

Feasibility randomized control trial of physical activity in women aged 55-70 years: a
mixed-methods self-determination theory study of dancing and walking

by

Samantha Michelle Gray
Bachelor of Science, Simon Fraser University, 2013

A Thesis Submitted in Partial Fulfillment
of the Requirements for the Degree of

MASTER OF SCIENCE

in the School of Exercise Science, Physical and Health Education

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University of Victoria

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Supervisory Committee

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Abstract

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Background: Physical activity (PA) is a health protective behaviour that is critical in the reduction of most major chronic diseases. It also provides the participant with psychological benefits. Despite its well-established health benefits, PA engagement is low in the adult population. Women over the age of 60 are the least physically active segment and thus an important target for behaviour change interventions. **Objective:** The purpose of this mixed methods feasibility study was to explore the feasibility of six-week Self-Determination Theory (SDT)-based dance and walking programs for older women. **Design:** This was a parallel, randomized controlled trial with three groups: dance, walking, and wait-list control. This study included the sequential collection of quantitative then qualitative data (sequential explanatory design). **Setting:** This study was conducted in Victoria, BC. **Participants:** Participants were community-dwelling, English-speaking women aged 55-70 years who were not meeting PA guidelines. **Methods:** Data were collected at baseline and two endpoints: post-intervention at six weeks and follow-up at 12 weeks. The primary outcomes were feasibility measures: recruitment, intervention adherence, retention, and satisfaction. Survey data included self-reported PA (Godin Leisure Time Exercise Questionnaire) and measures of behavioural regulations and psychological needs (SDT constructs) using validated tools

(Behavioural Regulations in Exercise Questionnaire-2 and Psychological Need Satisfaction in Exercise Scale). Qualitative data were collected in the form of open- and close-ended program evaluation questions and during focus group interviews, both occurring at post-intervention (six weeks). **Results:** The feasibility measures suggest that it is feasible to recruit and retain participants and that they were generally satisfied with the programs. Thirty-five of 37 randomized participants completed the study (mean age \pm SD = 62.8 \pm 4.8), representing a 39% recruitment rate and 95% retention rate. Both programs were highly attended. Exploratory effect sizes for the quantitative measures were promising for conducting a larger-scale trial. Emergent themes highlighted the importance of the leadership component of the group-based PA programs. **Conclusion:** This study had high protocol adherence, promising effect sizes, program evaluation satisfaction, and a recreation centre took on the dance program; these factors provide a foundation for expanding this feasibility trial to a full-scale study.

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Acknowledgments

I would like to sincerely thank my supervisor Dr. Ryan Rhodes for his support, patience, and assistance with my process through my masters studies. I am grateful for all of the research opportunities he provided me that have shaped my learning, challenged my skills, and developed my confidence as a scholar. It has truly been an honour to work under the mentorship of a world-renowned expert researcher. I must extend my gratitude to him for allowing me to pursue an area of study that I was so passionate about and supporting me to fulfill the work with the utmost integrity.

Furthermore, I must also thank my committee member Dr. Joan Wharf Higgins. She devoted time and guidance to me in learning, conducting, and analyzing the qualitative components of my study and never faltered in patience or enthusiasm. She enriched my experience by opening my eyes to the value and necessity of qualitative research.

Additionally, I need also express my gratitude to my physical activity mentors for this project: Mena Westhaver and Kathy Lang. For the walking component, Mena selflessly offered her time, mentorship, and resources for conducting a safe, graded, and fun program. For the dance component, Kath shared her vast dance teaching experience with me and allowed me to model my dance program after her existing class Rust. Importantly, she continued to mentor and teach me as a dancer; she pushed me to explore the boundaries of what I could achieve, helping me to become a better, more curious and creative person.

Finally, I need to thank my loved ones who have supported me from afar (across the Salish Sea!) and from very far (across the Pacific Ocean!). Thank you to my endlessly supportive partner, Peter, and my parents for their support through this time. I am also deeply grateful to my sister Rachael; though she is half-way around the world, her example of perseverance and hard work have inspired me to push through every challenge along this path.

