres located in the east end, such as

Renfrew and Kensington, offered relatively few programs for older adults and these were sparsely attended.

Each site demanded a slightly different visitation protocol, largely depending on the number of programs offered, the number of seniors frequenting the facilities, the cooperation and interest of the agency coordinator and as well, the health and cooperation of the seniors. On many days, unusually heavy rains reduced attendance noticeably, and to compensate, extra visits to programs were made. For major community centres, a number of seniors programs would occur over the course of each day, and it was practical to stay on the site for the entire duration of each of week day. In other situations only one program for seniors was offered and I moved between sites to contact a number of the available seniors programs that day. In some cases I was able to give surveys to women coming and going to their formal programs in casual settings such as lounges, hallways and lunchrooms on the site.

Over a 10-week period, I personally introduced the study to over 2000 older adults in the 18 research sites (Table 4.6). In many cases, the adults I approached were willing, but too young to participate, since many seniors were under the age of 70. Several men were disappointed the study was exclusive to women. In other cases, very frail or very old individuals simply did not want to volunteer.

Fifty-eight individual seniors groups were contacted in total. These 58 groups represented 30 different types of programs requiring 37 site trips (Table 4.7).

I was introduced, or introduced myself, to either a group or an individual and explained the nature of the study: over 480 questionnaires were given out to ~~the women who were age-eligible and interested in participating. Participants~~

were asked to take the questionnaire home to fill it out and return it to the agency office or program staff the following week. Each agency was provided with a survey collection box which was kept secure inside the office headquarters.

Most frequently a group of seniors were addressed during a research visit, but in any setting only a portion of the whole were females born in 1921 or earlier. Furthermore, not all eligible women were interested in participating for the reasons expressed earlier in the chapter. Women who wanted to take questionnaires home were anonymous participants but many recorded their name and phone number on a temporary list so that a reminder phone call could be made to them if the questionnaire had not been returned by late December.

At the end of eight weeks, only 90 out of the first 250 questionnaires had been returned. Between mid-December and mid-January I telephoned subjects who had not yet turned in questionnaires. The phone contact strategy did bring in more questionnaires to the collection boxes. In a few cases, women decided to mail them in, and in other cases, I picked up questionnaires at private homes.

From January to March, the distribution of questionnaires and follow-up phone calls continued. Dozens of questionnaires were returned blank without any responses. These were redistributed to other individuals. By early February, 230 questionnaires had been collected from the various sites. Questionnaires continued to be returned until mid-March, 1991. At this point, the returns ended and the survey concluded with 280 returns out of 486 questionnaires distributed. This was a 57.6% return rate, if we do not count the redistributed questionnaires. This response fell far short of the projected sample size of over 400 subjects.

Table 4.6

Chronological Distribution and Return of Questionnaires by Research Site

RESEARCH SITE	DATE OF VISIT	CONTACT PERSON	PHONE	QUESTIONNAIRE DISTRIBUTION	
				OUT	IN
Champlain Heights Comm. Centre	Oct. 12	M. Goodale	437-9115	15	15
Renfrew Community Centre	Oct. 16, 17, 18	J. Besdan	434-6688	21	11
Downtown YWCA	Oct. 18	P. Hunter	683-2531	1	1
U.B.C. Aquatic Centre	Oct. 21, Nov.6	L. Grundy	228-4522	27	24
Marpole/Oakridge Comm. Centre	Oct. 23	M. Bates	327-8371	0	0
Vancouver Aquatic Centre	Oct. 30	S. Baskin	665-3424	12	7
Riley Park Community Centre	Nov.5, 7, 13, 14, 15, 16	K. Feay	879-6222	24	16
Kerrisdale Seniors Centre	Nov.6, 13, 19, 22, Dec.5	G. Pirie	266-1003	103	65
Chalmer's Lodge	Nov.6, 9	Mr. Estergard	731-3178	20	10
False Creek Community Centre	Nov. 7	J. Becker	665-3425	14	8
Granville Park Lodge	Nov. 8	T. Clarke	732-8633	8	8
Golden Age Club	Nov. 14	G. Levitt	266-9111	26	2
Commodore Bowling Lane	Nov. 16	V. Potter	873-6185	16	5
West End Community Centre and Barclay Manor	Nov.20, 21, Dec. 3, 4	D. Chin	698-3876	89	67
Canadian Memorial Society	Nov. 28	A. Jarrell	732-1477	7	7
Kensington Community Centre	Nov. 16, 29	D. Stark	327-9401	8	6
Lions Den	Nov. 30	C. Innis	253-9716	16	8
Dunbar Community Centre	Dec. 4	A. Walkinshaw	224-1374	15	5
Seniors 411 Centre	Dec. 12	M. Melnyk	684-8171	7	0
Unknown				57	16
Facilities = 20	Visits = 37		TOTAL	486	280

Table 4.7

Distribution of Questionnaires by Program Type

PROGRAM TYPE	SURVEYS OUT	SURVEYS IN
Ballroom Dance	4	2
Bell-ringers	2	0
Be Well Fun and Fitness	23	15
Bingo	26	13
Bowling, 5 Pin	15	9
Bowling, Carpet	6	1
Bridge	28	22
Chocolate Making	5	1
Choir	11	5
Crafts	10	5
Crossreach (Adult Daycare)	7	7
Dance and Social	3	1
Fitness Class, gymnasium	16	14
Fitness Class, water	63	44
Foamball Tennis	4	3
French Lessons	2	2
Line Dancing	38	20
Lodges/Seniors Apartments	28	18
Lunchrooms	11	6
Oil and Water Painting	2	2
Orchestra	1	1
Osteoporosis Class	6	6
Senior's Meetings	60	37
Square Dance, Scottish Dance	11	11
Swimming	1	1
Tai Chi	6	3
Tap Dance	6	1
Walkers Club	8	5
Weight Training	1	1
Yoga	2	1
Unknown	40	23
PROGRAMS = 30	486	280

Data Preparation

Missing Data

Missing data on one or more variables was a concern for almost every questionnaire - a problem that was not an issue in the pilot study. Missing data was particularly injurious to the regression analysis because the software program used listwise, rather than pairwise deletion of subjects missing data. This meant that an individual missing any data on the model variables was totally excluded from the analyses.

Fortunately, most subjects had provided their phone numbers for this very kind of follow-up. Subjects with missing data were contacted by telephone and verbal responses were obtained from those reached. The follow-up ended, if after three attempts, the respondent could not be reached. The follow-up calls proved to be an important way to correct for missing data.

Cleaning the Data

SYSTAT and SYGRAPH 5.0 (1991) were the software packages used to analyze and graphically display the 162 variables on each of 327 subjects. A spreadsheet style of data entry prevented most row and column entry errors, but not typing errors. I visually scanned the data for mistakes using raw data, ranges of scores, frequency tables and scatterplots on each variable. Data entry errors were corrected by referring back to the original data from individual questionnaires.

Discrete variables such as education, marital status, work role and school location were "dummy coded" into dichotomous (0,1) categories. Age in years and the number of children were "centered"; this procedure subtracts

the average score of the group from each individual score so that the mean of 'X' is centered on zero of the 'X' axis. The outcome variable (exercise status in kilocalories) and all remaining independent variables were standardized.

Outliers

Scatterplots were made for all model variables against the criterion variable (Level of Exercise in the Past Week). SYGRAPH provides scatterplots which visually enlarge the influential outliers in the data. I identified five authentic outliers on the criterion variable which were situated beyond 3.5 standard deviations from the mean. These were deleted from the data set in order to improve the strength of associations between variables.

Statistical Analysis

Frequency tables and histograms were produced for nominal and ordinal variables. Means and standard deviations were calculated for ratio and interval variables. Frequency distribution polygons were graphed for all variables in order to determine normality of the data prior to statistical analysis.

Scatterplots of the variables important to the theoretical model were graphed with regression lines and confidence interval bands of .95. These displays assisted in observing trends in the data.

Three multiple linear regression analyses were conducted to test the if both life situational as well as cognitive mediating components of the theoretical model were important in explaining the variability of late life

exercise behavior. Tabachnick and Fidell (1989) recommend that there should be 20 cases for every independent variable entered in regression analysis in order to improve the accuracy of the estimate. In this study, with 16 independent variables, 320 cases were needed. Even though 327 women participated in this study, missing data was evident on many of the variables, such that the n would fall below 320 cases (Appendix E).

To overcome this, I ran standard linear regressions with the independent variables split in two parts. First, I regressed the dependent variable, weekly exercise level on the ten life situational variables. Second, I regressed exercise level on the six cognitive variables. In a third regression, exercise level was regressed on all the independent variables from Analysis 1 and 2 which had demonstrated significance below .05. The specific outcome of each regression analysis is dealt with in Chapter 5. In all regressions, the independent variables competed simultaneously for explanation. Six situational variables (in Analysis 1) and four cognitive variables (in Analysis 2) showed no promise of providing explanation and were omitted from the third analysis. The final analysis included six independent variables: four situational and 2 cognitive variables.

The representativeness of the sample becomes a concern when trying to make generalizations about the mean (or variance) of the variables from this sample to older women in general (the population). But for regression estimates, the lack of representativeness due to non-random sampling is less of a concern. With regression, the important factor is that the sample comprise enough heterogeneity such that there is a large variance in the dependent and independent variables. Regression estimates are less affected

by non-randomness than are means or variances (D. Willms, personal communication, June 14, 1992).

CHAPTER V. RESULTS

Description of the Sample

The descriptive characteristics of the 327 women participating in this study are outlined in Table 5.0. The participants ranged in weight from 78 to 240 pounds with a mean body weight of 135 lbs. + 23.3 lbs. (61.7 kg + 10.3 kg.). Their height ranged from 48 to 70.5 inches with an average of 63.2 inches or 1.6 meters. The women in this study were less overweight, better educated, in better health, and more physically active than the average Vancouver or Canadian women their age. Compared to Vancouver women, the sample contained fewer married individuals, but were similar in their school location (cultural background). The sample was virtually identical to Canadian women in terms of their economic need for the Guaranteed Income Supplement (43% supplemented) and reported physical health symptoms (60% with one or more symptoms).

Almost one third of the sample reported that over their entire life course they "had always been physically active", while over 60% said that they were no longer active or had "never been much involved with physical fitness activity."

The sample reported an average of 1400 kcal per week and a median of 1100 kcal per week spent on exercise. This is more than the 777 kcal per week reported by 1,206 women over the age of 65 in the Stanford Five-City Project community health survey (Blair, et al., 1985) and more than the 1042 kcal per week reported by LaPorte, Black-Sandler, Cauley, Link, Bayles and Marks (1983). LaPorte and colleagues used the Harvard Alumni Activity Survey to estimate activity levels in 76 post-menopausal women with an average age of 61 years. LaPorte's study concluded that "the activity levels ranged from sedentary to very sedentary" when compared to college students (1983, p.396).

Table 5.0

Descriptive Characteristics of the Sample, Vancouver and Canadian Population

ELDERLY WOMEN	SAMPLE	VANCOUVER*	CANADA**
NUMBER	327	18,000	1,269,440
AGE	76.7	70 - 80	65+
EDUCATION	52.6% > Grade 12	27.5% > Grade 12	23.2% > Grade 12
HEALTH	22.3% Fair/Poor 51.3% Good 26.3% Excellent		39.9% Fair/Poor 42.2% Good 17.7% Excellent
BODYMASS ***	11.9% Underweight 50.2% Acceptable 15.9% Overweight 17.1% Obese		6.3% Underweight 40.7% Acceptable 35.5% Overweight 15.0% Obese
MARITAL STATUS	9.5% Single 54.7% Widowed 27.8% Married 8.0% Sep/Divorced	6.0% Single 48.4% Widowed 39.0% Married 6.3% Sep/Divorced	8.6% Single 57.1% Widowed 34.5% Married 3.6% Sep/Divorced
SES (ASSISTANCE)	42.7% GIS		43% GIS
PARQ SYMPTOMS	39.8% No Symptoms		39.7% No Symptoms 60.3% Screened out (CFS, 1983)
SCHOOL LOCATION	72.0% Canada 14.4% Britain 3.6% U.S. 10.0% Other	70.3% Canada 6.5% Britain 1.7% U.S. 21.5% Other	
LIFELONG ACTIVITY STATUS	60.5% Not currently Active 8.0% Active Just Recently 31.5% Always Been Physically Active		45.0% Sedentary 47.5% Moderately Active 6.3% Active
GET SWEATY FROM EXERCISE IN THE PAST 4 MONTHS	53.5% Not at all 27.2% Not frequently 19.3% 3 times/week		

* Profiles Part II. (1988). Census Tracts. Ottawa: Ministry of Supply and Services. Also data came from a special run on Census data from Statistics Canada.

** Statistics Canada. (1990). Women in Canada: A statistical report. Ottawa: Ministry of Supply and Services. SES provided from The economic situation of Canada's seniors. Ottawa: National Council on Aging.

*** Health & Welfare Canada (1988). Promoting healthy weights: A discussion paper. Ottawa: Ministry of Supply & Services Canada.

Descriptive Results of the Situational Variables

Age

The 327 women participating in this study ranged in age from 70 to 98 years, with an average age of 76.7. Eight women in the study were born in 1900 or earlier (2.5% of the sample) and nearly 10% of the sample were born in 1906 or earlier. The median year of birth was 1914.

Marital Status

The sample was primarily unpartnered with only 27.8% of the women married or with common-law partners. The unpartnered sample included 179 widows (54.7%), 31 single women (9.5% never married), and 26 separated or divorced women (7.6%).

Family Size: Number of Children

The women in this sample had an average of 1.94 children with 30% of the women reporting no children at all. Women who had four or less children made up 92% of the sample. Two women reported 11 children each.

Work Role

The domestic situation best describing the adulthood of most of the women was "motherhood" (68.7%). About 6% described themselves in mid-life as "homemakers with no children" and 25.4% said they were "on their own". As far as employment was concerned, the work situation for these women when they were age 35 and 65 was divided as follows: 25.6% said they had no paid employment up to age 65, part-time or intermittent full-time work was declared by 36.6%, and steady full-time work was reported by 37.8%. Considering the entire sample, the



In this survey, three questions were asked about personal financial status. First women were asked "Do you feel financially secure for the remainder of your life?" Most women said "yes", they felt secure (72.1%), but over one quarter of the sample said "no", they did not feel secure, or they weren't sure they felt secure.

Second, women were asked, "Are you able to handle unexpected expenses with no worry?" Over 30% of the women in this study answered this question in the negative reflecting financial concerns by almost one third of the sample.

Third, women were asked if they received the Guaranteed Income Supplement (GIS), a government supplement to Old Age Security (OAS) of up to \$421.79 per month. The federal government provides the GIS for those aged 65 and older, whose incomes, not including OAS, are below a certain level. The benefits are payable only to those who qualify for OAS and are based on income only, so a person could have assets which do not produce any income such as a home, and still qualify for GIS (National Advisory Council on Aging, 1991b). Thus the GIS is considered to be an indicator that a woman's cash income from all sources is low enough to qualify for government assistance. In 1990, the National Council on Aging reported that GIS was given to 43% of seniors to supplement their income. In this study, 42.7% of the women claimed they were receiving the GIS.

Medical Symptoms

The Physical Activity Readiness Questionnaire (PARQ), designed by Fitness Canada to screen adults at risk with exercise participation, was the first item of the survey. In this study, over 40% of the women were symptom-free, while over 50% had at least one serious medical condition that might limit their ability to take up vigorous forms of physical activity. Over one third of the sample

reported that they were medication-free, while another 30% said they were using just one prescription medicine. Eleven percent of the women surveyed reported taking three or more prescription medications.

Cardiovascular disease was the principle medical concern facing women in this study. Approximately 22.7% of the women in this survey had been told by a physician that they had a heart condition. Furthermore, one third of all women reported at least one physically limiting condition such as high blood pressure (33.7%), severe dizziness (10.8%), and angina pain (9.8%),

Self-Rated Health

Over 75% of the women in this study rated their health from "good" to "excellent." Those rating their health as "excellent" reported the most overall activity with energy expenditures at nearly 2000 kcal per week. Women who rated their health as "fair" tended to report the lowest levels of exercise at less than 1000 kilocalories per week.

Childhood Social Support

Over 75% agreed, or strongly agreed, that they had enjoyed school sports and physical education as children. The majority of women in this study did not report being involved in an athletic family during their childhood, but about 40% had felt encouraged by at least one person as a child to develop their physical abilities.

Childhood Movement Confidence

About 60% of the women collectively rated riding bicycles and hanging and ~~swinging by the knees as the skills about which they recall having the most~~

confidence. Almost 60% said they knew they couldn't have climbed a rope as a child and 65% said they knew they couldn't do the splits.

Lifelong Status

Subjects were asked "how would you describe your physical fitness activity over your entire life course?" Almost 19% said they had NEVER been much involved in physical fitness activity. Another 16% said that they had been previously active, but not anymore. Eight percent said that they had become active just recently. Over 25% claimed to be intermittently involved over the lifespan while 31.8 percent marked the category "always been involved in physical fitness activity".

The Typical Week

Subjects were asked "how typical was this past week in terms of your normal physical activity level?" About three-quarters of the women claimed that the reported activities were typical of normal activity patterns; 21.5% said it was less activity than in a typical week and 4.2% said it was more activity than normal.

Total Exercise Sessions in the Past Week

The diary format of reported activity permitted a simple count of number of exercise encounters over the entire week (disregarding duration of the involvement). The range of sessions reported was 0 to 30 sessions, with half of the women reporting seven or less weekly exercise involvements. Twenty-three women reported not a single physical activity; over 20% reported three or less physical activity involvements.

Hours of Activity in the Past Week

Women in this study spent on average 5.8 hours in the reported week in physical activities, but the variability was large. The hours spent in activity varied from 0 to 41 hours per week.

Change in Activity in the Past Five Years

In responding to a question about change in physical activity in the past five years, one third of the sample reported "no change" (32.4%). Another one third reported a decrease (33.6%) in activity, while 15.1% reported a significant decrease. Other women reported an increase (14.5%) or significant increase (4.4%) of physical activity in the past five years.