Dedication

I dedicate this research to my late grandmother: an incredible woman who had an integral part in my upbringing. She showed me the importance of quality of life and family support. Though her physical body faltered, her spirit and zest for life never did.

Chapter 1: Review of Literature

Canada's population is aging: in 2015 approximately one in six Canadians (16.1%) was over the age of 65 and projections estimate that this segment of the population will continue to increase to 20.1% by 2024 (Statistics Canada, 2015a). As such, it is important to recognize the health and quality of life needs of older adults (Statistics Canada, 2011). Unfortunately, many suffer from at least one chronic illness, causing increased demands on the healthcare system and dampened quality of life (Canadian Institute for Health Information (CIHI), 2011). Therefore, it is worthwhile to invest in healthy aging. The National Framework on Aging has identified five key focus areas: social connectedness, healthy eating, falls prevention, tobacco control, and physical activity (PA) (Health Canada for the Federal/Provincial/Territorial Ministers Responsible for Seniors, 1998). PA has a host of physical and psychological health benefits, for instance: improved mood, weight management, stress management, fitness, and bone health, among others (Warburton, Nicol, & Bredin, 2006). Despite awareness of the health benefits of PA, Canadian adults are not active enough to achieve these benefits (Colley et al., 2011). PA guidelines recommend that adults 18-64 years engage in at least 150 minutes of moderate to vigorous PA per week, in bouts of 10 minutes at minimum. The same recommendations are provided for adults over the age of 65, with an emphasis on balance exercises to maintain mobility and prevent falls (Canadian Society for Exercise Physiologists, 2014). According to data from the Canadian Health Measures Survey, only 15% of Canadian adults between the ages 20 and 79 are physically active enough to attain health benefits (Colley et al., 2011; Statistics Canada, 2015b). Among these adults, women over 60 years of age are the least physically active (Statistics Canada, 2015b). Hence, the growing concern centres on how to promote older adults, particularly older women, to engage in PA over the long term.

1.1 Psychological Theories of Behaviour Change

There are a few dominant theories of health behaviour change in the literature: Theory of Planned Behaviour (TPB), Social Cognitive Theory (SCT), and Self-Determination Theory (SDT). The TPB states that attitudes toward behaviour, perceived behavioural control, and subjective norms help shape behavioural intentions and thus influence behaviour execution (Ajzen, 1991). The SCT posits that behaviour is influenced by interactions among individual factors, social factors, and environmental factors. The SDT proposes that three psychological needs (autonomy, competence, and relatedness) are necessary components to be motivated to perform a behaviour. At best, these theories explain only modest changes in health behaviour such as PA (Foster, Hillsdon, Thorogood, & Kaur, 2005; Rhodes & Pfaeffli, 2010). All three theories have limitations: the TPB has shown little success for interventions aimed at changing PA behaviour (Symons Downs & Hausenblas, 2005); the success of SCT is largely based on the measurement of self-efficacy, which may actually be measuring motivation rather than capability (Williams & Rhodes, 2016); SDT does not consider less conscious processes, and it assumes that only three needs are necessary for motivation (Ryan & Deci, 2000). However, given a target population such as older women, who might be particularly responsive to a group-based intervention (Burke, Carron, & Shapcott, 2008), where the relatedness need is emphasized and a fun, collegial experience is promoted, SDT was chosen as a theoretical framework.

1.2 Self-Determination Theory

Motivation is a complex human behaviour (Ajzen, 1991; Ryan & Deci, 2000). Researchers worldwide have examined this phenomenon in an array of settings and multiple theories have emerged (Ajzen, 1991; Bandura, 2013; Ryan & Deci, 2000). One theory that has received considerable attention is SDT. The meta-theory for SDT, The Organismic Viewpoint, states that humans are active creatures that inherently yearn to be challenged. However, the

inherent drive needs to be continually reinforced by support from the social environment. So, the social environment can either support or hinder the human tendency toward growth and motivation. SDT posits that motivation ensues while three needs are satisfied: autonomy, competence, and relatedness. Autonomy is the urge to self-govern; competence is the ability to experience mastery; relatedness is the need to interact and connect with others.

Motivation thus lies on a continuum from nonself-determined to self-determined, where amotivation is non-regulated, extrinsic motivation is regulated by external factors (introjection, identification, or integration), and intrinsic motivation is internally regulated. Indeed, the continuum incorporates loci of causality and regulatory processes. Causality loci range from impersonal to external to internal. At the non-regulation end, regulatory processes lack control. Moving along the continuum to external regulation there is the use of external rewards and punishments. Introjected regulation uses the ego, self-control, and internal rewards and punishments. Identified regulation works by way of personal importance and conscious valuing. Even further along the continuum, integrated regulation occurs by awareness, congruence, and self-synthesis. Finally, intrinsic motivation is regulated by enjoyment, interest, and fundamental satisfaction. In sum, to maintain the intrinsic drive toward growth and self-development, humans need the three needs satisfied with the support of the social context (Ryan & Deci, 2000). SDT has gained attention as a framework for understanding motivation toward PA for two reasons. One, the satisfaction of three innate needs leads to improved psychological well-being, which in turn has a positive effect on many behaviours, including PA. Two, motivation for PA is regulated on a continuum from amotivated to intrinsically motivated; research has shown that intrinsic motivation and self-determined extrinsic motivation are linked to exercise adherence (Dacey,

Baltzell, & Zaichkowsky, 2008; Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997; Teixeira, Carraça, Markland, Silva, & Ryan, 2012).

1.3 Self-Determination Theory and Physical Activity

In terms of motivation toward PA behaviour, a general SDT process model has been established (Ryan et al., 1997; Teixeira et al., 2012) and evaluated in a recent systematic review that analyzed behavioural outcomes of PA and exercise in relation to SDT (Teixeira et al., 2012). Empirical literature was reviewed across 66 studies that included cross-sectional, experimental, and prospective designs. Studies in the review spanned a range of participant groups. In terms of gender, some studies were mixed and others were focused on one gender only. Additionally, study participants ranged in age from under 24 to over 65 years. Inclusion criteria demanded exercise behaviour evaluation, which took the forms of self-report, accelerometry/pedometry, and stages of change in PA participation. Other indicators were also accepted, such as attendance, dropout, and relapse. The primary analyses examined SDT predictors of the following categories: exercise regulations/motivations and need-supportive climates (psychological need satisfaction in exercise). First, of the 66 studies, 53 demonstrated associations between exercise regulations and behaviour, where results predominantly favoured more autonomous forms of regulation (intrinsic, integrated, and identified). Controlled forms of regulation were consistently found to have little or no predictive value for exercise behaviour. Second, a total of 17 studies examined associations between basic psychological needs and exercise behaviour. Analysis of need satisfaction was challenged by the inconsistency of measurement tools used across the 17 studies. Twenty-four percent of studies examined all three basic needs (autonomy, competence, and relatedness), whereas others examined only one or two needs in isolation. Eighty-two percent assessed competence, 65% assessed autonomy, and 53%

assessed relatedness. Positive associations were found for perceived competence in most studies; some samples showed no association. In terms of autonomy, results were mixed. Associations ranged from zero to moderately positive or negative with exercise behaviour. Relatedness consistently lacked an association with exercise behaviour. Altogether, results demonstrated the role of autonomous regulations: identified regulations tended to predict short-term adoption of exercise behaviour, whereas intrinsic regulations tended to predict long-term adherence to exercise (Teixeira et al., 2012).

1.4 Self-Determination Theory and Physical Activity in Older Adults

Older adults represent a population segment with potential for psychological needs to be met by PA. Unique to this age group, older adults face potential social isolation, functional limitations, and possible challenges in activities of daily living: circumstances that may be aided by PA (Hawton et al., 2011; Kujala, 2011). Unfortunately when it comes to older adults, studies of PA and SDT are limited and represent a literature gap. Of the existing literature, there is little experimental work and even fewer studies that investigated underactive or sedentary participants.