In answering the question, "If you have changed your activity level, was this for health reasons?", 37.8% agreed, 24% partially agreed and 38.3% disagreed that their exercise level changed for health reasons.

Descriptive Results of the Cognitive Variables

Table 5.1 shows the means and standard deviations for the cognitive variables.

Table 5.1

The Descriptive Statistics for the Cognitive Variables

COGNITIVE VARIABLES	Mean Score	S.D.	Range
Health Incentive	3.48	.51	2.0 - 4.0
Movement Efficacy	14.38	4.24	6.0 - 24.0
Social Support	12.20	3.84	4.0 - 20.0
Perceived Risks	14.17	5.6	6.0 - 30.0
Perc. Benefits	17.86	5.95	6.0 - 30.0
Health L.O.C.	36.45	6.67	15 - 58

Health Incentive

The motive to live a long a healthy life was high for almost every participant in the study. The median score was 3.5 out of a possible score of 4.0.

Adult Social Support to Exercise

About half of the sample felt they had received the encouragement of at least one person to maintain their physical ability since middle age. Similarly, about half of the women reported that they currently had friends active in physical fitness activities, and had athletic families who were athletically inclined. However 38.3% were not sure what their doctor thought about their personal participation in vigorous activities, and another 30% said their physician would not approve of vigorous forms of exercise.

Adult Movement Confidence

Women felt most confident about their ability to walk, and 54.1% of the women were "very sure" that they could walk briskly for 20 minutes. Over 13% claimed they couldn't do brisk walking for that duration. The activity rated by the women with little overall confidence was the aquafit class of 50 minutes. Almost 65% of the women claimed they were unsure or knew they couldn't do this activity. Efficacy was lowest for the modified pushup with about half of all women reporting that they knew they couldn't do five pushups.

Outcome Expectations

Ten repetitions of the curl-up was rated as the riskiest activity of the six fitness exercises presented, with many women reporting that they believed that they might hurt their back or neck. Both walking and stretching were considered to be of low risk with only 14% finding these activities to be of any risk.

As for perceived benefits of the six fitness exercises, brisk walking for 20 minutes was ranked first since 63% of the sample rated brisk walking to be

moderately to highly beneficial. Aquatic fitness exercise was ranked second and was thought to be beneficial by 45% of the women. Doing the five push-ups was perceived to be of the least benefit. For the curl-up and the push-up, the risks were rated higher than the benefits; for the aerobic activities and the toe touch, the benefits were rated higher than the risks.

Health Locus of Control

Scores for Health Locus Of Control ranged from 15 to 58 (possible range was 11 - 66) with a mean of 36.45 (s.d. = 6.67). Lower scores indicate feelings of personal control over one's health (internality), while higher scores indicate stronger beliefs that one's health is under the control of external forces (externality). Compared to college students and an older sample of hypertensive outpatients with HLOC scores of 40 (s.d. = 6.2), women in this study demonstrated more internality.

Descriptive Results of Late Life Exercise

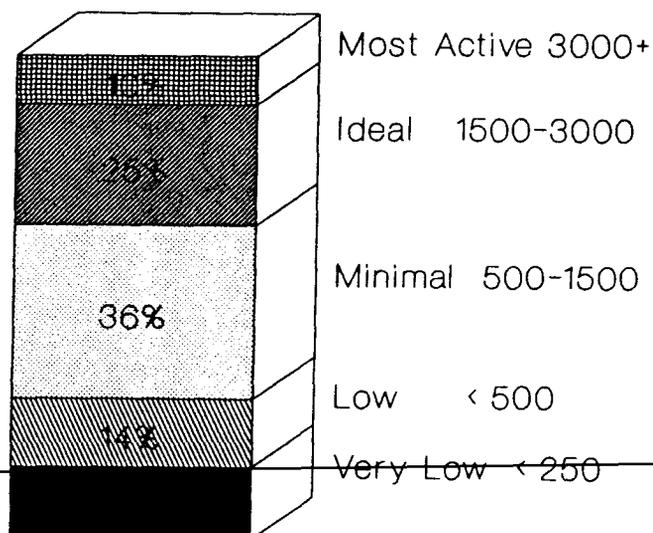
Energy Expended in the Past Week

The majority of the 327 women in this study reported activity levels below the prescribed ideal of 2000 kcal per week for middle-aged men (Paffenbarger, Hyde, Wing & Hsied, 1986). The average energy expenditure spent on exercise in the past week was about 1500 kcal but the median was well below that at 1079 kcal. As anticipated, the activity level of women in this study was highly variable with a large positive skew toward extremely high activity levels of several dozen women.

About 25% of the women reported activity levels that placed them in an "ideal" category of 1500 to 3000 kilocalories per week (Figure 5.0). This is equivalent to a 60 kg. person walking briskly for an hour, seven days a week - an activity level that exercise physiologists might consider optimal for aerobic fitness and health promotion at even younger ages. Most women in the study were less active than that, with 38% exercising at a level of 500 to 1500 kcal/week, an amount that is comparable to walking briskly a total of two hours per week - and an amount which, while deficient according to current recommendations, may contribute some benefits to the maintenance of overall health and physical ability. About one quarter of the women reported physical activity below 500 kcal/week ("low"), and half of those women reported less than 250 kcal/week in terms of total activity level ("very low"). Still it should be acknowledged that about 10% of the women in this study were exercising at levels above 3000 kcal per week.

Figure 5.0

Activity Levels of Vancouver Women Aged 70+



Statistical Findings

Correlations

Correlations between all theoretical model variables and the dependent variable were estimated using SYSTAT 5.01 (Table 5.2). Using SYGRAPH, scatterplots were drawn for each pair of variables, and a least squares regression line was superimposed. The correlations were examined to see which model variables and situational variables were strongly associated with the criterion "exercise level in the past week". Independent variables which were associated over .200 with exercise level were illustrated according to Bandura's triangular principle of reciprocal determinism (Figure 5.1). The model of associations illustrates the important correlation coefficients while visually maintaining the triad structure of the Composite Model.

The correlations of the situational variables with "exercise level" were -.257 ($p < .01$) for Age, .270 ($p < .01$) for Composite Health, -.080 ($p = .06$) for Composite SES, .014 ($p = .66$) for Marital Status, .029 ($p = .73$) for Number of Children, .073 ($p = .55$) for level of Education, -.072 ($p < .05$) for School Location, -.000 ($p < .05$) for Work Role, .250 ($p < .01$) for Childhood Movement Confidence, and .131 ($p < .05$) for Childhood Social Support. Correlations of the situational variables with "exercise level" were .015 ($p < .83$) for Health Incentive; -.185 ($p < .01$) for Perceived Risk; .110 ($p < .01$) for Perceived Benefits; .333 ($p < .01$) for Adult Social Support; .324 ($p < .01$) for Adult Movement Confidence and .086 ($p = .72$) for Total HLOC.

Two of the six cognitive variables were significantly associated with "exercise level". Adult Social Support ($r = .333$; $p < .01$) and Adult Movement

Confidence ($r = .324$; $p < .01$) were the only two cognitive variables which had strong and significant relationships with older women's exercise level.

Table 5.2 shows that the cognitive variables, Perceived Risks and Perceived Benefits were significantly associated with Adult Movement Confidence with correlations of $r(\text{RISK}) = -.653$ ($p < .01$) and $r(\text{BENEFITS}) = .551$ ($p < .01$).

Two situational variables significantly related to Adult Movement Confidence and Adult Social Support were Childhood Movement Confidence and Childhood Social Support (Figure 5.1). In that the childhood variables were recollections of ability and support from years ago, they can be thought of predisposing variables to current self-referent beliefs. Childhood Social Support was related to Adult Social Support ($r = .382$; $p < .01$) and Childhood Movement Efficacy to Adult Exercise Efficacy ($r = .439$; $p < .01$).

Thus women who reported feeling efficacious and experienced in skilled activity in childhood also tended to report they felt efficacious and experienced in adult fitness activities. Recalling higher levels of physical competence as a young girl was positively associated with recollections of higher levels of childhood social support for physical activity ($r = .460$, $p < .01$). The positive relationship between social support and movement confidence is seen again at late adulthood when Adult Movement Confidence and Adult Social Support are also highly related to each other ($r = .418$; $p < .01$).

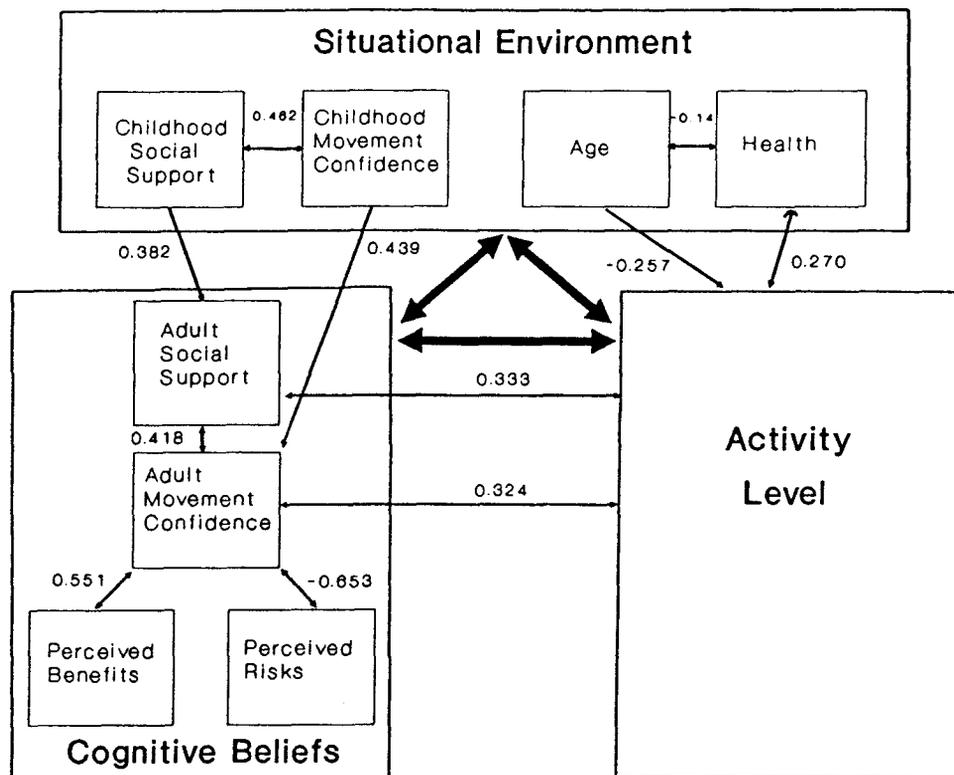
Table 5.2

Correlation Matrix of the Explanatory Variables Using Pairwise Deletion

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 ENERGY	1.000																
2 AGE	-0.257	1.000															
3 CHILDREN	0.029	-0.113	1.000														
4 COMP. HEALTH	0.270	-0.140	-0.004	1.000													
5 COMP. SES	-0.080	0.034	0.076	0.149	1.000												
6 SCHOOL LOCATION	-0.072	0.088	-0.096	0.014	0.088	1.000											
7 MARITAL	0.014	-0.163	0.143	0.098	0.119	0.055	1.000										
8 EDUCATION	0.073	-0.038	-0.111	0.107	0.156	0.072	-0.029	1.000									
9 CHILD SOC.SUPP	0.131	-0.036	0.022	0.129	0.060	0.033	-0.061	0.203	1.000								
10 CHILD MOVE.CONF.	0.250	-0.221	0.113	0.198	0.034	0.038	0.056	0.226	0.460	1.000							
11 WORK ROLE	0.000	-0.029	0.185	0.058	-0.175	0.109	-0.043	-0.042	0.003	0.110	1.000						
12 ADULT MOVE.CONF.	0.324	-0.294	0.090	0.481	0.047	-0.118	0.065	0.198	0.215	0.439	0.015	1.000					
13 ADULT SOC. SUPP.	0.333	-0.272	0.195	0.281	0.079	-0.050	0.087	0.107	0.382	0.321	-0.080	0.418	1.000				
14 PERCEIVED RISK	-0.185	0.244	0.009	-0.465	-0.120	0.049	-0.138	-0.115	-0.126	-0.296	-0.031	-0.653	-0.234	1.000			
15 PERCEIVED BENEFIT	0.110	-0.106	0.010	0.317	0.024	-0.165	0.206	0.214	0.059	0.267	-0.062	0.551	0.182	-0.558	1.000		
16 MOTIVE	0.015	-0.063	0.063	0.040	0.019	0.020	-0.031	0.028	0.056	0.043	0.160	0.038	0.030	0.021	0.032	1.000	
17 HEALTH LOC	0.086	-0.156	0.030	0.254	0.038	-0.032	0.052	0.158	0.126	0.129	0.025	0.231	0.207	-0.156	0.152	0.021	1.000

Figure 5.1

Proposed Model of Explanation of Elderly Women's Physical Activity



Multiple Regression Analysis

One purpose of multiple regression is to examine the variability of a criterion, or dependent variable (Y), and to explain Y's variability in terms of its covariation or relationships with independent variables (X's) (Pedhazur, 1982). The dependent variable (Y) in this study was *EXERCISE IN THE PAST WEEK*, a continuous variable measuring energy spent on exercise activities over a seven-day period in kilocalorie units.

The independent variables describing life context were:

- X1 = Age (continuous)
- X2 = Marital Status (dichotomous: 1 = partnered, 0 = unpartnered)
- X3 = Number of Children (continuous)
- X4 = Main Work Role (1 = employed, 0 = never employed)
- X5 = Culture (1 = English language school, 0 = foreign language school)
- X6 = Education (1 = At least Grade 12 or better, 0 = < Grade 12)
- X7 = SES (continuous composite index)
- X8 = Health (continuous composite index)
- X9 = Childhood Movement Confidence (continuous)
- X10 = Childhood Social Support (continuous)

The independent variables describing self-referent beliefs were:

- X11 = Health Incentive (continuous)
- X12 = Adult Social Support (continuous)
- X13 = Adult Exercise Efficacy (continuous)
- X14 = Perceived Risk of Exercise (continuous)
- X15 = Perceived Benefit of Exercise (continuous)
- ~~X16 = Health Locus of Control (continuous)~~

Multivariate analyses combine these explanatory variables by examining each X in terms of the importance of its relationship with Y. The size of the coefficients indicates the importance of each X variable in explaining the outcome variable, Y, holding the other variables in the model constant. However, the number of variables included in the analysis is an important consideration (Tabachnick & Fidell, 1989). As more variables are added to the regression equation, the prospects for including variables with overlapping variance and missing data is increased. The goal of the regression analysis was to find the minimum number of variables representing the most subjects which would offer unique and significant explanation of the criterion variable.

The aim of the study was to determine which variables of the Composite Model would best explain late life exercise behaviour. Thus a regression analysis was preferred which would "force" all 16 of the situational and cognitive variables into an equation explaining "Exercise Level". In this way, both situational and psychological variables could "compete" with each other for explanation of late life exercise behaviour. To maximize the accuracy of the estimate, three separate regressions were undertaken.

For Analysis 1, the dependent variable, exercise level, was regressed on the ten life situation variables. This strategy permitted a smaller and theoretically related group of variables an independent role, at least initially, in explaining the variability in late life exercise.

This regression strategy permitted the following reduced model equations to be tested:

ANALYSIS 1: Life Situation Variables

$$Y = \text{constant} + W_1(X_1) + W_2(X_2) + W_3(X_3) + W_4(X_4) + W_5(X_5) + W_6(X_6) + W_7(X_7) + W_8(X_8) + W_9(X_9) + W_{10}(X_{10}) + \text{residual error}$$

For Analysis 2, the dependent variable was regressed on the six cognitive variables.

ANALYSIS 2: Cognitive Variables (Beliefs)

$$Y = \text{constant} + W_{11}(X_{11}) + W_{12}(X_{12}) + W_{13}(X_{13}) + W_{14}(X_{14}) + W_{15}(X_{15}) + W_{16}(X_{16}) + \text{residual error}$$

Table 5.3 summarizes the outcome of Analysis 1, performed on the personal attributes. It displays the unstandardized regression coefficients (b), the standard errors, the intercept, and R, R², and adjusted R². R for regression was significantly different from zero, $F(10, 264) = 5.741$, $p < .01$. Altogether, 18% of the variability in weekly exercise was explained by knowing all the personal attribute variables.

Four of the ten independent variables from the personal attribute category contributed significantly to the explanation of weekly late life exercise: age, composite index of health, school location, and childhood movement confidence. Work Role did not achieve significance ($p = .173$). A reduced model regressed exercise on the seven situational variables which had a probability level $< .25$. The right half of Table 5.3 shows the reduced model of the four situational variables which were significant ($p < .05$) in explaining exercise level: age, school location, composite health, and childhood movement confidence. On their own, these four variables explained 17% of the variability in weekly exercise. The decrease in R² was not significant.

Table 5.4 summarizes the outcome of Analysis 2, performed on the cognitive variables. The table displays the unstandardized regression coefficients (b), standard errors, intercept, and R, R², and adjusted R². R for regression was significantly different from zero, $F(6,129) = 7.555$, $p < .01$. Only two of the independent variables from the cognitive variables contributed significantly to

the explanation of weekly late life exercise. Altogether, 26% of the variability in weekly exercise was explained by knowing all the cognitive variables.

Table 5.4 also displays the reduced model of exercise level regressed on the two significant cognitive variables: Adult Social Support and Adult Movement Confidence. These variables explained 22% of the variability in late life exercise involvement.

Analysis 3 then utilized the variables derived from Analysis 1 and 2 that were significant ($p < .05$) or approaching significance ($p < .25$) in explaining late life exercise (Y). In this analysis, six variables were "forced" into the final regression analysis (Table 5.5).