Cross-sectional studies on PA behaviour in older adults from an SDT lens have shown similar findings. One group of researchers was interested in the relationship between exercise in older adults and the satisfaction of psychological needs and behavioural regulations according to SDT (Kirkland, Karlin, Stellino, & Pulos, 2011). A sample of 209 adults over the age of 55 was recruited to this study to examine need satisfaction and exercise behaviour among exercisers and non-exercisers. Both men and women were included and they did not differ significantly in terms of exercise behaviour. Results showed that there was a significant difference in autonomy ($d = 0.74$), competence ($d = 0.40$), relatedness ($d = 0.44$), non self-determined extrinsic motivation ($d = 0.50$), self-determined extrinsic motivation ($d = 0.67$), and intrinsic motivation ($d = 0.98$)

between exercisers and non-exercisers. In addition, older women reported significantly greater satisfaction in the need of relatedness than did older men. Similarly, Dacey et al. (2008) examined whether motive type could differentiate three PA levels among a group of older adults, namely inactive, newly active, and long-term exercisers. In this cross-sectional study, 645 older adults with a mean age of 63.8 years completed questionnaires at one time point regarding their exercise motives: enjoyment, social/emotional, stress management, health/fitness, appearance, and weight management. Intrinsic motivation was characterized by enjoyment; self-determined extrinsic motivation was characterized by social/emotional motives, stress management, and health/fitness motives; non self-determined extrinsic motivation was characterized by weight management and appearance motives. It was found that intrinsic and self-determined extrinsic motivations were associated with the highest levels of PA in older adults. Non self-determined extrinsic motivation was negatively associated with PA level. These studies consistently demonstrate that regular exercisers are high in intrinsic, self-determined extrinsic, and introjected regulations and low in external regulations; non-exercisers are low in intrinsic and self-determined extrinsic regulations and high in external regulations.

Ferrand et al. (2012) also studied motivational profiles of older adults, specifically of those who were already regularly active. A total of 92 older adults, aged 63-89 years, completed questionnaires and a subset of this sample (n = 38) volunteered to be interviewed regarding their perceived motives toward PA and sports. Cluster analyses revealed two motivational profiles: high-combined motivation (n = 44) and low-to-moderate motivation (n = 48). Results showed a significant effect of cluster membership on motivation. The qualitative interviews, conducted with both high-combined and low-to-moderately motivated participants, revealed two important categories. The first was relatedness and its importance was shown in the following interview

quote: “There is not only the physical activity, there is the conviviality! Most programs focus on group activities. We are among friends. We laugh, we blather, chat. It is this that makes us feel great” (pg. 221). The second was well-being and its importance was demonstrated in an interview: “My well-being is linked to my commitment to practice physical activities. I really experience pleasure because I am feeling well practicing my activities, and I also have the associated interest of challenge and effort” (pg. 224). Overall, the high-combined motivation cluster had higher levels of PA than did the low-to-moderate motivation cluster. The groups also varied in their motives, as elucidated from interviews; the high-combined group exercised for their health and well-being, by their own volition; the low-to-moderate group exercised in order to avoid losses in physical functioning with age.

Like Kirkland et al. (2011) and Dacey’s (2008) findings, Ferrand and colleagues (2012) showed a similar motivational profile for regular exercisers: high intrinsic, self-determined extrinsic, and introjected regulations, and low external regulations. Ferrand et al. (2012) also highlighted via qualitative interviews the importance of relatedness for this demographic. While these cross-sectional studies characterize motivational profiles of exercising and non-exercising older adults, it is important to consider the, albeit limited, experimental evidence of SDT-based PA interventions.

Lee and colleagues (2016) conducted a 13-month feasibility trial of an SDT-based exercise program for community-dwelling older adults. The study included 18 participants with mean age of 67.50 years and found that attendance in the exercise program was high (82.52%). The study was limited in its lack of a comparison or control group but provided preliminary support for SDT-based motivational strategies for exercise in older adults. In another experimental study, Solberg et al. (2013) conducted a 16-week trial with 118 older adults (mean

age 74.3 years). The exercise program attendance was again very high, 85.5%, and it was found that at seven weeks into the trial autonomous motivation (e.g., intrinsic and self-determined extrinsic regulations) had increased in the experimental exercise group. In a 10-week randomized controlled trial, 442 sedentary participants were placed in a referral (considered control), a walking, or a coaching condition (Van Hoecke, Delecluse, Bogaerts, & Boen, 2014b). The latter two were increasingly need-supportive and used SDT-based motivational strategies for PA. At post-intervention, participants in the walking and coaching conditions reported significantly more PA than did those in the control condition ($p < 0.01$ and $p < 0.05$, respectively). At one-year follow-up, participants in the walking and coaching conditions were again found to report significantly more PA than those in the control condition ($p < 0.05$ and $p < 0.01$, respectively). Overall, the experimental studies demonstrate that SDT-based PA interventions were well-received among older adults with adherence rates greater than 80%.

For the most part the research on PA with older adults from an SDT perspective is limited. Several studies collected data using cross-sectional designs and there were few studies that targeted underactive or sedentary participants. To date, only three experimental trials based in SDT have been identified for the older adult population. In addition, the existing research has generally focused on PA as a whole. There is less research on how different types of PA might affect motivation and need satisfaction.

1.4.1 Walking

Walking, a common form of PA among older adults, might be able to satisfy some psychological needs according to SDT (Kinnafick, Thøgersen-Ntoumani, Duda, & Taylor, 2014). For instance, autonomy could be satisfied to the extent that the individual chooses how far, how fast, how often, and where to walk. The same reasoning could apply in a prescribed

setting. If an individual is part of a walking clinic or walking program, the leaders could provide choices to participants: different groups that walk varying distances at varying intensities and speeds. In terms of competence, walking is not likely to satisfy this need to a great extent. Walking speed and endurance could be improved, but the activity itself is not complex; there is less opportunity to build mastery and competence (Cheng et al., 2009). The third need, relatedness, has potential to be satisfied by walking in a clinic with other participants. By participating in group-based walking, individuals have the chance to converse and interact with others, forming relationships and communities. Participants inevitably share the same goal of being physically active.

Kinnafick et al. (2014) examined autonomy-support, need satisfaction, subjective vitality, and PA behaviours in a group of sedentary adults participating in a lunchtime walking clinic. A sample of 69 participants, 63 women and 6 men, was recruited from a large British university; all participants were non-academic staff members at the university with a mean age of 46.59 years (standard deviation = 10.51 years). The intervention, called “Step by Step” was a 16-week program with follow-up at four months. Walk leaders received educational training on SDT needs and provision of autonomy-supportive environments. Participants took part in three weekly 30-minute lunchtime walk programs led by the trained leaders for 10 weeks. During the initial 10 weeks, participants were encouraged to accumulate another 60 minutes of walking time over the weekends. Following the 10 weeks, there was 6 weeks of independent walking. Participants were instructed to get 150 minutes of walking per week and they were encouraged to contact the research team if they required support or assistance. The walk program was accompanied by motivational text messages sent to participants and a motivational information booklet. All data were self-reported and included measures of perceived autonomy support from

the walk leader and the walk program, need satisfaction from the walk leader and program, subjective vitality, and PA behaviour. Results showed that autonomy support from the walk leader positively predicted change in vitality from baseline to 16 weeks (post-intervention) and change in PA, but not from baseline to four-month follow-up. Autonomy support from the walk program positively predicted vitality change from baseline to 16 weeks, but did not predict change in PA. In addition, autonomy satisfaction from the walk leader mediated the relationship between autonomy support and vitality, as well as between autonomy support and PA.

Limitations in this study included the following: predominantly female participants, walk leaders that could have received more extensive training, and competence need satisfaction being removed from the analyses due to poor internal consistency (Kinnafock et al., 2014).

1.4.2 Dancing

Dancing is another type of PA that is viable for the aging community and has the potential to meet psychological need satisfaction according to SDT (Quested et al., 2011). The first need, autonomy, could be met in the recreational dance setting. For example, participants could be given the opportunity to move their individual bodies through space as they choose through improvisation exercises. Common in modern, contemporary, and creative dance settings, dance instructors allot time for the class to explore new movement patterns and shapes in space by allowing participants to partake in improvised dance movements. The participant thus has complete freedom to choose his or her own movements (Martin, 1965). Another opportunity for autonomy in a group dance class is related to competence and mastery of body movements and skills. The instructor could provide levels to help a dancer build competence to achieve a desired outcome. For example, to learn how to do a pirouette (a pivot on one foot with the heel elevated so that the dancer rotates on their toes), the instructor could give the dancer the option to practice