Analysis 3: Best Situational and Cognitive Variables

EXERCISE LEVEL = Constant + W_1 (Age) + W_5 (School Location) + W_8 (Health) + W_{10} (Childhood Movement Confidence) + W_{12} (Adult Social Support) + W_{13} (Adult Movement Confidence)

From the life situation variables, Composite Health and School Location were significant predictors ($p < .05$). Age approached significance ($p = .155$), but Childhood Movement Confidence ($p = .52$) lost its effect to the cognitive variables. From the cognitive variables, Adult Social Support and Adult Movement Confidence remained highly significant predictors ($p < .01$). The full model was then reduced by dropping Childhood Movement Confidence. The final equation explaining over 26% of the variation in late life exercise in women over age 70 was:

$\text{EXERCISE LEVEL} = .03 + .248 \text{ Adult Social Support} + .195 \text{ Adult Movement Confidence} + .174 \text{ Composite Health} - .126 \text{ School Location} + \text{error}$
--

Table 5.3

Unstandardized Regression Coefficients and Standardized Errors for the Regression of Late Life Exercise on the Life Situation Variables

Situational Variables	Full Model (N = 275)		Reduced Model (N = 284)	
	b	S.E.	b	S.E.
Intercept	.047	.057	.045	.055
Age	-.032*	.011	-.027*	.010
Marital	-.065	.059		
Children	-.021	.031		
Work Role	-.081	.059		
School Location	-.121*	.059	-.124*	.057
Education	.025	.061		
Composite SES	-.012	.060		
Composite Health	.272*	.059	.271*	.057
Child Mov	.151*	.068	.159*	.057
Child Soc	.013	.064		
<hr/>				
R ² =	.18		.17	
Adjusted R ² =	.15		.16	
R =	.42		.42	

* p < .05

Table 5.4

Unstandardized Regression Coefficients and Standardized Errors for the Regression
of Late Life Exercise on Cognitive Variables

Cognitive Variables	Full Model (N = 136)		Reduced Model (N = 275)	
	<i>b</i>	S.E.	<i>b</i>	S.E.
Intercept	.003	.081	.009	.052
Incentive	.012	.051		
Adultmov	.306*	.115	.287*	.059
Adult Support	.338*	.087	.281*	.060
Risks	-.069	.112		
Benefits	-.075	.085		
HLC	-.109	.085		
R ² =	.26		.22	
Adjusted R ² =	.23		.21	
R =	.51		.47	

* $p < .05$

Table 5.5

Unstandardized Regression Coefficients and Standardized Errors of Late Life Exercise on the Significant Variables of the Full Model

Model	Full Model (N = 262)		Reduced Model (N = 264)	
Variables	<i>b</i>	S.E.	<i>b</i>	S.E.
Intercept	.033	.053	.034	.053
Age	-.015	.010	.014	.010
Schooloc	-.125*	.055	-.126*	.055
Health	.165*	.063	.174*	.062
Childmov	.039	.060		
Adultsoc	.239*	.063	.248*	.061
Adultmov	.185*	.070	.195*	.066
<hr/>				
R ² =	.26		.26	
Adjusted R ² =	.24		.24	
R =	.51		.51	

* $p < .05$

The regression coefficients are estimates of the effects on Y of a one-unit change in X given the other variables in the model. For example, the estimated effect of age was $-.014$, which suggests that for each year of age, exercise level drops by $.014$ amounts per week, or $.014$ of the standard deviation of the exercise level mean (1800 kcal) or 25 kcal. This means that, on average, with each year of age examined, exercise level dropped 5 kcal per week, or about 1400 kcal less each year. This is a small effect that would translate into a difference of one flight of stairs per day (Paffenbarger, Wing & Hyde, 1978) or about 20 miles of walking in a year. Over a ten year period, if eating and activity patterns did not change, a woman could expect to gain up five pounds of extra body fat annually.

Where women went to school as children was a significant predictor of their current exercise level. For example, the estimated effect of being educated in Canada, Britain or the United States was $-.125$. The dummy code for these women was 1, and the standard deviation of exercise level was 1800 kcal, therefore women who were educated in Canadian, British, or American settings could be predicted to exercise 223 kcal less per week than other respondents in the study. This is a large difference. For example, a woman older than age 70, educated in Canada, is predicted to be exercising significantly less than immigrant women of her age every week, and the exercise she is missing is equivalent to about three miles of walking, or over 50 flights of stairs. In a year, this would equate to over 150 miles of walking which would burn about 12,000 kilocalories.

The best explanatory variable was Adult Social Support, or current encouragement from family, friends, spouse and physician. In the final model, ~~exercise level was predicted by $.25$ of a standard unit of Adult Social Support.~~

Adult Social Support had a mean of 12.2 out of a possible score of 20. The standard deviation was almost 4 points. This means that for every four unit score on the social support scale, women increased their exercise level .25 of the standard deviation unit of exercise level, or 450 kcal. This is a very large effect, because it indicates that for each social support unit, women change their exercise by over 100 kcal, or over a mile of walking. Providing older women with encouragement for exercise is thus very important. If she is unsure about the opinion of her physician in regard to her exercise behavior, and then finds out that her doctor is fully in support, she would experience an increase in social support which could elevate her exercise to the equivalent of brisk walking two or three miles a week. On the other hand, if a woman suddenly loses a committed walking companion, and this companion cannot be replaced, social support could drop by 4 four points -- the equivalent of omitting a customary 5 miles of walking per week.

Adult Movement Confidence had a significant and important effect on exercise level too ($b = .20$). This efficacy measure had a mean of 14.4 units out of a maximum score of 24 and a standard deviation of 2.4. Raising a woman's confidence to be able to try walking by only one unit, say from "not very sure" to "pretty sure" would mean an increase of activity expending as much as 150 kilocalories per week. This would be the equivalent of walking about two miles each week or over one hundred miles in a year.

Post Hoc Analyses

In a post-hoc analysis, the data was examined for interaction effects. A new variable called SAMPLE was created so that the strategic sample subjects (N=280) were coded "0" and the convenience sample subjects (N=47) were coded "1".

All of the independent variables were multiplied by SAMPLE to get 16 interaction terms. Three regression analyses were conducted again in their reduced forms but including the respective interactions and the variable, SAMPLE. SAMPLE displayed a beta coefficient of .446 with exercise level (ENERGY) which was highly significant ($p < .0001$). None of the other interaction terms were significant and R^2 was 31%. Therefore the best explanatory variable of late life exercise was indeed the simple difference in the physical activity levels of the two sample groups. Still, the research committee decided that there was merit in keeping the two samples. The convenience sample was significantly less active than the strategic sample, but that difference meant that the full sample was more representative of the general population.

The interaction of ADULTMOV x SAMPLE (B_1) and the interaction of COMPHEAL x SAMPLE (A_2) were also important predictors in this analysis with beta coefficients at .180, but these were not significant. The results indicate that by adding the convenience sample, the roles of adult movement confidence and health status were strengthened in explaining late life exercise. The predictive roles of school location and adult social support were unchanged in combining the two samples.

VI. SUMMARY AND DISCUSSION

Summary of the Findings

The purpose of this study was first, to describe the variability among elderly exercise behavior in women, and second, to examine the utility of the Composite Model in explaining this variability. A third purpose was to explore the childhood roots of movement confidence and social support as possible historical determinants to older adult physical activity participation. The measurement and etiology of elderly women's physical activities have received little previous study and thus this research is considered to be exploratory in nature. This study was, however, able to confirm the heterogeneity of older adult activity patterns and provide preliminary support for a Composite Theory of exercise behavior.

Descriptive Findings

A geographically representative community sample of 280, and a strategic sample of 47 Vancouver women, aged 70 to 98, filled out survey questionnaires. Current exercise level was assessed using a seven-day recall report of the type, intensity, and duration of 38 leisure-time activities. Metabolic units were applied to each reported activity and provided a weekly energy expenditure in kilocalories for each woman.

This study is among the first to collect field data on the specific nature and scope of older women's leisure-time physical activities in Canada. Over one half of the elderly women consulted reported no participation in *vigorous* activities (6+ METS) and over one third reported no participation in *moderate* activities (4 - 5.9 METS). Walking was the predominant *mild* (< 4 METS) exercise

with 60% of the women reported having walked in the past week. Out of six different fitness activities, walking briskly for 20 minutes was rated the lowest in perceived risk to health, the highest in perceived benefit to health, and the one activity about which women over age 70 reported the most confidence.

The 327 women in this study, although all over the age of 70, displayed substantial heterogeneity in their exercise patterns, ranging from zero to over 11,000 kilocalories of weekly energy spent on exercise during a seven day period. Over half of the women said they had "never exercised long enough or intense enough to actually get sweaty" in the past four months. But, overall, the participants in this study were substantially more active than older adults studied elsewhere (Stephens, Craig, & Ferris, 1986; Teague & Hunnicutt, 1989). This outcome supports Brook's (1988) finding that individuals living in western regions of the continent tend to be more active than those living in other regions. As a group, the elderly women in this study met the "adequately active" criterion of 3+ kcal/kg/day in physical activity (Paffenbarger et al., 1986). While 35% of the women in this study were substantially above the criteria however, the majority of women in this study (65%) were inadequately active to receive full health benefits.

Theoretical Findings

One purpose of this study was to test the utility of a Composite Theoretical Model by combining constructs from psycho-behavioral theory (Social Cognitive Theory and Health Locus of Control Theory) with constructs found in social epidemiology (life situation and personal characteristics). Thus the theoretical explanation for the variability in older women's activity levels in this study was based on life situational and personal attributes of individuals

(Age; Health Status; Marital Status; Education; Socioeconomic Status; Cultural Background; Family Size; Work Role in mid-life; Childhood Social Support for physical activity; and Childhood Movement Confidence for physical skill), along with their self-referent belief systems about late life physical activity (Health Incentive; Self-Efficacy to do fitness exercise; Environmental Cues/reinforcement in the form of perceived social support; Expected Outcomes in the form of perceived risks and benefits; and Health Locus of Control).

A series of multiple regression analyses were used to examine which theoretical elements provided unique explanation to late life exercise behavior. In the first regression, the ten situational variables were reduced to four significant predictors of energy spent on exercise in the past week: Health Status; Childhood Movement Confidence; Age; and Cultural Background according to school location. Together these four variables explained 18% of the variance seen in late life exercise level. In the second analysis on the cognitive variables, Adult Movement Confidence and Adult Social Support emerged as the only significant variables ($R^2 = .22$).

A full regression model was tested by including the four situational variables and two cognitive variables which had probability levels below .05 in the preliminary analyses. In this final analysis, both Childhood Movement Confidence and Age were dropped from the regression equation. Adult Movement Confidence, Adult Social Support, Composite Health, and Cultural Background (School Location) remained to explain 26% of the variance seen in exercise participation.

The important factors from the model which best explained why older women were physically active were: they perceived high levels of social support to exercise; 2) they felt personally efficacious for fitness-types of activities;

3) they had satisfactory health; and 4) they were educated in foreign countries.

Discussion of the Methodology

Self-Report Interviews

The use of a comprehensive survey questionnaire proved to be useful in the collection of data in women over age 70. Missing data was the greatest research challenge, which could be overcome in the future by using oral interviews. Oral administration of the survey did occur with about 10% of the sample (the convenience sample), and the completeness of the data was noticeably better. Overall, the instruments used in the study were effective, especially the movement confidence scales, social support scales, and the Older Adult Exercise Status Inventory. Missing data affected the Perceived Risks and Benefits Scales, and this will be discussed later in this chapter.

Statistical Analysis

In terms of the statistical analysis, readers might wonder why path analysis, or causal modelling was not used in this study. Path analysis is a structural application of regression analysis in which questions about the minimum number of relationships (causal influences) and their directions are asked by observing the size of regression coefficients with and without certain variables entered into equations (Tabachnick & Fidell, 1989). An increasingly popular set of new techniques, called structural analyses, involves path analysis of a set of independent variables and dependent variables as latent factors all considered simultaneously using computer programs such as LISREL.

Pedhazur (1982) points out that recursive models leading to path diagrams are one-way in direction. That is, reciprocal causation between variables is ruled out. "A path coefficient indicates the direct effect of a variable hypothesized as a cause of a variable taken as an effect" (Pedhazur, 1982, p. 583). The immature stage at which theory building exists for exercise behavior suggests that study of causality is not appropriate at this point. Rationally, it doesn't make sense that good health, social support, and movement confidence, as they are defined in this study, "cause" an individual to exercise. Rather, this study examined the factors that facilitate or interfere with late life physical activity, but do not necessarily cause it. The causes of leisure-time physical activity are simply beyond the scope of this study.

Furthermore, Social Cognitive Theory, the most promising theoretical thrust, is not a model of linear causation. Bandura has described 1) the individual, 2) their beliefs, and 3) their environment, to be associated by "reciprocal causation" (1986, p.1175), or "reciprocal determinism" (Perry et al., 1990, p. 165). Self-functioning is viewed as a continuous interaction between environmental factors, beliefs and behaviors such that a change in one has implications for the others.

Movement Confidence and Social Support Scales

The Movement Confidence Now (MCN) Scale, as modified from Griffin and Crawford's (1989) Stunt Movement Confidence Inventory, proved to be useful with older adults in documenting current efficacy for specific fitness activity. The illustrations of the activities and described performance requirements likely helped support face validity since subjects could identify more accurately the ~~exertion and special performance requirements of each activity.~~

The Movement Confidence as a Child (MCC) Scale is more difficult to assess in terms of validity. Recall of self-efficacy for, and experience with, six challenging youth activities, (swinging from the knees, rope climbing, diving into deep water, jumping from a height, doing the splits, and riding a two-wheel bicycle) in combination, were significant in explaining late life movement confidence and late life exercise behavior. The MCC scale was shown to be reliable in the pilot study and correlated highly with adult movement confidence.

Sceptics could argue that the MCC scale may not represent childhood efficacy from so many years past. Without other concurrent validity, the MCC Scale would be difficult to defend. However, some evidence exists to suggest that the scale has validity. The MCC scale did correlate significantly with childhood social support ($r = .462$). Also the childhood skills were selected to focus on major skills that most people as children would never forget that they had mastered. For example, women at any age are unlikely to forget whether they ever learned to do the splits, ride a bike or learn to dive and swim in deep water. Further, the impact of childhood socialization on lifelong physical activity is corroborated by a second variable in this study which is clear and objective; the geographic location where older women were educated as children was a significant predictor of their late life activity patterns. Women who grew up in Germany or Scandinavian countries as children were significantly more physically active than other women in the study. These results lend support to an "early and habitual activation" hypothesis. The findings are of particular interest since early perceptions of ability and cultural support for physical skill development appear to last for the entire life course. Some critics would argue that recall variables are heavily biased by present attitudes and

circumstances, but in this study the subjective measures confirm what we know about the strong school-sport culture of Northern Europe.

The Older Adult - Exercise Status Inventory

The OA-ESI also appears to have merit in self-evaluating older adult weekly exercise. The OA-ESI demonstrated concurrent validity with a question reporting lifelong status in physical activity ($r = .450$; $p < .01$); frequency of sweating in the past four months ($r = .411$; $p < .001$) (LaPorte, Black-Sandler, Cauley, Link, Bayles, & Marks, 1983); and active days per week ($r = .491$; $p < .001$).

Despite the amount of detailed data generated on the OA-ESI, there was little confusion with the elderly in this study on how to document their weekly activity. From a research point of view, the instrument was easy to work with in terms of calculating row sums (across the days) and column totals of kilocalories (down the activities). Furthermore, the OA-ESI provided all the important information required for TYPE of exercise, INTENSITY of exercise, DURATION of exercise and FREQUENCY of exercise using only two pages. The instrument is highly suitable to collect oral data in an interview setting if necessary.

Further analysis for number of active days per week as well as the most active days of the week are possible to assess with the OA-ESI. If the researcher wanted to know if people exercised more on weekends than during the week, the OA-ESI format could provide this information. The inventory may be improved in the future by incorporating questions about domestic activity such as has been done in recent instruments on elderly physical activity assessment (Mattiasson-Nilo, Sonn, Johannesson, Gosman-Hedstrom, Persson, & Grimby, 1990; Voorrips, Ravelli,

Dongelmans, Deurenberg, & Van Staveren, 1991). Future studies will be needed to clarify the utility of these instruments with other older adult populations.

Discussion of the Findings

Discussion of the Criterion Variable

Although an R^2 of .26 is quite low since 74% of the variability in exercise level went unexplained, it is important to note that R^2 's of this magnitude are typical in the social sciences. The explanation of exercise level in this study substantially exceeds that provided by other studies of this type as is discussed below. The unexplained portion includes variance attributable to: 1) measurement error in estimating the intensity of exercise reported; 2) subject errors in the recall of physical activity over the past seven days, 3) weekly fluctuations in individual activity levels, and 4) seasonal and uncharacteristic weather patterns which interfered with normal outdoor activities such as walking and gardening. Because any of these portions of variance may be quite large, it may not be possible to achieve a substantially higher R^2 by including more variables in the model, unless there are major deficiencies in the model such as the omission of constructs which represent important explanation.

One suggestion would be to use repeated measures of weekly exercise so that human and seasonal fluctuations of actual activity level, are considered. A second strategy would be to seek ways to increase the diversity of the volunteer sample in order to strengthen the power to explain differences in exercise level. If a sample is composed of people who are all fairly alike, except for variation in the dependent variable, the reason for this variability is unexplainable. Thus R^2 in this study was limited to some extent by the

homogeneity of the sample. The people in this study were alike in these respects: all the subjects were women; all were over age 70; the majority were of adequate health to be mobile in their community; and the 327 women had sufficient will and competence to complete the 30 to 60 minute survey questionnaire. In addition, two independent variables showed little variability; most of the women in this study wanted to live a long and healthy life (motive), and most of them were "internals" in terms of health locus of control. Providing monetary incentives or using quota sampling are ways to obtain more diversity in samples.