the balance, the 180 degree pivot, the 360 degree pivot, or the 540 degree pivot, and so on (Koff & Magill, 2003). Competence could also be satisfied in that dancing is a complex movement form (Martin, 1965). There are numerous ways to improve: technique, style, expression, and timing, to name a few. Finally, the third need of relatedness could be easily satisfied in a recreational group setting. Relatedness could be achieved with the other dancers, the instructor, the choreography, the music, and the work and common goals of the collective group dancing together (Goulimaris, Mavridis, Genti, & Rokka, 2014). Given the potential to meet these needs, researchers in Greece took to exploring the relationship among recreational dancing, need satisfaction, and psychological well-being.

Goulimaris, Mavridis, Genti, and Rokka (2014) were interested in how dancing would affect need satisfaction and psychological well-being and the differences in these relationships due to sex and age. Adults aged 40-70 years were recruited from Greek recreational dance societies; all participants danced in two one-hour sessions per week. A sample of 290 adults, 196 women and 94 men, were surveyed regarding need satisfaction and psychological well-being using the Basic Psychological Need Satisfaction in Exercise Scale (BPNES) and the Subjective Exercise Experiences Scale (SEES), respectively. Questionnaires were completed immediately following a dance session at one time point. The SEES measured three domains: positive well-being, psychological stress, and fatigue. Correlational analyses showed that positive well-being had a highly positive association with the satisfaction of all three needs: autonomy, competence, and relatedness. Psychological stress did not have a significant association with any of the three needs, but it had a highly positive association with fatigue. Additional analyses revealed that there was no difference between men and women in terms of need satisfaction and well-being. There was however a difference in terms of age. The oldest age category (61-70 years) had

significantly higher scores of well-being and relatedness compared to the other age categories (40-50 years and 51-60 years). Overall, participant mean scores for need satisfaction were high, particularly for relatedness. There were also high mean scores for positive well-being, low mean scores for fatigue, and scores of almost zero for psychological stress. Though the results were positive, the study was not without limitations. The participants were all physically active individuals, so they may not represent sedentary individuals. The design was cross-sectional and therefore trends over time cannot be inferred (Goulimaris et al., 2014). Moreover, given the potential to meet all three needs, dancing could prove to be more intrinsically motivating than other types of PA and it possesses many of the same health benefits.

1.5 The Health Benefits of Walking

Walking is a simple form of PA that does not require equipment or membership. It is an easily accessible activity that can be done almost anywhere: residential/city streets, parks, walking trails, malls/community centres, or on a treadmill. It is also an activity suited well to most body types and fitness levels (Hart, 2009). Furthermore, it is the most commonly reported activity for exercise by adults over 18 years of age in Canada (Canadian Fitness & Lifestyle Research Institute, 2016). In addition, 80% of Canadian adults over the age of 65 reported participation in walking for exercise (Canadian Fitness & Lifestyle Research Institute, 2016). Further to its ease of access and popularity, walking provides a number of health benefits to its participants. Benefits of walking include: physical health, emotional and mental health, and social connection (Hart, 2009).

The benefits of walking to physical health are substantial. Walking can increase muscle strength and cardiovascular endurance, improve weight management and regulation of blood glucose, lipids, and insulin, as well as increase bone density, and a host of other benefits (Bravata

et al., 2007; Hart, 2009). As with the general PA research, these benefits of walking are achieved by meeting threshold levels of activity. Walking briskly for 30 minutes per day on most days of the week is one method by which to meet guidelines (Canadian Society for Exercise Physiologists, 2011). A review has also approximated step counts for adults reflective of different lifestyles based on pedometer indices (Tudor-Locke & Bassett Jr, 2004):

- <5000 steps/day may be a sedentary lifestyle
- 5000-7499 steps/day is considered a low active lifestyle
- 7500-9999 steps/day is considered a somewhat active lifestyle
- ≥ 10000 steps/day is considered an active lifestyle
- >12500 steps/day is considered a highly active lifestyle

These indices are helpful as many researchers utilize pedometers or accelerometers to measure activity and the general public can also access commercially available step counting products for their own monitoring. Further to the physical benefits, walking can (in an outdoor setting) provide mental health benefits where natural environments and green spaces are included.