The R^2 of .26 substantially exceeds the explanation of exercise in other studies. Dzewaltowski (1989) has compared the ability of two different theoretical models to predict exercise prediction. The Theory of Reasoned Action (Fishbein & Ajzen, 1975) assessed intention to exercise, attitude toward the activity and the social environment (subjective norm), but only 5% of the exercise behavior variance was explained in 328 undergraduate students. In the same study, two social cognitive constructs (self-efficacy and self-evaluated dissatisfaction) predicted 16% of the exercise variance.

In a similar study comparing the two theories, Dzewaltowski, Noble and Shaw (1990), found 10% of the variance in undergraduate students' exercise behavior was explained with measures from the Theory of Reasoned Action. When self-efficacy measures were added to the regression analysis, another 7% of the variance in exercise behavior was explained.

Brooks (1988) reports on causal modelling analysis using sociodemographic information to predict five levels of physical activity behavior in 19,110 Americans over age 18. The sociodemographic measures were age, sex, marital status, education, household income, region of the country, and county size. Only

age, education and income were able to predict physical activity levels, and the variance explained was only 8%. Brooks concluded that her results indicate that education and income "in fact contribute very little to our understanding as to why some adults choose to lead physically active lifestyles while others do not" (Brooks, 1988, p. 335).

Another study of 98 adults found self-efficacy for exercise program adherence and outcome expectations from the program, in a linear combination, predicted 12.5% of the variance between adherers and dropouts (Desharnais, Bouillon, & Godin, 1986). A path analysis model of achievement behavior designed to predict physical activity performance was able to explain 16% of the variance.

Relative to all of the above studies, the Composite Model used in this study performed well, since, in the present study, 26% of the variance in exercise behavior was explained. To improve on this prediction, one may choose to employ more costly and time-consuming means of measuring exercise levels, such as oral interviews or daily diaries, in order to reduce error.

Life Situational Variables

Of the life situational variables only health, school location, age, and childhood movement confidence were prominent in explaining late life exercise. As has been found in other studies on older women in exercise settings, women who were more active reported better health (Kriska, Bayles, Cauley, LaPorte, Black Sandler, & Pambianco, 1986; Segovia, Bartlett, & Edwards, 1989), tended to be schooled in an ethnic or foreign (non-English-speaking) culture (Brooks, 1988; Hutchison, 1987), were younger (Brooks, 1988), and recalled being efficacious and experienced with challenging physical skills when younger (Morgan, 1986). This

latter finding deserves further exploration because the implications for lifelong life quality and public health are enormous.

One might wonder why other measures such as Education, Marital Status, Number of Children, Work Role and the Composite SES Index did not add more explanation to the criterion variable. Many of these indicators, while they are potent predictors of behavior in younger adults, are probably "levelled" by the later years. For example, the financial status of middle class older women is reduced by old age, everyone is receiving Old Age Security, and those who have marginal means are "boosted" with the Guaranteed Income Supplement. Thus SES differences, which are difficult to measure in the elderly anyway, are further masked by social assistance programs. Education, employment, marital status, and raising children are often inter-related and therefore may confound each other in statistical effect.

Cognitive Variables

Adult social support and adult exercise efficacy were the two outstanding variables of the cognitive variables explaining late life exercise, suggesting that feeling capable to do fitness activity, and feeling encouraged to participate were two important beliefs which lead older women to pursue more active lifestyles. This study confirms the findings of other studies that positive relationships exist between social support and involvement in physical activity (Andrew, Oldridge, Parker, Cunningham, Rechnitzer, Jones, Buck, Kavanagh, Shephard, Sutton & McDonald, 1981; Gottlieb & Baker, 1986; Heinzelmann & Bagley, 1970; Langlie, 1977; Wankel, 1984). Other researchers are also recognizing the importance of social support in a variety of activity settings. ~~Shivers (1991) suggests that intense socialization is fundamental to the older~~

adult recreational experience. In studying the meaning of physical activity in old age, Takala (1991) notes that partway through his research more emphasis was given to the social meaning of physical activities. In a study on exercise adherence, Danielson & Wanzel (1977) found that women were more likely to be attending fitness classes if they were accompanied by a companion. Wankel (1984) succeeded in improving adherence to an exercise program by creating "a buddy system."

Exercise scientists are only beginning to appreciate the significance of social support in physical activity settings. The socializing characteristics of physical activity, exercise and sport appear to be among the key reasons older adults participate (Rudman, 1986). An irony which is becoming evident is that while physical activity settings may be the best source of female encouragement and companionship, other forms of social support may have to exist for women in order for the potential of these activity settings to be tapped. Further research is needed to clarify how fragile or resilient women's confidence and support systems are. For example, women may rapidly become more, or less, active upon the death of their spouse. The findings suggest that self-perceptions about early skill mastery accompanied by childhood encouragement and opportunity in physical activity may give many females an advantage in fostering adult support networks and an efficacious view about lifelong exercise involvement. This finding speaks to the lifelong, lifestyle consequences of present-day girlhood experiences in challenging sport and play - stemming from processes of opportunity, encouragement and acquired skills in physical settings such as school physical education and community sport programs. Contemporary families, schools and communities must be effectively providing these opportunities, supports and ~~skills for young females, and society must help to sustain active women with~~

incentives throughout the adult years if females are to age with optimal activity levels, and thereby sustain health, independence, and a fuller quality of life. Life circumstances and inadequate encouragement apparently limit opportunities, from childhood on, to develop the kind of confidence in one's physical abilities that would promote an active lifestyle through to women's oldest life stage.

Health Locus of Control did not achieve significance in this study, but the effect was in the expected direction with internals exhibiting more physical activity. At the over-70 age level, day-to-day health may be variable enough that the elderly may begin to question their personal control of it. Also among those women who reported their health as only "poor" to "fair," many were exercising extensively. In this study, clearly women at both ends of the health spectrum were among the heaviest exercisers. Thus those who felt the *least* control and *most* control over their health may have exhibited greater involvement in physical activity. Those in the poor end of the health rating were likely following medical advice to rehabilitate themselves, or viewed that increasing illness was a "cue to act" before it was too late to do something to improve their health.

Bandura's Incentive to Act also failed to significantly explain late life exercise. Health Incentive might have been more useful as a motive variable if it had been more closely tied to exercise as a direct consequence, such as "I would walk everyday if I knew it would give me 500 more days of life" or "I would do 5 sit-ups a day if I knew it would improve my posture."

The reasons for engaging in late life physical activity appears to be motivated by other factors unrelated to health maintenance and disease prevention. Other motives should be explored such as personal enjoyment, ~~improved appearance, and in the case of women, an incentive possibly related to~~

"beauty". Many women of the over 70 generation were involved with the Women's League of Health and Beauty which originated in Britain and spread to the Commonwealth. Older women often lament over negative changes in their physical appearance as they get older. Physical attractiveness may be more important than health to many women, particularly if they perceive their health to be good and their appearance to be a problem.

Outcome expectations, assessed as perceived risk and perceived benefits, were quite highly correlated to adult movement confidence and therefore lost their predictive power in the overall model. When perceived risk was entered on its own to explain exercise level, it explained about 7% of the exercise criterion; when benefits was entered on its own, it explained about 3%.

Discussion of the Model: Theoretical Significance

The Composite Model was supported as being more effective than other theories advanced so far which have focussed exclusively on situational barriers, or psychological determinants. In this study, both life situational variables and cognitive variables played important and independent roles in explaining 26% of the variance in late life exercise. Thus the findings support Bandura's triangular model that the cognitive profile of people along with their life situation are both influential determinants of their actions. This study confirms Bandura's principle of reciprocal determinism, that is, situational and cognitive determinants both have important relationships with exercise behavior and with each other. The associations may be bi-directional in causation or reciprocal in effect (Kaplan, Atkins & Reinsch, 1984).

The Composite Model performed well in this study since explanation of the exercise patterns of a large elderly sample was superior to that of other research using other theories and combinations (Dzewaltowski, 1989a, 1990). The recent addition of self-efficacy to the Health Belief Model also suggests that the time may have come to rework present theoretical models according to the specific human behavior under study. Some consistently successful predictors of human health behavior appear to have been identified across various models, but few researchers have been willing to address more than one theory at a time. Indeed, the application of current theory has usually occurred with only one or two of the theoretical constructs put to test. Self-efficacy has received the most emphasis and has often stood on its own as the only construct used.

The present study extended previous research by examining a more complete Social Cognitive Model which included: 1) a health and longevity motive to exercise (Incentive to Act), 2) perceived personal risks and benefits of fitness activities (Outcome Expectations), 3) social support to exercise (Environmental Reinforcement) 4) Self-Efficacy to participate in fitness types of exercise, and in addition, 5) Health Locus of Control. Since Bandura's work suggests that cognitive beliefs are already a reflection of the personal and socioenvironmental context of an individual, previous researchers using SCT have not examined individual attributes and social situations for competing explanation. Because one's life situation is considered to be less alterable than beliefs, less attention has been paid to the inter-relationship of life situation to beliefs and behavior.

Cognitive theorists have studied behavior as an outcome of cognitive processes only, and have tended to assume that the influence of one's life ~~situation and personal attributes are imbedded in these cognitive processes. Of~~

importance to future research, this study found that cognitive beliefs do not account for all of the explanation of late life exercise. In other words, life situation and personal attributes can add significant influence to the explanation of physical activity over and above the assessed cognitive beliefs about physical activity. Since late life exercise is independently explained in this study, in part, by health, age, and culture (school location as a child), future researchers are encouraged to assess more than just the cognitive beliefs of individuals. Overall, the findings do not support the inclusion of all ten situational variables and all six cognitive beliefs in the Composite Model of late life exercise. Still, this study provides strong, confirmatory support for two key constructs of Bandura's Social Cognitive Theory; Self-Efficacy to participate in fitness exercise and Social Support to be physical active offer significant explanation of physical activity behavior in elderly women. Risk and benefit outcome expectations are beliefs that have more important relationships to one's self-efficacy than to late life exercise itself.

Social Cognitive Theory was not significantly aided by adding the Health Locus of Control belief. Similarly, health and longevity did not appear to act as important motives (Incentives to Act) to participate in late life physical activity. Health Locus Of Control and Incentive to Act operate in a context of health, which, in this study, might not have been conceptually related to physical activity patterns in the minds of older women. Together, their lack of explanation points to the possibility that many women are motivated to exercise for reasons other than health. This possibility raises the question, what IS the main motive for the high activity levels of women after the age of 70?

Although the next stage of theoretical work might attend to eliminating ~~ineffective variables~~ and examining new combinations of the strongest constructs

across the theories, I am not convinced that any elements of the Composite Model should be abandoned yet. Further, I believe that the main determinants of exercise behavior have not been fully identified. If I was to do this study again, I would be interested in refining the variables I did include, such as perceived outcome expectations (benefits and risks), and developing a better understanding of "motives" for late life exercise. These refinements are not trivial. The identification of the specific fears of older adults about exercise, as well as their beliefs about specific benefits, will demand a major research project of both a qualitative and quantitative nature. The study of motives for late life exercise will involve a similar challenge. The list of ten life situational variables might be reduced, but if the Composite Theory is to have wide applicability to different populations and health behaviors, inclusion of a full contextual list might be advisable. In this way, the unique explanation of various "life situations" can be accounted for in distinctive populations.

Chief Limitations and Suggestions for Future Research

Self-selection Bias and Survivorship

The 327 women participating in this study were not perfect representatives of the general Vancouver or Canadian population in their age group, but were identical with respect to two important demographic variables: medical health symptoms and percent receiving the Guaranteed Income Supplement. Comparison data suggests that the sample in this study were more active, better educated, and less overweight than the general elderly female population. Challenges to be faced in recruiting elderly participants for research have been reported elsewhere (Carter, Elward, Malmgren, Martin, & Larson, 1991).

Subjects willing to participate in this study were mainly found in community programs or seniors lodges and therefore represent a study population who were independently mobile, who were actively pursuing leisure activities by taking advantage of community leadership resources, and who enjoyed a reasonable level of health. Geographic location in one of Canada's more temperate cities may bias this sample toward more activity-conscious individuals. Government studies suggest that the adults living in British Columbia surpass national averages for activity level, freedom from physical limitations, not being overweight, and overall health status (General Social Survey, 1985).

One should also remember that females living to their seventh, eighth and ninth decade of life already represent a biased population of survivors - individuals who may have certain social, psychological and biological advantages not available to every female born in 1921 or earlier. Age group mortality statistics indicate that 62% of the women who were born in 1919 survived to age 60 (Golini & Lori, 1990). Women in this study averaged a mean birth year of 1913 and have lived at least a decade longer. They therefore represent only about 30 to 50% of their particular birth cohort.

Mortality statistics also suggest that 5 to 6% of North American women over age 70 in 1990 would not be alive just one year later - an attrition rate of about 50 to 60 per 1,000, or in this study, potentially a loss of about 16 to 20 subjects out of 327 (U.S. Department of Health & Human Services, 1991). Mortality rate is not available for this study but mail-outs to all 327 subjects eight months later were apparently received by all but five. These five reports were returned with no forwarding address. The uncomfortable reality of this type of research is that some of the subjects are not alive just one year later to ~~learn about the findings!~~

Finding representative samples of large populations will continue to pose difficulties in the future. One recommendation is that future research should focus on targeted social groups, such as those in poverty, institutions, ethnic men and women, married adults, rural people and so on, in order to provide descriptions of the activity patterns and unique determinants in a variety of settings. As data collects on the situational barriers to older adults in various sport and exercise settings, commonalities and unique differences will surface.

Variables With Poor Response Rate

Further bias and error is added to a study when subjects choose not to answer certain kinds of questions. Post hoc analysis on the people who provided missing data is reported in Appendix E. The missing data group were significantly less active, had fewer children, were older, had less childhood confidence, especially in childhood, had less adult social support and perceived more risks with the six fitness exercises. Ethical protocol at the University of British Columbia required that all subjects were to be informed that they were not required to complete all of the survey, and could withdraw from the study at any time.

Women in this study were particularly reticent to answer perceived benefits and perceived risks rating scales of the six fitness adult fitness exercises. Perceived risks and benefits of exercise had the poorest response rate of any of the cognitive variables. Complete data on only 47% of the women (N = 153) were available on the perceived benefits and on just 55% (N = 180) for the perceived risks. Open-ended questions of "The major benefit for me would be" and "The major risk to me would be..." were rarely filled in, and when they were, quite often the specific benefit or risk identified was clearly a guess.

A written evaluation by one of the students involved in administering the questionnaire to a 77 year-old woman stated:

You will notice that some questions are partially completed or not completed at all. The subject felt they were inappropriate, for example, "rate the possible risk to your health" because she had no way of knowing for certain. Those questions she felt sure about she answered quickly. (A.E.L., February 12, 1991).

Thus the data on risks and benefits, although showing conceptual promise, were weakened by many non-responses. A more appropriate format might be to use the perceived risks and benefits scales in a forced-choice Likert format such as "This exercise 1) has 0% risk for me; 2) has some risk for me; 3) is very risky for me". Possibly oral interviews would facilitate the response rate too. A list of possible risks and benefits might also help respondents select their responses with more ease.

Explanation for this missing data is only speculative. The missing data was generally found in the middle portion of the survey questionnaire, and it is unlikely that the women were fatigued at this point. Of interest is the fact that the missing data was prevalent for the efficacy and experience estimates of the childhood skills and also for the six adult fitness exercises. These questions required the subject to identify their experiential or acquired knowledge and such questioning could have been threatening to many participants. A possible explanation is that the women were inexperienced at these six particular exercises and weren't sure how able they were to perform them. One woman commented that she had never done any of these exercises, and was sure that she couldn't do them, but it was demoralizing to keep reporting that for each of the six skills. One can imagine that women without first-hand experience with adult exercise would find it extremely difficult to perceive any specific risks or benefits.

On the rest of the survey, there was a remarkably high completion rate of about 92% with over 300 women providing data on almost every question. Although little is known about response rates in the elderly, the quality of response in the present study appears to be good. A few studies have reported response/participation rates. In a recent random telephone survey to older adults, Graham, Graham and MacLean (1991) reported that a 50% participation rate seriously jeopardized the representativeness of their sample. A Polish study on excessive weight and hypertension in adults age 65-84 reported a participation rate of 28% in the 65-74 age group and only 9% in the 75-84 age group. They therefore warn the reader that,

...the conclusions should be drawn cautiously as the results of the study presumably are affected by the differential survival between sexes as well as by selection bias. It was disclosed that those in the older age group (75-84 years) were underrepresented compared to younger subjects. (Jedrychowski, Mroz, Bojanczyk & Jedrychowska, 1991, p.68)

Generalizability

This study attempted to achieve a representative sample of all women over 70 in the Vancouver area by randomly selecting settings from the full list of settings serving this population. Within each location, however, it was impractical to randomly select women because the older adults in senior's programs are "drop-in" participants. Compiling a full list of the over 65 population might have been possible through the Government of Canada and Old Age Security addresses. Even if this list could have been obtained, it would have proved difficult to identify only the women over the age of 70.

Instead, the sample included volunteers from each setting. Added to the original sample of 280, 47 older women were surveyed by university students in ~~their homes. These women were far less active, and displayed qualities which,~~

when merged with the original sample, brought the total sample closer to a nationally representative sample. These 327 women may differ from a true random sample in the following ways: physically more active, socially more adventurous, younger, financially secure, more healthy and better educated. Therefore the mean scores on exercise level, adult social support, age, composite SES, composite health and education will likely be positively biased.

However the main interest in this study lies in the regression relationships and these will be less affected by the non-random sampling. If the achieved sample is more homogeneous than the (hypothetical) true sample, then the reported relationships are probably underestimated.

Quality of the Data

The challenge of collecting data on several hundred elderly women brings attention to the methodological problems of survey conduct. Colsher and Wallace (1989) claim that previous research indicates that data quality tends to decline with respondent age. For example, elderly adults are more likely than younger individuals to refuse to participate in surveys (Carter et al., 1991) and to refuse to answer specific questions. Elderly non-respondents have indicated that they dislike investigations (Eriksson, Mellstrom & Svanborg, 1987).

While it might be expected that these problems would be similar to those experienced with younger persons, the prevalence of impaired physical health, declining sensory function, cognitive impairment, and abnormal affect among the elderly population may complicate surveys by reducing both data quality and sample representativeness. (Colsher & Wallace, 1989, p. P45)

Older persons are thought to be more prone to response biases such as choosing socially desirable responses; they may tend to be more cautious in making choices (Okun, 1976) and may require more information in making decisions (Denney & Denney, 1973; Kesler, Denney & Whitely, 1976). However, some investigators have

found increased accuracy among older respondents (Traugott & Katosh, 1979). But income, in particular, is one item which receives many omissions, especially for women (Colsher & Wallace, 1989).

In this study, data quality was considered to be good. The questionnaire was carefully constructed using validated instruments whenever possible, and new scales were checked for one-month test-retest reliability in the pilot study. The illustrations of the childhood physical skills and adult exercises were acknowledged by several women to be helpful in clarifying the nature of the questions. Missing data was corrected in dozens of cases by follow-up phone calls.

The women agreeing to participate in this study appeared to be committed to the task of providing quality responses; women who felt that they could not do an adequate job (for reasons of poor English, poor vision or poor health) declined to participate. When it was possible, subjects with these kinds of problems were given the questionnaire orally in an interview setting.

This study provides evidence that women over the age of 70 are capable of self-completing a large survey instrument. Although oral surveys are often advocated as preferable, older adults in interviews cannot move through the survey at their own pace, and some may feel more pressured or distracted. Some individuals are eager to give socially desirable answers to the researcher. In other cases, the survey questions may provoke informal conversation which challenges researchers to stray from the research topic. In any case, oral surveys lose the advantage of anonymity.

A problem that needs to be addressed in future research is that of public perceptions about research. Many of the women in this research did not feel "~~worthy~~" of scientific research; ~~one woman suggested that her husband would be~~

"much more interesting to study". One older man asked "Why are you studying older women? Their lives are so uneventful."

Even after explanations of the importance and value of the research, some individuals did not see the relevance of the study to their present or future lifestyles, or could not appreciate the relevance of the study to benefit others. In addition, there was a lack of understanding about a need for scientific protocol, such as limiting the study to women of a specific chronological age.

Overall, the most prevalent concern of older women eligible to participate was that of a personal vulnerability to criminal behavior. Some women thought they were secretly being screened for institutionalization. Many women thought that reporting their age, medications, health, marital status, education and income characteristics was too much of a risk. They worried they would be taken advantage of in some way.

Future researchers can improve on their data quality with older adults by: having a trusted member of the group explain the importance of their time and the value of the study; conducting the survey in smaller units over a period of sessions; scheduling special survey times for the questionnaire; using at least 12 point font size lettering on the survey instrument; spacing the questions out well and using illustrations for visual interest; starting off with objective questioning and concluding with more subjective items; and having seniors read through the questionnaire in advance for clarity and understanding.

Unanswered Questions: Gaps in the Present Work

Missing Constructs

One motivating belief which was not explored in this study comes from the Health Belief Model and is called *perceived susceptibility*. A similar construct is described by Bandura as self-dissatisfaction with performance. In this study, having two or three medical symptoms was associated with lower exercise involvement (averaging about 1000 kcal per week). However, when histograms were produced showing activity level according to the number of medical symptoms, women reporting four or more symptoms were, as a group, almost as active (1800 kcal per week) as women taking no medications (1900 kcal per week). Future studies will need to attend to the possibility that some women may be motivated to take up physical activity when they develop a concern for, or dissatisfaction with increasing health problems. Comments from older women in the study supports this notion that some people do come to recognize that, without adequate activity, they are susceptible to more health difficulties. This realization about personal vulnerability may provide an important incentive to take action; such a realization is fundamental to Rosenstock's perceived susceptibility construct in the Health Belief Model.

Identifying the Perceived Risks of Exercise

The fact that older women in the present study were unable, or unwilling, to comment freely upon what they considered to be the personal risks of participating in six fitness activities, suggests that public education strategies are needed. There is evidence in this study, that most women feel that there are definite benefits to their health and well-being, but are not able (or

willing) to divulge what they view the specific benefits to be. This finding casts a challenge for health professionals. Without information about the older women's attitudes and cognitive knowledge regarding risk and exercise, advocates will find it difficult to favourably direct health promoting messages to the older public. Future research, new instruments and more strategic research will need to be aimed at the exercise risk perceptions of various social segments of the population.

The Significance of Domestic Activity

One missing link in this study is the lack of attention paid to women's lifelong energy expenditure to mild, moderate and vigorous forms of domestic work. Several women in the study pointed out that they have little leisure-time to exercise, but do put a great deal of energy into their chores around the home. There is little existing data on the life-long patterns of domestic activity, but observation suggests that women do maintain a lifelong physical involvement in the daily maintenance of the family and the home. Some recent research suggests that women's energy spent on domestic activity has been greatly underestimated (Mattiasson-Nilo et al., 1990).

Discussion with older women in the present study indicated that one of the supportive situations which fosters regular indoor and outdoor exercise is that of living in a private residence. Women in their seventies and older have indicated that their previously active lifestyles took unplanned turns for the worse when they gave up their residential homes and relocated into small apartments or senior's lodges.

The meaning of such a move on an older adult's activity patterns is not at first evident - but selling a home with yard means that housework and domestic cleaning are reduced to a minimum, there is no more raking, hoeing and digging in the garden, there is less garbage to dispose of, and less distance to carry it. The devastating physical implications of such a move is best described by an 86 year old woman:

I have been in this 'home' for only one year. I have been shocked by the number of women who just 'sit'. There are arrangements for drives and rides, but never for walks. The exercises are mostly for upper extremities sitting in chairs. There is a large activity room in the basement but many have never seen it - elevator is available, easy access, good lighting. My personal wish is that we might be encouraged to utilize any work habits and garden knowledge that we developed before coming here. We would take pride in the results, providing plants and seeds, even if we developed a hodge-podge! I get a guilty feeling just picking off dead flowers... maybe next year. (Anonymous, 1990)

Future research needs to include women's work in energy estimates. Only recently have women's activities as homemakers been accounted for (Cauley, LaPorte, Black Sandler, Schramm & Kriska, 1987; Kolanowski & Gunter, 1988). It appears that most occupational studies, linking life occupation to mortality and health outcomes, have been done on all-male samples. In recent years, physical energy output in employment settings has altered so dramatically that research interest in male occupational settings has waned. However, for women, the impact of domestic labor continues lifelong, and the changing leisure-time patterns of women are worthy of study, particularly in view of women's extra longevity. Exercise physiologists may eventually find that mild and moderate forms of domestic physical activity over the life course may contribute to added years of function or even added years of life.

Perhaps most important of all, women who had recently moved to senior's lodges reported that they had to give up their favourite walking companion -- their dog. So far, the research literature has neglected the role of "man's best

friend," or in this case, woman's reliable walking companion and protector on the streets. Many older women have apparently found their canine pet to be the perfect type of social support and environmental cue for regular physical activity. Owning a dog of any size or breed requires that the dog be exercised everyday. Older women who own dogs are therefore pressed to get out for a daily walk. For many women, this is just the incentive and companionship they need to obtain reliable walking exercise, and furthermore, the dog may provide the older woman with some sense of personal security in public spaces.

The Significance of Being a Turn-of-the-Century Tomboy

The present research has opened a treasure chest of questions about the early activity and socialization experiences of today's elderly women, and it is today's oldest women, like those in this study, which hold the keys to that treasure of knowledge. Significant advances in the physical liberation of young females took place around the turn of the century. The bicycle craze of the 1890's provided many young women and girls with new opportunities for transportation and physical challenge that forced an alteration of the restrictive fashion of the day. By the 1920's, women in North America were prominent in sports such as golf, competitive ice skating, athletics and tennis. Further research is urgently needed to learn about the sporting experiences of women at this time as reported by them.

Many of the women in this study were quick to point out that they were as active as was tolerated for girls of their day, and that they were often called "tomboys" when they were girls. Despite this label, their active nature was not easily curtailed and therefore must have been tolerated at some level by their ~~childhood family and community. Now at the other end of the life spectrum, these~~

women still seem to revel in the memory of this deviant attitude toward challenging physical activity which has, in some way, continued to provide them with rewards.

For the self-proclaimed "tomboys" in this study, lifelong advantages appear to have been acquired through their exuberant involvement in their early physical exploits. For example, the consequences of certain past behaviors may have informed them as to what they must do to gain beneficial outcomes from activity and how to avoid punishing ones. Women, who 50, 60 and 70 years later, recall being a tomboy, provide this admission with little embarrassment, and usually a great deal of pride. Bandura and Walters (1963) suggested decades ago that the acquisition of physical skill requires more than genetic predisposition.

Since proficiency in physical skills is often dependent on an early commencement of training, which must then continue over a lengthy period of time, persons not infrequently find that lack of opportunities or guidance during their childhood and adolescent years has, in effect, imposed a life-time barrier to their legitimately acquiring possessions and status, or participating in activities that for other persons are evident sources of enjoyment and means for obtaining additional social and material rewards. Thus, both genetic and early-experience factors may create conditions under which persons are tempted to acquire socially acceptable rewards by socially unacceptable means. (Bandura & Walters, 1963, p.166)

Exploration of the tomboy theme in future research will require some creative approaches, especially in finding ways to encourage women to give 'voice' to their early childhood experiences in sport and physical activity.

Policy Implications of the Findings

Creating Social Support for Physical Activity

Evidence is rapidly accumulating that social support is indeed a significant force in assisting individuals to initiate activity, to adhere to activity once started, and to increase enjoyment of the activity experience. While it has been suggested that health educators and fitness leaders should assist individuals in seeking and recognizing sources of social support for more physically active lifestyles (Blair, Kohl, Pate, Blair, Howe, Rosenberg & Parker, 1980), it is becoming apparent that older adults, especially women, may be most in need of a helping hand in this regard.

Social support for a more physically active lifestyle may be the most powerful intervention or source of motivation for women over the age of 70. Older women will be more active if they are encouraged from multiple sources: their spouse or immediate family, at least one exercise companion, peers who are active, and importantly, by their primary physician. The findings of this study suggest that older adults easily get caught up in the social dynamics or momentum of an active community. On the other hand, they may easily feel disempowered by the surrounding lethargy and sedentary social activities available to them.

Communities may be able to rapidly shed the stereotypes of old age by highlighting local groups and individuals who are ordinary seniors in most respects, but who are authentic role models for healthy lifestyles and physical involvement. More attention could be placed on the "come-back" stories of older individuals who have restored their health through physical activity after a serious illness, or of individuals who were former exercise sceptics, but are now keen advocates of physical activity. People like these are found in most

communities. Added to these strategies must come more leadership from seniors themselves, to develop the kinds of programs, and to lead their peers in the physical activities that they most enjoy. Seniors, while reluctant to spend money on their own recreation, need to explore their attitudes about the expected value of physical leisure to their well-being and compare recreation fees to the costs of medications which may not be essential.

To promote broader and more vigorous physical activity participation at all ages, the input of physicians is essential (Allen & Allen, 1986). Practitioners are advised to team up with professionals outside of medicine to create partnerships in community health promotion. Physicians could also be more willing and able to talk to patients about the importance of appropriate exercise for their individual needs, to be more optimistic about the ability of older adults to become more active, and to identify where in the community older adults can get the exercise supervision or help they need to initiate or resume activity.

Walking is recommended as the ideal form of mild to moderate exercise (Monahan, 1987) and is the favourite mode of exercise for women over the age of 70. This finding is not surprising, and it is not new. But little research has yet focused specifically on the determinants and barriers to walking in adults. One study has found that people become more cautious in pedestrian behavior with age (Harrell, 1991).

While brisk walking may be adequate aerobic exercise for the unfit, it may not be suitable or effective for more fit, or the very unfit, or obese populations of older adults. Walking is also not the exercise panacea to full fitness. Walking makes no contribution to upper body strength, nor to certain joints for increased flexibility. Walking may be adequate movement to maintain

one's balance and proprioception, but no scientific evidence exists to demonstrate that.

Research is needed that could identify the specific benefits of various intensities of walking, at various frequencies, at various duration in different populations of adults. Research is needed that could inform the public about the specific benefits about specific walking regimens and how best to develop the social support systems to insure that this form of exercise is as enjoyable as possible. A good example of a supportive environment for walking all-year around is now seen in the larger shopping malls, where groups of adults meet regularly walk for fitness. Notwithstanding its low-risk, low-cost prospects for participation, walking may be the most compatible mode for conversation with companions, and thereby create and strengthen opportunities for further social support (Kasper, 1990).

Increasing Self-Efficacy and Incentive for Physical Activity

There has been some debate on whether efficacy perceptions involving physically skilled behavior can be easily altered by simply increasing people's knowledge and incentives to act. Kirsch (1985) has discussed possible conceptual confusion in the definition of self-efficacy and outcome expectations in that both are related to expectancy theory. In comparing self-efficacy to approach a live snake, and self-efficacy to accurately toss a wad of paper into a wastebasket, Kirsch found that snake phobia was easy to alter by adding a five dollar incentive. However, he found that it was difficult, even with a million dollar incentive, to increase people's confidence to toss a wad of paper accurately. This finding raises the possibility that increasing self-efficacy for skilled psychomotor tasks, such as found in sport settings, may be extremely difficult in the adult population. More skilled forms of health-promoting

exercise may be inaccessible to certain social groups who have traditionally lacked the opportunity to acquire the necessary skills in advance of adulthood.

Implications for Professional Practice in Adult Education

To capitalize on the finding that perceived efficacy in exercise settings is a key determinant for older women's participation, adult educators in health and activity counselling must find ways to increase the initial personal confidence of the participants. Since just being more active has been associated with efficacy estimates, educators should introduce adults to low skilled activity first, and then progressively challenge participants into higher skilled activity.

Higher efficacy estimates are known to accompany higher levels of experience and performance, but only if the individual perceives success. Thus individuals must be given latitude to set personal goals and pursue these at a self-paced rate so that success is ensured. New learners in physical activity settings have little past experience on which to base present efficacy. Thus former athletes or older adults with previous skills, may need to be challenged at a faster pace than those who are newcomers to sport and physical activity settings.

Contemporary literature suggests that North American children in the last part of the 20th Century are among the least physically active in history. Yet this study highlights that early experience and skill in physical activity and sport are important health and lifestyle resources. Experiencing early mastery of vigorous and adventurous activities provides first-hand knowledge of the benefits, and increases the prospects that females will return to healthy levels

of physical activity at various points over their life course. Particularly for women, many of whom can be expected to have activity patterns disrupted with marriage, relocation, childbearing, childrearing and changing work patterns, the enhancement of their ability to keep re-entering activity settings in adulthood will be important. Examination of the life stages and individual circumstances which support exercise re-entry would be valuable in future research.

Cultures outside of North America are apparently able to accomplish successful and lifelong lasting experiences in female physical activity, exercise and sport settings. The physical activity experiences in present-day school curricula need to be examined and culturally compared to those of Northern Europe, at least for girls. More studies examining the determinants of successful participation for females at all ages is warranted.

The finding that impressionable beliefs, more than poor health and old age, are primary barriers to physically activity in one's older years suggests that adult educators, health professionals and activity leaders have the potential to influence potentially-active seniors. Exercise leaders of older adults should seek information about what the participants actually value as expected outcomes of the exercise participation. Ultimately, leaders will want to find out what aspects of exercise causes anxiety in participants, and which aspects of the exercise environment interfere with their participation. These findings suggest that older adults may need more specific knowledge about the kinds of benefits to expect from various activities, and how these benefits may outweigh the known risks. The kind of detail and specificity seen in nutrition counselling may well apply to exercise counselling.

Evidence is rapidly accumulating that social support is indeed a ~~significant force in assisting individuals to initiate activity, to adhere to~~

activity once started, and to increase enjoyment of the activity experience. Older adults, especially older women, may be most in need of a helping hand in this regard. The women in this study who were most physically active, also perceived high levels of encouragement from family, friends, and their primary physician. Further study will be needed to uncover other types of social support which will stimulate more aging women to seek the rewards of physically active lifestyles. Future research will need to tease out which types of social cues motivate women best for increasing or sustaining participation in exercise settings. Until such time as more is known about the specific nature of social support, adult educators should insure that there are social rewards and reinforcements in their exercise programs by fostering social networks and enhancing self-confidence as the MAIN objectives of physical activity participation for aging women.

Although activity levels appear to be improving at all ages, older men and women persist in underestimating their physical abilities and limiting their activity choices to a few involvements which are deemed to be socially acceptable and age-appropriate. Social incentives need to be explored which would challenge the self-fulfilling prophecy of decrepitude and ultimately empower older women to venture into less passive activities for which they might find new opportunities and new skills to learn. Unravelling ageism and sexism in everyday settings of exercise and sport will require innovation, intergenerational cooperation, and exceptional levels of social support in some contexts.

To enact more variety in adult programming, and to provide opportunities for invigorating physical activity at all ages, society must be willing to share its sport and recreation resources with its oldest taxpayers, and allow them ~~moments of priority to enjoy these facilities as full participants, rather than~~

as spectators. This means that administrators of sport facilities and community centres must be willing to share their limited resources and expertise by providing the best of support staff, including advanced coaches and fitness leaders, to address the challenges of creating the richest experiences possible for citizens at their oldest life stage.

CHAPTER VII. REFERENCES

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APPENDIX A

The Questionnaire

**AGING AND ACTIVITY SURVEY
FOR WOMEN BORN BEFORE 1921**

INTRODUCTION:

This questionnaire is about YOUR beliefs about aging and exercise. We are very interested in your answers whether or not you are physically active. You need no special qualifications to participate as long as you are female and at least 70 years of age.

PURPOSE OF THE PROJECT:

Little research has been undertaken on the views of elderly women toward physical activity in late life. We are interested in inactive, somewhat active and even athletic elderly. Through this study, we hope to demonstrate that the lifestyles of aging women are highly diverse while developing an understanding on the various forces which may explain this diversity.