Researchers note that walking in outdoor green environments is beneficial since there is contact with nature. Three theories have been proposed to explain this phenomenon of enhanced wellbeing in response to exposure to nature: the Biophilia Hypothesis (Wilson, 1984), Attention Restoration Theory (Kaplan & Kaplan, 1989), and Psycho-Evolutionary Stress Reduction Theory (Ulrich, 1981). The Biophilia Hypothesis is based on the presence of an evolutionary component to the relationship between humans and nature, citing an innate dependence and affinity for humans to interact with the natural environment. The Attention Restoration Theory asserts that humans are more attentive following bouts of contact with nature. The Psycho-Evolutionary Stress Reduction Theory posits that exposure to nature can reduce stress and lead to restoration,

and that emotional and affective mechanisms are important in this process. Though their mechanisms vary, all theories posit that walking in nature contributes to mental development and improved wellbeing and involves a restorative component.

Beyond the restorative component of walking in green spaces, walking is also associated with social benefits in a group-based setting. Acquiring social connections has been cited as a reason for joining walking groups, and members of walking groups have discussed the enjoyability of walking with others noting social support and pleasant environment as motivation for continuing to participate in walking (Kassavou, Turner, & French, 2015). Ashley and Bartlett's (2001) work also echoes these findings: motivating factors to continue being active were the social components of the group and the organized, cohesive nature of the activity.

In sum, walking as an activity provides or is associated with, many health benefits. These findings are also true for older adult populations and are presented in the following sections.

1.5.1 Physical Benefits of Walking in Older Adults

A number of studies have demonstrated the benefits of walking on physical health in the older adult population. For example, Diehr and Hirsch (2010) used longitudinal data from the Cardiovascular Health Study (CHS) to approximate an intervention trial, what they called a “limited-bias” design that better estimates the benefit of walking more in sedentary, generally healthy older adults. The data from the CHS spanned five years and included 1409 participants, 829 of which were sedentary individuals. Sedentary individuals were defined as those walking less than seven city blocks per week and active individuals were those walking more than 28 city blocks per week. Data from follow-up at year five showed that 83.5% of those who were actively walking at baseline self-reported excellent, very good, or good health, whereas only 63.9% of sedentary individuals self-reported the same health ratings: this equates to a benefit of about 19.6

percentage points. In the analysis to account for co-variates in the limited-bias design, the walking benefit was 11.2 percentage points. The researchers concluded that even small increases in walking were associated with important health benefits for older adults. Further to this research, there are also walking intervention studies that have demonstrated health benefits for older adults.

One study in Portugal evaluated the benefits of a National Walking Program on physical measures of fitness in adults over the age of 60 (Branco et al., 2015). This group of researchers at the University of Porto recruited 26 participants (mean age 65.5 years) who were not regularly engaged in PA and provided them with a walking intervention that lasted six months, with group-based sessions occurring three times per week. Each walking session was led by a qualified physical educator and consisted of warm up, brisk walking, and cool-down components and the program was graded in intensity over the duration of the six months. Results showed significant improvements in all fitness tests (arm curl, chair stand, timed-up and go, 6-minute walking test) except the flexibility tests (sit and reach, back stretch). Note that a limitation of this walking intervention study includes its lack of a control or comparison group.

In another intervention study of walking, investigators examined the effects of an ecological walking program on aerobic endurance and physical functioning in older adults living in a residential care setting (Magistro, Liubicich, Candela, & Ciairano, 2014). Magistro and colleagues (2014) recruited 126 residential care participants to a randomized control trial (mean age = 73.1 years) consisting of a 16-week walking program or a control group. The walking program had sessions running two times per week and included balancing and lower limb strengthening components. These activities were conducted within the halls of the residential setting in order to fulfill the ecological components for participants. Data were collected at

baseline and post-intervention and included the 6-Minute Walking Test (6MWT) for endurance, the 30-second chair stand for lower limb strengthening, and the Timed Up and Go test for mobility. Results indicated that the intervention group participants had steady and significant increases in all measures as opposed to the control group participants, who showed significant decreases in all measures. These findings again demonstrate the positive effects of a walking program on measures of physical health and functioning in older individuals.