BENEFITS TO BE DERIVED:

The information you provide will add valuable data to our study on the activity patterns of older women. The findings of the study will assist health educators to better advise women of all ages on the determinants of healthy aging.

PROCEDURE:

Thankyou for taking the time to fill out this questionnaire. It takes about 30 minutes to complete. All information will be coded and kept strictly confidential - your name and address will not be available to anyone. The page which has your name and address will be removed from the questionnaire and filed separately. From that point on, the information on your questionnaire will be identified by a number only.

You may refuse to participate or withdraw from the study anytime. You do not have to answer any questions that are difficult for you - however, it would help us if you would jot down your reason for not answering. The questionnaire is more valuable to us if it is as complete as possible.

RESEARCHERS:

Sandy O'Brien 222-2947 (messages), 228-6270 (office)
Patricia Vertinsky 228-5513 (office)

MAILING ADDRESS:

AGING AND ACTIVITY STUDY
Patricia Vertinsky and Sandy O'Brien
Faculty of Education
U.B.C., Vancouver, B.C.

V6T 1Z5

In order to obtain a summary of the research results, please make sure to PRINT out your name, address and phone number.

NAME _____

ADDRESS _____

_____ POSTAL CODE _____

PHONE _____

SUBJECT CONSENT

I AM WILLING TO PARTICIPATE IN THIS RESEARCH PROJECT AND I HAVE A COPY OF THIS CONSENT FORM.

NAME (Signature) _____

THANK YOU SO MUCH FOR TAKING TIME TO COMPLETE THIS SURVEY.

SANDY O'BRIEN
Department of Adult Education
The University of British Columbia
Phone: 222-2947, 228-6270

For office use only:

Location _____ Date _____ Subject # 518

START HERE:

HEALTH STATUS

Please mark (X) the appropriate answer.

	<u>NO</u>	<u>YES</u>
Has your doctor ever said you have heart trouble?	()	()
Do you frequently have pain in your heart and chest?	()	()
Do you often feel faint or have spells of severe dizziness?	()	()
Has a doctor ever said your blood pressure was too high?	()	()
Is there a good physical reason not mentioned here why you should NOT follow a physical activity program even if you wanted to?	()	()

PLEASE LIST ALL IMPORTANT REASONS:

In general, how would you describe your current state of health?
Place an (X) anywhere on the line.

1 2 3 4
poor fair good excellent

Compared with one year ago, would you say that your health NOW is
() worse? () the same? () better?

In what year were you born? _____

How many medicines are you taking that require a written prescription by your doctor?

- | | |
|-----------|-------------------|
| () None | () Four |
| () One | () Five |
| () Two | () Six |
| () Three | () Seven or more |
-

EDUCATION

What is the highest grade or level of education ever completed?

- () No schooling
 - () Grade 1 to 4
 - () Grade 5 to 8
 - () Some high school
 - () Completed high school
 - () Business or trade school
 - () Some university or college
 - () University of college degree(s)
-

In which country did you complete most of your schooling as a child?

- | | |
|-------------------|-----------------|
| () Canada | () Italy |
| () Britain | () Japan |
| () United States | () China |
| () Germany | () Other _____ |
-

RESOURCES

What is your current marital status?

- married
- common-law partner
- single (never married)
- widowed
- separated/divorced

Which domestic situation best describes your adulthood?

- On my own.
- Homemaker, no children.
- Mother of _____ (number) children.

What kind of work situation best describes you from age 35 to 65? (Pick only one.)

- No paid employment
- Part-time or intermittent full time employment
- Steady full-time employment

What kind of work situation describes you NOW? (Pick only one.)

- No paid employment
- Part-time or intermittent full-time employment
- Steady full-time employment

Do you feel financially secure for the remainder of your life?

- Yes Not sure No

Are you able to handle unexpected expenses with no worry?

- Yes Not sure No

Which of the following financial assistance do you receive?

- None
 - Guaranteed Income Supplement (GIS)
 - Spouse's Allowance/ Widowed Spouse's Allowance.
-

HEALTH DRIVE

Please mark the answer in EACH statement which best describes you:

I don't really care how much longer I live.	Strongly <u>Agree</u> ()	<u>Agree</u> ()	<u>Disagree</u> ()	Strongly <u>Disagree</u> ()
I am motivated to avoid illness any way I possibly can.	Strongly <u>Agree</u> ()	<u>Agree</u> ()	<u>Disagree</u> ()	Strongly <u>Disagree</u> ()
I am trying to live as long as I possibly can.	Strongly <u>Agree</u> ()	<u>Agree</u> ()	<u>Disagree</u> ()	Strongly <u>Disagree</u> ()
I am trying to stay healthy as long as I possibly can.	Strongly <u>Agree</u> ()	<u>Agree</u> ()	<u>Disagree</u> ()	Strongly <u>Disagree</u> ()

PLEASE READ THE FOLLOWING DEFINITION:

PHYSICAL FITNESS ACTIVITY refers to participating in active sports or vigorous exercise long enough to get **SWEATY** at least **TWICE A WEEK**.

HOW WOULD YOU DESCRIBE YOUR PHYSICAL FITNESS ACTIVITY OVER YOUR ENTIRE LIFE COURSE? Please select only ONE:

- () Never been much involved with physical fitness activity.
- () Previously active, but not anymore.
- () Active just recently.
- () Intermittently active.
- () Always been involved in physical fitness activity.

Now we would like to know about your **CHILDHOOD INVOLVEMENT** in physical activity and sport.

1. During my childhood, my family was generally not athletic.

- Strongly agree
 - Somewhat agree
 - Unsure
 - Somewhat disagree
 - Strongly disagree
-

2. As a youngster, I was encouraged by at least one person (parent, teacher, friend) to develop my physical abilities beyond what was normally expected for the average girl.

- Strongly agree
 - Somewhat agree
 - Unsure
 - Somewhat disagree
 - Strongly disagree
-

3. Physical education, exercise and sports at school were enjoyable for me.

- Strongly agree
 - Somewhat agree
 - Unsure
 - Somewhat disagree
 - Strongly disagree
-

4. When I was a child, I had little opportunity to participate in vigorous physical activities during my free time.

- Strongly agree
 - Somewhat agree
 - Unsure
 - Somewhat disagree
 - Strongly disagree
-

What experiences in your youth (age 8 to 18) might help to explain your current level of exercise?

MOVEMENT CONFIDENCE AS A CHILD

INSTRUCTIONS: For each stunt, check the box which best describes you when you were young (about age 8 to 18).

SWINGING BY YOUR KNEES:



HOW SURE ARE YOU THAT YOU COULD HAVE DONE THIS AS A YOUTH?

very sure

pretty sure

not very
sure

I know that
I couldn't

HOW MANY TIMES WOULD YOU HAVE DONE THIS AS A YOUTH?

I have done
this a lot

I have done
this a few times

I tried it
once

I've never
done this

ROPE CLIMB:



HOW SURE ARE YOU THAT YOU COULD HAVE DONE THIS AS A YOUTH?

very sure

pretty sure

not very
sure

I know that
I couldn't

HOW MANY TIMES WOULD YOU HAVE DONE THIS AS A YOUTH?

I have done
this a lot

I have done
this a few times

I tried it
once

I've never
done this

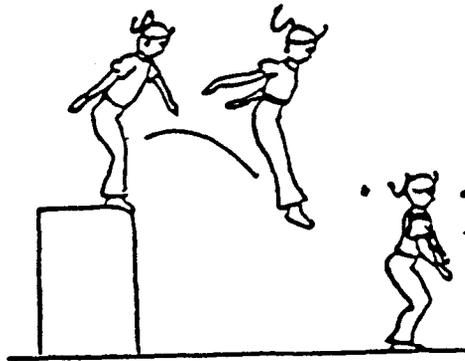
DIVE HEADFIRST INTO DEEP WATER:

HOW SURE ARE YOU THAT YOU COULD HAVE DONE THIS AS A YOUTH?

()	()	()	()
very sure	pretty sure	not very sure	I know that I couldn't

HOW MANY TIMES WOULD YOU HAVE DONE THIS AS A YOUTH?

()	()	()	()
I have done this a lot	I have done this a few times	I tried it once	I've never done this

JUMP AND LAND WITHOUT FALLING FROM YOUR STANDING HEIGHT:

HOW SURE ARE YOU THAT YOU COULD HAVE DONE THIS AS A YOUTH?

()	()	()	()
very sure	pretty sure	not very sure	I know that I couldn't

HOW MANY TIMES WOULD YOU HAVE DONE THIS AS A YOUTH?

()	()	()	()
I have done this a lot	I have done this a few times	I tried it once	I've never done this

DO THE SPLITS:

HOW SURE ARE YOU THAT YOU COULD HAVE DONE THIS AS A YOUTH?

()	()	()	()
very sure	pretty sure	not very sure	I know that I couldn't

HOW MANY TIMES WOULD YOU HAVE DONE THIS AS A YOUTH?

()	()	()	()
I have done this a lot	I have done this a few times	I tried it once	I've never done this

RIDE A TWO WHEEL BICYCLE:

HOW SURE ARE YOU THAT YOU COULD HAVE DONE THIS AS A YOUTH?

()	()	()	()
very sure	pretty sure	not very sure	I know that I couldn't

HOW MANY TIMES WOULD YOU HAVE DONE THIS AS A YOUTH?

()	()	()	()
I have done this a lot	I have done this a few times	I tried it once	I've never done this

Now we'd like to find out about your adult years.

1. When I was 20 to 50, my own family (husband and children) was **not athletic**.

- Strongly agree
 - Somewhat agree
 - Unsure
 - Somewhat disagree
 - Strongly disagree
-

2. Since middle age, I have been encouraged by at least one person to develop or maintain my physical abilities beyond what was normally expected for the average woman.

- Strongly agree
 - Somewhat agree
 - Unsure
 - Somewhat disagree
 - Strongly disagree
-

3. My physician is in favour of me participating in vigorous (sweat-inducing) physical activity.

- Strongly agree
 - Somewhat agree
 - Unsure
 - Somewhat disagree
 - Strongly disagree
-

4. The people I spend most of time with now are **NOT** interested in physical fitness activities.

- Strongly agree
 - Somewhat agree
 - Unsure
 - Somewhat disagree
 - Strongly disagree
-

What experiences in your adult years (age 20 to 70) might help explain your current level of fitness activity?

MOVEMENT CONFIDENCE NOW
Please mark the box which best describes you now.

CURL-UP 10 TIMES:

HOW SURE ARE YOU THAT YOU COULD CAN DO A CURL-UP 10 TIMES?

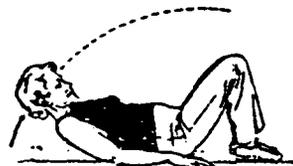
()	()	()	()
very sure	pretty sure	not very sure	I know that I couldn't

HOW MANY TIMES WOULD YOU HAVE DONE IN THE PAST YEAR?

()	()	()	()
I have done this a lot	I have done this a few times	I tried it once	I've never done this

PLEASE RATE THE EXERTION YOU WOULD FEEL IN DOING THE CURL-UP 10 TIMES. (Circle a number between 6 and 20).

- 6
- 7 very, very light
- 8
- 9 very light
- 10
- 11 fairly light
- 12
- 13 somewhat hard
- 14
- 15 hard
- 16
- 17 very hard
- 18
- 19 very, very hard
- 20



PLEASE RATE THE POSSIBLE RISK TO YOUR HEALTH OF DOING THE CURLUP 10 TIMES.

1 2 3 4 5
low risk moderate risk high risk

The major risk for me would be _____

PLEASE RATE THE POSSIBLE BENEFIT TO YOUR HEALTH OF DOING THE CURLUP 10 TIMES:

1 2 3 4 5
low benefit moderate benefit high benefit

The major benefit for me would be _____

PERCEIVED WELL-BEING SCALE
PLEASE MARK (X) ON THE APPROPRIATE ANSWER.

1. I don't have many physical complaints.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

2. No one really cares whether I am dead or alive.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

3. I don't think that I have a heart condition.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

4. I have a good appetite for food.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

5. I am often bored.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

6. I have aches and pains.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

7. It is exciting to be alive.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

8. Sometimes I wish that I would never wake up.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

9. I am in good shape physically.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

10. I feel that life is worth living.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

11. I think that my health is deteriorating.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

12. I don't seem to care about what happens to me.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

13. I don't get tired very easily.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

14. I can stand a fair amount of physical strain.
 strongly agree agree partially agree unsure partially disagree disagree strongly disagree

HLC SCALE

PLEASE MARK (X) ON THE ANSWER BEST DESCRIBING HOW YOU FEEL ABOUT YOUR HEALTH.

1. If I take good care of myself, I can avoid illness.

<input type="checkbox"/>					
strongly agree	agree	partially agree	partially disagree	disagree	strongly disagree

2. Whenever I get sick it is because of something I've done or not done.

<input type="checkbox"/>					
strongly agree	agree	partially agree	partially disagree	disagree	strongly disagree

3. Good health is largely a matter of good fortune.

<input type="checkbox"/>					
strongly agree	agree	partially agree	partially disagree	disagree	strongly disagree

4. No matter what I do, if I am going to get sick I will get sick.

<input type="checkbox"/>					
strongly agree	agree	partially agree	partially disagree	disagree	strongly disagree

5. Most people do not realize the extent to which their illnesses are controlled by accidental happenings.

<input type="checkbox"/>					
strongly agree	agree	partially agree	partially disagree	disagree	strongly disagree

6. I can only do what my doctor tells me to do.

<input type="checkbox"/>					
strongly agree	agree	partially agree	partially disagree	disagree	strongly disagree

7. There are so many strange diseases around that you can never know how or when you might pick one up.

<input type="checkbox"/>					
strongly agree	agree	partially agree	partially disagree	disagree	strongly disagree

8. When I feel ill, I know it is because I have not been getting the proper exercise or eating right.

<input type="checkbox"/>					
strongly agree	agree	partially agree	partially disagree	disagree	strongly disagree

9. People who never get sick are just plain lucky.

<input type="checkbox"/>					
strongly agree	agree	partially agree	partially disagree	disagree	strongly disagree

10. People's ill health results from their own carelessness.

<input type="checkbox"/>					
strongly agree	agree	partially agree	partially disagree	disagree	strongly disagree

11. I am directly responsible for my health.

<input type="checkbox"/>					
strongly agree	agree	partially agree	partially disagree	disagree	strongly disagree

APPENDIX B

Confirmation of the Ethics Review Committee

REQUEST FOR ETHICAL REVIEW

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1 Principal Investigator (or faculty advisor) Sandra O'Brien	3 UBC Department Interdepartmental/ Adult/Physical Educ.	4 Phone Number 228-6235 228-6270
2 Student or Co-Investigator(s) Patricia Vertinsky	5 Granting Agency TBA	6 Project period Jan. 1990 - June '91
Indicate the institution(s) at which the research will be carried out: UBC Campus { } CCABC { } Childrens { } Grace { } Univ-Shaugh { } SPH { } Univ-UBC { } VGH { } Other: <u>Seniors Programs</u>		
7 Title of Project <u>The Social Forces and Life Course Determinants of Physical Activity in Elderly Women</u>		

ALL INFORMATION REQUESTED IN THIS FORM MUST BE TYPEWRITTEN IN THE SPACE PROVIDED.

***NOTE: IF THE PROJECT IS LIMITED TO ONE OF THE FOLLOWING, PLEASE CHECK THE APPROPRIATE BOX AND COMPLETE AND SUBMIT ONLY PAGES 1 AND 2 OF THIS FORM:

- () observation without intervention. (i.e. no tests, interviews or questionnaires)
- () interviews of professional colleagues in the fields of law or business (not Education) in which no invasion of an individual's personal privacy or possible jeopardy of employment status is involved. (Summarize interview/questionnaire content in item #12 or attach a copy)
- () UBC course or programme evaluation
- () modification of existing approved protocol # _____ : indicate changes only and submit copies of any revised attachments. Also please attach a copy of the existing protocol.

8 Summary of purpose and objectives of project (Must be typewritten in this space)

It is the purpose of this study to examine the social determinants and current health beliefs of elderly women who differ in late life physical activity. Highly active women are become evident in communities and yet the majority of elderly women are choosing a sedentary lifestyle that has been condemned by health agencies and exercise scientists as a path to frailty and decrepitude well before the end of life. This relatively poor exercise participation rate by older women, combined with the fact that women are the most poorly studied and longest living gender suggests that this population must be further studied.

Currently little is known about the perceptions held by older women concerning the risks or benefits to their health of participating in vigorous exercise in late life. More specifically, it is important to investigate how their motives and attitudes toward utilizing physical activity as a health protection resource may be shaped by life course socialization, opportunities and perceived physical competency as mediated by psychological considerations such as outcome expectations (risk/benefit analysis), health locus of control, physical efficacy and perceived social norms. By controlling for factors such as health status, education, economic status and cultural upbringing, this research will test the hypothesis that physical skill competency developed in earlier life stages, combined with social support over the life course, and current opportunities for exercise are the most important social determinants of late life exercise in women. It is further hypothesized that women who perceive exercise to be high risk, and low benefit, who perceive an external locus of control as well as low personal efficacy are more likely to avoid late life exercise.

SIGNATURES

9 Principal Investigator (or faculty advisor)	10 Student or Co-Investigator(s) (if applicable)	11 UBC Department Head or Dean
_____	_____	_____
_____	_____	_____
Date	Date	Date

The University of British Columbia
Office of Research Services

B90-106

BEHAVIOURAL SCIENCES SCREENING COMMITTEE FOR RESEARCH
AND OTHER STUDIES INVOLVING HUMAN SUBJECTS

C E R T I F I C A T E o f A P P R O V A L

INVESTIGATOR: Vertinsky, P.
UBC DEPT: Phys Ed & Recreation
INSTITUTION: Wellness program sites, activity centres
TITLE: The social forces and life course
determinants of physical activity in
elderly women (Phase I)
NUMBER: B90-106
CO-INVEST: O'Brien, S.
APPROVED: **SEP 17 1990**

The protocol describing the above-named project has been reviewed by the Committee and the experimental procedures were found to be acceptable on ethical grounds for research involving human subjects.

Dr. R.G.C. Johnston, Chairman
Behavioural Sciences
Screening Committee

Dr. R.D. Spatley
Director, Research Services

THIS CERTIFICATE OF APPROVAL IS VALID FOR THREE YEARS
FROM THE ABOVE APPROVAL DATE PROVIDED THERE IS NO
CHANGE IN THE EXPERIMENTAL PROCEDURES

Sep 18, 1990
B90-106

The University of British Columbia
Office of Research Services

BEHAVIOURAL SCIENCES SCREENING COMMITTEE FOR RESEARCH
AND OTHER STUDIES INVOLVING HUMAN SUBJECTS

MEMO TO: Vertinsky, P.
Phys Ed & Recreation

TITLE: The social forces and life course
determinants of physical activity in elderly
women (Phase I)

NUMBER: B90-106

CO-INVEST: O'Brien, S.

AGENCY: None

The Committee has reviewed the protocol for your proposed study and has issued a Certificate of Approval with the understanding that evidence that the following requirements have been satisfied will be supplied to the Office of Research Services before commencement of research:

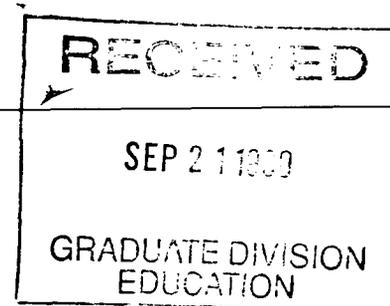
Please submit copies of agency approvals when received.

If you have any questions regarding these requirements, please call Shirley Thompson at 224-8584.

Richard D. Spratley
Director, Research Services

PLEASE SEND ALL CORRESPONDENCE TO RESEARCH SERVICES, UBC

enc.



APPENDIX C
Agency Approval Forms

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October 1, 1990

TO:

From: Dr. Patricia Vertinsky and Sandy O'Brien (M.P.E.)
 AGING AND ACTIVITY SURVEY
 Faculty of Education, 5th Floor, Scarfe Bldg.,
 The University of British Columbia,
 Vancouver, B.C.
 V6T 1Z5

RE: Aging and Activity Survey for Women Over Age 70

We are conducting a survey involving up to 600 women born before 1921 in the Central Vancouver area. The importance and objectives of this research are described on the attached page.

Over twenty agencies, programs and residences have been randomly selected from all those in the city for participation in the study. Among those selected is your program. We are hoping that 10 to 20 women in your program/facility/residence would be willing to spend about 30 minutes filling out the questionnaire.

We would appreciate your endorsement and support for this project. For example there may be a contact person who could help us to arrange to meet with a group or groups of women at, or prior to, their normal program times. The procedure would require that we bring the questionnaires to your site at an appointed time and supervise the women filling them out.

If you need more information, please call Sandy O'Brien at 288-6270 or 222-2947 (messages). Thankyou so much for your consideration and time.

I approve of the Aging and Activity Survey being conducted in this program/facility acknowledging that individual women will choose for themselves whether or not to participate.

Signature _____

Position _____

Facility/Program _____ Phone _____

(Please use the self-addressed stamped envelope we have enclosed).

TO: U.B.C. Students participating in the Aging and Activity Survey

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FROM: Sandy O'Brien, Adult Education (222-2947)

Thankyou for showing interest in this project. Please read this page to insure that the questionnaire is filled out as fully as possible.

INSTRUCTIONS FOR ADMINISTRATION OF THE QUESTIONNAIRE

1. Any woman at least 70 years of age is eligible to participate. You may do more than one questionnaire if you you wish.
2. The questionnaire must be completed as fully as possible. We are trying to find out why some women are doing vigorous activities while many others are quite inactive. We are looking at girlhood experiences along with current perceptions of risk and benefit. However many women are quite sedentary or frail and feel that they are of no use to the study. Quite the contrary - these are the very women we need to be spending time with in order to understand the determinants of decreasing activity patterns as people age. It could be poor health, heightened perceptions of risk and over-exertion, disabilities, lack of social support, inexperience and so on...among many others. This is what we are trying to find out!! (We are trying to find out women are NOT doing and why). Therefore everyone's opinion and story is of value to the study because it lends strength to our ability to find statistical trends.
3. You should find it interesting to orally ask the questions. You will get much more information that you think you need, but we'd appreciate it if you would make legible notes right on the questionnaire and "quote" the woman when possible. Students that have given the questionnaire orally have learned a great deal about the subject and the historical time frame in which the woman grew up.
4. Subjects who wish to remain anonymous can do so, but if they would like the findings of the study to be mailed to them we would need their address. All files are secured and addresses are separated from the actual questionnaires. No one other than myself has access to the mailing list.
5. Please return your questionnaire at the agreed upon time for EDUC. 508. I will collect the questionnaires on ~~Thursday's class~~ ~~February~~ Mar. 1/91. Failing that you can drop the questionnaire off at the Graduate Programs and Research Office c/o Dr. Patricia Vertinsky, 5th floor Scarfe Bldg., South Wing, east end.
6. If you would like to receive a copy of the findings of the study, please send along this sheet with your address. Thanks again for assisting with this project!

NAME _____ ADDRESS _____

CITY _____ POSTAL CODE _____

APPENDIX D
Subjects Letters and Comments

From: Pat

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I have not yet started answering the questionnaire, but I have read it totally twice, and portions of it several times.

Before I start I want to explain why my answers will often appear contradictory. I am now 71. At age 65 I had a severe heart attack (myocardial infarction). Because my only two brothers died of heart attacks before age 50 I consider my sudden and unwarned heart attack to be hereditary more than activity-related. I have no angina, and have not required heart medication for the past three years, but damage to the heart muscles limits "sweat-making" activities.

Also, and probably similarly hereditary, I have arthritis, affecting me mostly in the feet.

I would like to comment on the purpose of this project, which seems to be to find out how the lifestyle of the participants affects their present degree of activity.

I was already in my fifties when "exercise" came into fashion with Trudeau's jogging and the 60-year-old Swede. I had grown up with my mother's dictum. When she felt poorly she used to say: "There's nothing wrong with me that a good day's work won't cure." She died at 84 from the effects of a car accident.

"Exercise" was more often a verb than a noun. You exercised your mind or exercised your muscles. Race horses were exercised. Men and boys exercised to give them macho muscles, not good health.

Humans "felt better" if they got "lots of fresh air". Activities like tennis and walking were "good for you".

The Depression in the 30's was a great deal responsible for my physical activity. I lived on a farm, and digging, lifting, packing wood, hanging up the clothes, etc., were part of the life. I cycled a lot because it was the only way of getting about.

The Depression was also responsible for an activity that thousands and thousands of B.C. youth took part in: PRO-REC. The B.C. government provided mats, springboards, 'horses', and other athletic equipment for every small village. A trained instructor travelled to each village weekly. Teams by age and sex travelled to bigger centres to compete. I was an active participant.

...2

-2-

Lastly, I would be pleased to receive a copy of the findings of this study. I would be particularly interested in knowing -- if the data are included in the study -- the percentage of women in extended-care homes who lived physically active lives. That is, if you live a slow life, are you likely to then die a slow death?

I hope that when I have deteriorated so much that it is necessary for me to enter an extended-care hospital there will be no opprobrium or legal hassle involved in taking 'end-it-all' pills.

infamy, disgrace

With best wishes for your success in this project,



IN A GOOD MANY SMALL TOWNS, SUCH AS THE ONE IN WHICH I WENT TO SCHOOL, THERE WAS NO SUCH THING AS ORGANIZED SPORTS - LET ALONE A GYM.

AND I DOUBT IF MANY, OTHER THAN CITY SCHOOLS, WERE ANY BETTER, CERTAINLY DURING THE 20 - 30'S AND PROBABLY LATER.

BECAUSE OF THIS IT WAS A BIT DIFFICULT FOR ME TO PROPERLY FILL IN SOME OF THE QUESTIONS. I WAS ALWAYS RUNNING OR WALKING SOMEWHERE AND SKATING EVERY WINTER, WITH HOCKEY WHEN I WAS IN HIGH SCHOOL. WE PLAYED A BIT OF BASEBALL AT SCHOOL BUT THE BOYS HAD TO SUPPLY THEIR OWN EQUIPMENT, THOUGH I THINK THE SCHOOL BROKE DOWN AND BOUGHT THE GIRLS A SOFT BALL - SUCH AN EXPENDITURE!

SKATING AND HOCKEY HAD NOTHING TO DO WITH THE SCHOOL AND I DON'T THINK THE TEACHERS WERE ATHLETICALLY INCLINED SINCE THEY DIDN'T ENCOURAGE ANY SORT OF GAMES.

NOR DID I HAVE A BIKE THOUGH TRIED SOMETIMES FOR VERY SHORT PERIODS TO RIDE SOMEONE ELSE'S.

WHILE LIVING IN FIELD (AFTER MARRYING) I USED TO CURL FOR ABOUT 8 YEARS BUT DID NONE WHEN I RETURNED TO VANCOUVER. LACK OF MONEY AND TIME WERE THE REASONS FOR THAT.

BEING DIVORCED IN THE MID 50'S I MADE MY OWN WAY WITH 3 DEPENDENTS.. SO HAD NO TIME OR MONEY TO ENGAGE IN ANY SORT OF ATHLETIC ACTIVITY EXCEPT WALKING (AND DID A LOT OF THAT).

CHEERS AND ALL SUCCESS TO YOUR EFFORTS.

We did not have P. E. in high school.
Grass hockey, basketbass & preparation
for high school sports, all after school.
In all of these I was an also run.

But I was in the choir, orchestra,
& a marching band. And now, as a
senior, I am in a choir and vary
from participating in from 1 to 3
hand bell groups.

But I keep active & busy doing
what I enjoy.

Sorry, much of your list did
not apply to me. V. H.

Sandy -

Sorry, but I find
the questionnaire a little
more personal than
I care to complete.

Again, my regrets



JUST A SHORT ADDENDUM

I worked in Community Recreation from time I was 26 until I was about 48, played a lot of tennis, badminton and golf as well.

After seven years at U.B.C. I became a college teacher, but continued to play some badminton, squash and golf -

In July Of 1989 I started to teach GOLF to Seniors out of Dunbar Centre, then as well out of Kerrisdale -later out of Riley and Champlain heights centres, once a week at each Centre, through fall spring and summer -as of November 2nd, 1990 I have now taught twelve classes of seniors - total about 165 persons-I all were motivated learners and are doing well. We hope to start the Seniors golf lessons again, out of Kerrisdale and Riley centres about mid-February, 1991.

Thank you for reading my little story. To my knowledge, I DO NOT BELIEVE THAT THERE IS ANOTHER 70year old woman teaching golf in B.C. maybe Canada!

Dear Sandy:

I really don't consider myself a very good subject for your survey.

Since having my total hip replacement, my activities seem to be curtailed quite drastically. My husband, who is nine years older than me, has been ailing for many years and as time goes by, my time seems to be taken up with his care. When I get a few minutes for myself, I am just too tired to exercise, except for my bike and some walking.

Most of my friends are widows, so their time is their own, thus they are free to participate in everything and do very well.

We have recently returned from a conducted tour of the 23 districts, provinces. However on the fourth day out, my hubby collapsed and was hospitalized in Lubricton, N.B. for ten days. Since returning home, I have developed a myriad as a result of extreme stress. I am somewhat limited in my exercise until things stabilize.

I am not sure what this survey entails further so feel maybe I should withdraw. I have completed this as well as possible.

Circumstances certainly affect your personal involvement unless you have a spouse or partner who is also interested.

Yours truly ~

Dotis

Chalmers Lodge

Age 86.

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My personal opinion —

I have been in this 'home' for only one year. I have been shocked by the number of women who just 'sit.'

There are arrangements for drives & rides but never for walks —

Exercises mostly for upper extremities sitting in chairs —

The food is well balanced, cooked, chosen suitable & varied — no one can or should complain — but after each meal most just sit. There is a large activity room in the basement but many have never even seen it — elevator is available, easy access good lighting.

My personal wish — that we might be encouraged to utilize any work habits — garden knowledge we developed before coming here — take a pride in the results, provide plants & seeds even if we developed a hodge podge! One has a guilty feeling just picking off a dead flower. Maybe next year I'll get courage —

Additional Comments:

I grew up in a prairie city during the Great Depression, a time when cars were scarce & street car and bus service was very limited. People who had cars didn't drive them in the winter - usually because there were so few heated garages and no "plug-in" spaces. But even in the warm months cars were rarely used to drive kids to school & activities. Consequently we all walked a great deal & usually at a brisk pace or a run:

eg: (1) to & from school - 2-4 miles

- Daily
- (2) to & from church & Sunday school 2-4 miles every Sunday.
 - (3) Church activities - choir practise, Girl Guides, A.Y.P.A. - several miles a week.
 - (4) to & from swimming pool several times a week in July & Aug. Round trip 3 miles.

(5) Jot from Library once a week (no branch libraries then) - Round trip 3 miles.)

Also we skated a lot in the winter. The school was flooded & banked with snow - free skating after school - after with 2nd hand skates that went the rounds.

A grade 4 teacher ran a free dancing class at our school once week - after school. It was great exercise & great fun.

Even as a nursing student at a hospital 2 miles from my home I walked to & from at least once a week.

I trust these comments will be useful to your work.

Sincerely,

I am very involved in Volunteer work which limits my leisure time.

I hope to participate in more active pursuits shortly, particularly walking as this is one of my favorite occupations.

APPENDIX E

Post-Hoc Analyses: Missing Data

Post-Hoc Analyses: Missing Data

It was of interest to understand if women who had missing data in their questionnaires were different from women who had fully completed the survey. Analysis of variance using T-tests between the two groups (missing data group, or MD group, and the complete data group, or CD group) revealed that there were some significant differences. The means and standard deviations are seen in Table E.

The MD group were exercising at about 60% of the weekly kilocalorie expenditure of the CD group - a difference that was highly significant ($T = 3.211$; $df=311$, $p<.001$). The MD group also had fewer children ($T = 2.211$; $df=321$, $p<.03$) and were older ($T = -2.366$; $df=316$, $p<.02$). Women with missing data also rated their health slightly lower than the CD group ($T = 1.699$, $df=322$, $p<.09$) but were not different on the number of prescription medications they were taking nor on the symptoms list of the PARQ.

Of interest to this study was the finding that women who had left out questions were most different on the efficacy questions, especially the variable childhood movement confidence ($T = 4.694$; $df = 320$, $p<.0001$). The MD group reported significantly lower levels of childhood movement confidence, as well as less adult exercise efficacy ($T = 3.484$, $df=291$, $p<.001$), less adult social support to exercise ($T = 3.510$; $df=316$, $p<.001$) and significantly more perceived risks with exercise ($T = -2.554$; $df=178$, $p<.01$).

The missing data group was not different from the Complete data group on the Composite SES indicator, Education, Marital status, Work role, recalled Childhood Social Support, Motive to live a long and healthy life, and Health Locus of Control. This suggests that the MD group may have been

sensitive to the heavy emphasis on exercise efficacy, particularly if they recalled unhappy times with childhood sport and physical skill, if they currently did not feel well, or if they felt too old to be bothered filling out a questionnaire about exercise patterns. Should these women have fully completed the survey, it is likely that the regression analysis would have been even more powerful in finding efficacy, social support, age and health to be significant explanations of late life exercise.

Table E.

Comparison of the Missing Data Group with the Complete Data Group

	Number of Subjects*	Missing Group Means	Missing Group S.D.	Complete Data Group Means	Complete Data Group S.D.
ENERGY (kcal)	177/136	1210.8	1054.9	1716.9	1717.2
AGE (years)	179/139	77.3	5.8	75.9	4.9
EDUCATION **	185/139	0.686	0.465	0.748	0.436
MARITAL **	188/139	0.250	0.434	0.317	0.467
CHILDREN (#)	184/139	1.74	1.62	2.21	2.20
WORK ROLE **	181/139	0.729	0.446	0.763	0.427
SES (SECURE)**	187/139	0.690	0.464	0.763	0.458
RATED HEALTH	186/138	3.05	0.553	3.15	0.503
MEDICATIONS (#)	186/139	1.53	1.61	1.44	1.43
SYMPTOMS (#)	186/139	1.05	1.23	0.971	1.01
CHILD SOCIAL SUPPORT	180/139	-0.079	1.02	0.102	0.964
CHILD MOVEMENT CONFIDENCE	183/139	-0.221	0.984	0.291	0.948
MOTIVE**	187/139	0.594	0.492	0.604	0.491
ADULT EXERCISE EFFICACY	154/139	-0.190	0.982	0.210	0.981
ADULT SOCIAL SUPPORT	179/139	-0.170	0.958	0.220	1.01
PERCEIVED RISKS	41/139	0.345	1.11	-0.102	0.947
PERCEIVED BENEFITS	14/139	-0.137	1.03	0.014	0.999
LOCUS OF CONTROL	176/139	-0.069	1.03	0.087	0.963

* This represents the number of subjects counted in each group for this particular variable.

** This represents a dummy coded variable.

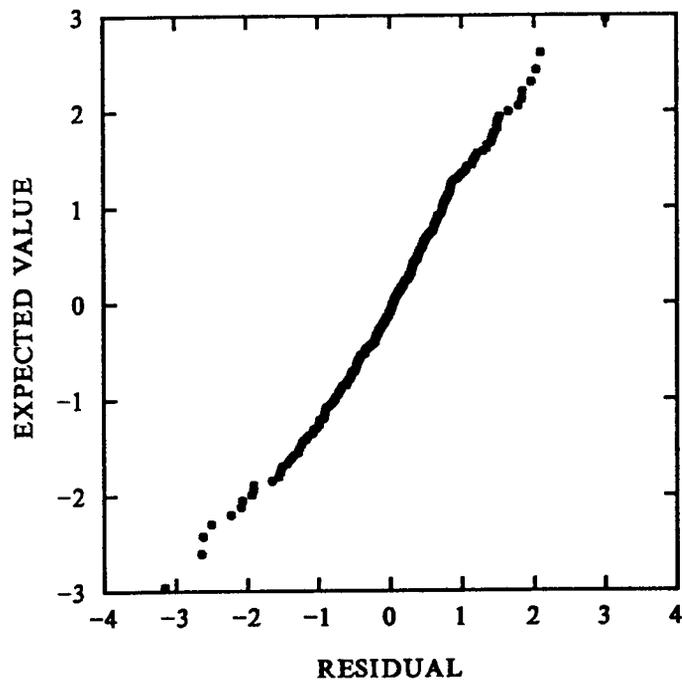
APPENDIX F
Residual Error



Ordinary Least Squares uses the squared residuals to estimate the regression line. These residuals are the errors of the estimate from real scores or the differences between the observed and predicted values of the dependent variable. If the errors are normally distributed, the residuals should fall approximately on a diagonal straight line. Figure F shows a normal probability plot of the residuals .

Figure F

Probability Plot of Residual Error



APPENDIX G

The Measurement of Physical Activity: The Outcome Variable



The Measurement of Physical Activity: The Outcome Variable

The outcome variable in this study is the self-reported amount of leisure-time exercise reported by an individual in the past seven days. Contemporary research emphasizes leisure-time physical activity or the expenditure of energy apart from work activity. Occupational activity is receiving little attention by researchers because almost all occupational activity has been replaced with labor-saving technology (Yasin, Alderson, Marr, Pattison, & Morris, 1967).

Self-report has become the measure of choice by epidemiologists and health educators because a researcher can acquire a vast amount of information about physical activity patterns with relatively little inconvenience to subjects, and with little time and expense (Baranowski, 1988; Godin, Jobin, & Bouillon, 1986). More detailed surveys about activity patterns are not thought to create more accurate data (Buskirk, Harris, Mendez, & Skinner, 1971; Reiff, Montoye, Remington, Napier, Metzner, & Epstein, 1964). The appeal for uniformity and brevity among assessment instruments (Wilson, Paffenbarger, Morris & Havlik, 1986) suggests that the seven-day recall may provide the best combination of brevity and detail.

In the next section, I summarize the evidence that self-report measures about exercise have demonstrated adequate reliability and validity. Construct validity of self-reported exercise is discussed in relation to health and fitness.

Reliability of Self-Reported Exercise

In general, the reliability of self-reported exercise status is quite good in adults of all ages (over .70) especially if the exercise is intense (LaPorte et. al., 1985, 1983) or sweat-inducing (Kohl, Blair, Paffenbarger, Macera, &

Kronengfeld, 1988).

Baecke, Burema and Frijters (1982) factor analyzed 29 items about habitual physical activity on a young, adult, Dutch population. Thirteen items were retained in three indices of physical activity: a work index, a sport index, and a leisure-time activity index. The three month test-retest reliabilities for these indices were $r = .80$, $.90$ and $.74$ respectively.

A two week test-retest reliability study on 163 males and 143 females aged 18 to 65 years was conducted by Godin and Shephard (1985). A simple two part leisure-time questionnaire asked the following self-report information:

1. Considering a 7-day period (a week), how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time? (Write in each circle the appropriate number).

- a) Strenuous Exercise (Heart beats rapidly) ()
- b) Moderate Exercise (Not exhausting) ()
- c) Mild Exercise (Minimal Effort) ()

2. Considering a 7-day period (a week), during your leisure-time, how often do you engage in any regular activity long enough to work up a sweat? (Heart beats rapidly). Often (), Sometimes (), Never/Rarely (). (Godin & Shephard, 1985, p. 146)

Two week test-retest reliability coefficients were respectively 0.94, 0.46, 0.48, and 0.80 for self-reports of strenuous, moderate, light, and sweat-inducing exercise.

Cauley, LaPorte, Black Sandler, Schramm and Kriska (1987) compared five methods of assessing physical activity in 255 white post-menopausal women: 1) the Paffenbarger survey estimating kilocalories; 2) a modified Paffenbarger survey focused only on sports; 3) the LSI or Large-Scale Integrated Activity Monitor, an electronic recorder with a mercury sensor for movement; 4) the Baeke survey developed in the Netherlands to assess occupational and leisure-time activity; and 5) caloric intake from food records. Large intraindividual variation was found in day-to-day caloric assessments and in the body movements counted by the

LSI Activity Monitor. The modified Paffenbarger (sport-assessment) index failed, since only one-third of the women had any sport activity to report. The Baeke Leisure-time Index was predictive of number of blocks walked. The best assessment tool was Paffenbarger's composite Physical Activity Index estimating weekly kilocalories with a reliability coefficient of .73 four weeks later, and .73 one year later.

A measure of caloric expenditure based on the type and duration of activities in the past week was designed by Paffenbarger, Wing & Hyde (1978) to assess exercise levels in male college alumni. This instrument was used with 59 older women aged 45 to 74 (mean = 61.1) in two trials one year apart (LaPorte, Black-Sandler, Cauley, Link, Bayles & Marks, 1983). The 1-year test-retest reliability was $r = .73$ ($p < .05$). Other relationships were of interest; estimated kilocalories correlated with blocks walked ($r = .42$, $p < .05$), stairs climbed ($r = .54$, $p < .05$) and sweat episodes per week ($r = .46$, $p < .05$).

Sallis, Haskell, Wood, Fortmann, Rogers, Blair & Paffenbarger, Jr. (1985) reported test-retest data on 2,126 men and women, aged 20 to 74. The correlation between the two weekly reports of the number of vigorous activities was .83 ($p < 0.0001$). For moderate activities, the correlation was $r = 0.75$ ($p < 0.0001$).

A lifestyle assessment tool administered by a microcomputer examined reliability of reporting among 117 outpatients 18 to 80 years of age with a mean age of 37 years (Skinner, Palmer, Sanchez-Craig & McIntosh, 1987). Physical exercise in reported days per week was 2.5 days at Time 1 and 2.6 days at Time 2 ($r = .82$).

In a study by Gross, Sallis, Buono, Roby and Nelson (1990), twenty-one trained interviewers demonstrated test-retest reliability with a seven-day recall instrument on separate occasions of .99; inter-rater reliability of the same

individual on the same day was .86. Gross and colleagues concluded that novice individuals can be taught to reliably conduct and score the Seven-Day Physical Activity Recall Interview (Gross et al., 1990).

Validity of Self-Reported Exercise

A measuring tool should have predictive validity, concurrent validity and construct validity if it is to serve a variety of measurement purposes (Chen, Calderone & Pellarin, 1987). Criterion or predictive validity is the degree to which the measuring instrument can predict a criterion. Concurrent validity is the degree to which two or more comparable measuring instruments agree in measuring the same underlying concept. Construct validity is the degree to which the results of the measurement support hypothesized relationships or differences in individuals or groups.

Lack of detailed information on exercise habits is, ironically, partially a result of the large number of positive outcomes from early studies that used only gross estimates of exercise status (Sallis et al., 1985). Despite the simple activity measures used in large epidemiology studies, strong relationships are still obtained in explaining general health, specific disease, mortality rate and fitness performance. Thus there appears to be support for criterion or predictive validity of self-reported exercise status. A wide variety of studies have acknowledged, and even apologized for, the crudeness of their physical activity measures. Nevertheless, research is unhindered in finding significant relationships of self-reported physical activity: with caloric intake (Alderson & Yasin, 1966), with smaller body fat skinfolds (Epstein, Wing & Thompson, 1978); with aerobic fitness (Godin & Shephard, 1985; Haskell, 1984; Horowitz, Blackburn, Edington & Berlin, 1987), with daily activity diaries (Taylor, Coffey, Berra,

Iafaldano, Casey & Haskell, 1984); with self-motivation to persevere (Dishman & Ickes, 1981); with heart attack risk (Paffenbarger & Hale, 1975; Paffenbarger, Wing & Hyde, 1978); with improved levels of HDL blood cholesterol (Haskell et al., 1980); with physical health status (Belloc & Breslow, 1972); and with longevity (Paffenbarger, Hyde, Wing & Hsied, 1986; Powell, Thompson, & Casperson, 1987). Regrettably, most of the support for predictive validity has been achieved in studies on white, middle-aged men.

Few concurrent validity studies have been reported. Paffenbarger's Composite Physical Activity Index also demonstrated concurrent validity with the L.S.I. electronic monitor (movement activated mercury sensor) of .33 ($p < .01$) (Cauley et al., 1987). LaPorte, Black-Sandler, Cauley, Lind, Bayles and Marks (1983) compared the LSI Activity Monitor and the seven-day recall survey of Paffenbarger, Wing and Hyde (1978) in assessing the physical activity of older women. After finding concurrent validity of $r = .23$ they report,

The LSI activity monitoring and Paffenbarger survey were both effective, reliable measures of physical activity. However, they appeared to measure somewhat different aspects of physical activity. The LSI measured physical activity associated with movement, whereas the surveys measured the intensity component of energy expenditure. The research indicated that it is important to evaluate the characteristics of the activity of interest in order to select a physical activity tool for assessing activity patterns in older women. (LaPorte, Black-Sandler, Cauley, Lind, Bayles & Marks, 1983, p.394)

Self-Reported Exercise and Construct Validity

Baranowski (1988) recently reviewed prominent epidemiological studies which assessed self-reported physical activity. He made four conclusions:

First, the same instrument, when applied to the same group of people, asking for patterns in habitual activity, have reasonably high reliability coefficients.

Second, the same instruments when applied to the same group of people, ~~asking for recall of specific events, but not covering an overlapping time period~~ have modest correlations.

Third, when two different instruments are applied to the same group of people, at the same time, the correlations are modest to nonexistent. In this case, the instruments are obviously measuring different phenomenon. The extent of error here also is unclear.

Finally, the correlation with external criteria are modest to nonexistent. When statistically significant correlations are obtained, this is evidence for validity. Since the measures are supposed to be measures of differing phenomena, and links between measures are primarily theoretical, it is impossible to say how high these coefficients should be. (Baronowski, 1988, p.318)

Recent studies have succeeded in demonstrating significant relationships between self-reported physical activity and epidemiological variables with quite simple questions. For example, the question "Do you regularly engage in strenuous exercise or hard physical labor?", was a better predictor of HDL cholesterol in the blood than was direct fitness measurement on the treadmill (Haskell, Taylor, Wood, Schrott & Heiss, 1980).

With the question, "Considering a 7-day period (a week), during your leisure-time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?", Godin and Shephard (1985) obtained correlations of $r = .35$ with aerobic fitness (VO_2 max).

Despite these crude and varied tools, a relatively consistent pattern has been shown between increased physical activity and reduced risk of coronary heart disease, osteoporosis, and noninsulin-dependent diabetes. (Laporte, Montoye, & Casperson, 1985, p.143)

Even simple self-ranking into categories of "little or no physical activity", "occasional physical activity" and "regular physical activity at least three times per week" have been found to predict percent body fat (exercisers = 20.9% versus nonexercisers = 27.6%, $p < .0001$) and aerobic fitness (exercisers = VO_2 max of 41.3 ml/kg/min versus nonexercisers = VO_2 max of 30.9 ml/kg/min., $p < .0001$) (Horowitz, Blackburn, Edington & Berlin, 1987).

Sallis and colleagues (1985) assessed vigorous activities by asking

subjects, "For at least the last three months, which of the following activities have you performed regularly?" Subjects then chose up to five of the categories for a score of 0 to 5. In women, physical activity was significantly related to high education ($r = 0.141$, $p < .0001$); managerial occupation ($r = 0.112$, $p < .002$); and nonmarried status ($r = 0.140$, $p < .0004$) (Sallis, Haskell, Wood, Fortmann, Rogers, Blair, & Paffenbarger, 1985).

LaPorte, Kuller, Kupfer, McPartland, Matthews and Casperson (1979) obtained a correlation of $r = .69$ between trunk movements as recorded on the motor activity monitor and energy expenditure over two days.

Siconolfi, Laseter, Snow & Carleton (1985) have noted the obvious face validity of Paffenbarger's Physical Activity Index Questionnaire, assessing frequency of sports and recreational activity, city blocks walked and flights of stairs climbed. Using the PAI index for a sample of male college alumni data, and expressing activity involvement in kilocalories per week, Paffenbarger et al. (1978) found inverse gradient patterns of first-time heart attack risk and adult exercise patterns. Finding this relationship provided criterion validity for Paffenbarger's instrument.

Criticisms of Physical Activity Assessment

Washburn and Montoye (1986) note that "adequate validation of physical activity questionnaires has not been done because of the difficulty in obtaining an acceptable criterion measure" (p.573). Consequently there have been equivocal results in successfully demonstrating the reliability and validity of the seven-day recall inventory. Researchers are warned, therefore, that there are variations between studies in measuring subject characteristics, the definition of physical activity, and most seriously, the wording, design, and types of

criterion measured in the seven-day recall inventory.

Such variation in the seven-day recall instrument has undermined the demonstrated validity of this instrument in at least one study. Kohl, Blair, Paffenbarger, Jr., Macera & Kronenfeld (1988) set out to validate self-reported physical activity (seven-day recall) in a mail survey with an objective measure of physical fitness (maximal treadmill test). While their research paper claimed that the seven-day activity recall method of assessment "appeared to be ineffective in measuring exercise behavior in this mail survey" (p.1237), a number of problems appeared to have undermined the statistical relationship between reported activity level and physical fitness.

First, physical fitness was assessed over a four month period, while activity level was assessed over seven days. This differential time frame reference may explain the lack of association. Second, both measures are admittedly imperfect, and each add a significant amount of non-identified error. Third, a strong genetic component is known to be involved in the individual performance of aerobic fitness (Dishman & Ickes, 1981). Fourth, individuals vary on the intensity of their weekly exercise - some exercise intensively for short periods, while others may exercise at low to moderate levels for several hours per week. The latter group may not be exercising intensively enough to elevate their aerobic fitness, and this becomes another source of error. Despite these difficulties, Kohl and colleagues (1988) claimed that the problem was in their choice of "physical fitness" as a criterion variable. They concluded that the good reliability suggested "that exercise behavior can be accurately estimated in large populations by using simple questions in a mail survey" (p. 1228).

Error rate has been found to increase, however, in individuals with less education and less income, and those with very high activity levels. Strenuous

activities are reported with more accuracy while mild activities can be underestimated by over two hours per day (Washburn et al. 1990).

Support for the Seven-day Recall

In spite of some equivocal findings previously reported in the Review of Literature, the seven-day recall form for leisure-time activity assessment is gathering research support. Blair and colleagues (1985) found adequate precision and demonstrated concurrent validity with related questions on physical activity and job classification (Blair, Haskell, Ho, Paffenbarger, Vranizan, Farquhar & Wood, 1985); an exercise and control group reported significantly different activity levels at the 3-month mark ($p < .05$), at the six month mark ($p < .01$) and the 12-month mark ($p < .004$). After six months of participation in an exercise program, reported exercise was significantly correlated with maximum oxygen uptake ($r = 0.33$; $p < .05$) and body fat ($r = -0.50$; $p < .01$).

The seven-day recall format was used for this study because it does not appear to surpass the recall memory of most individuals and does not create too great a respondent burden (Blair, 1984). Initially, consideration was given to the one year "recall" of the Leisure Time Physical Activities Questionnaire for middle-aged men. This instrument was conducted by interview and validated against physical work capacity (Taylor, Jacobs, Schucker, Kinesen, Leon & Debacker (1978). But the one-year recall was considered too onerous for the present study. The seven-day recall has the advantage of brevity. The one-week recall format has been used in a number of important studies and appears to have scientific merit in terms of reliability and validity (Blair, Haskell, Ping Ho, Paffenbarger, Jr., Vranizan, Farquhar & Wood, 1985).

~~Taylor, Coffey, Berra, Iaffaldano, Casey and Haskell (1984) compared seven~~

days of recalled activity (in an interview) to two other activity measures: 1) a seven-day daily activity log, and 2) an electronic movement detector (Vitalog). These researchers found that recalled seven-day activity somewhat underestimated diary logs of activity, but overall found that "a seven-day recall significantly agrees with daily self-report of physical activity and directly measured physical activity (Taylor et al., 1984, p. 823).

It is concluded that a seven-day activity recall accurately reflects mean kcal/day expenditure, with conditioning activities being the best recalled. (Taylor, Coffey, Berra, Iaffaldano, Casey & Haskell, 1984, p.818)

Age-appropriate, gender-appropriate, and activity-prompted style of survey information are considered important in reducing report error in research with the elderly (Cauley, LaPorte, Black-Sandler, Schramm & Kriska, 1987; Washburn, Jette & Janney, 1990). Furthermore, Baranowski (1988) suggested that self-report accuracy of physical activity might be increased using memory enhancing procedures such as lists. Washburn, Jette & Janney (1990) report their questionnaire underestimated light and moderate standing work for elderly men and women aged 95 to 91 years. They concluded that "the activity most likely to be engaged in by older people is the type that is most inaccurately assessed by questionnaire" (Washburn et al., 1990, p. 351). The Older Adult Exercise Status Inventory (OA-ESI) used in this study has incorporated these suggestions. The OA-ESI utilizes a gender neutral, age-appropriate, and activity-prompted format. These improvements over previous designs are thought to add to, and not undermine, the validity of the present findings.

The recall accuracy of older women is important to this study. Ridley, Bachrach & Dawson (1979) examined recall ability of females aged 66 to 76 in a similar birth cohort as the present study (1901 to 1910). Recall of fertility history over the life course revealed a "high and invariant level of recall

ability" (p.103) with over 90% accuracy to 15 items asked. Reliability was highest for subject matter that was factual more than attitudinal. Retests conducted three weeks later ranged from 44% to over 90% accuracy. Ridley's findings suggest that recall about the "facts" of activity participation over a short interval such as seven days will lead to quite accurate recall, and certainly more accurate recall than one might expect over a month over a year.