1.5.2 Psychosocial Benefits of Walking in Older Adults

Other literature on walking in older adults has demonstrated positive effects on mental health and shown associations with psychosocial benefits to the participant. For example in a study of high value natural green spaces in the east of England, researchers evaluated changes in self-esteem and mood following a single walking visit within a natural environment green space (Barton, Hine, & Pretty, 2009). Using a between subjects design and convenience sampling, participants were recruited as they were arriving or leaving a site. On that day, all visitors were approached (n = 137) and 132 agreed to participate in filling out validated measures of self-esteem and mood in a survey format. More than half of participants were aged 51-70 years (57.6%); 14.4% were over 71 years of age. The findings showed that self-esteem was significantly greater for those leaving the site than those arriving; overall mood was also significantly increased for those leaving than those arriving. Additionally, feelings of vigour were increased upon leaving the site. The researchers concluded that even following an acute walk in a natural, green environment there were positive associations between walking and mental wellbeing. They also argued that outdoor walking in these types of spaces has value beyond simply exercising: the experience is emotionally rewarding and might be a more sustainable way to maintain PA.

In another study of mental health and walking, investigators evaluated the efficacy of a municipality-led walking program for older adults on the prevention of mental decline (Maki et al., 2012). This randomized controlled trial included 150 community-dwelling older adults with a mean age of 72 years. The walking intervention included a once per week session for three months; each session lasted 90 minutes and included a 30-minute group walk and encouragement for participants to walk on their own, increase daily step counts, and set clear short term PA goals every week. The control group received educational sessions. The walks were composed of approximately six members to promote social interactions. Data were collected pre- and post-intervention to evaluate five measures of cognitive function, quality of life, depressive state, social interactions, and functional capacity. Results showed significant differences favouring the walking group at post-intervention for word fluency (component of cognitive function; $p = 0.01$), quality of life ($p = 0.002$), and social interaction ($p < 0.001$). The authors recommended this community-based intervention for larger scale testing as it is easy to replicate, low-cost, and there were clear benefits to the walking group participants.

There is also meta-analytic level evidence for the positive effect of walking programs on a component of psychosocial health: executive functioning. Scherder et al., (2014) conducted a systematic review and meta-analysis of executive function in sedentary older who participated in walking programs. Eligible studies were all randomized controlled trials with adults aged 55 years and older that were either cognitively impaired ($n = 3$) or not cognitively impaired ($n = 5$). The findings indicated that walking programs improved two components of executive function (set-shifting and inhibition) in previously sedentary older adults who did not have cognitive impairments ($d = 0.36$, $p < 0.001$). However, for cognitively-impaired older adults, walking programs did not show improvements in executive functioning ($d = 0.14$, $p = .56$). The authors

concluded these results to be clinically relevant as walking programs for sedentary older adults could prevent or delay the decline in executive functioning (Scherder et al., 2014).

In general, the research on psychosocial benefits of walking in older adults has been positive. Acute walks and walking programs in natural settings are opportunities for improved mental health and wellbeing in the older population.

1.6 The Health Benefits of Dance

Dance is one of the oldest art forms, rooted in every culture around the world (Alpert, 2011). It is the expression of human emotions, narratives, and ideas through bodily movement in conjunction with music (Grant, 1982; Martin, 1965). It can be performed individually, in pairs, in trios, or in large groups. The styles of dance are as varied as the styles of music available: from the classical ballet to Broadway jazz to ballroom dance to contemporary street dance and hip hop. Whether it is choreographed or freestyle, dancing helps the body to release emotion, stress, and nervous energy. It engages the mind and body together: moving through space in time with music and/or other dancers increases the heart rate and blood flow to the brain (Alpert, 2011; Davenport, 2001; Malkogeorgos, Zaggelidou, Manolopoulos, & Zaggelidis, 2011). Though it has rarely been regarded as a standard form of PA, dancing shares many of the health benefits of regular PA (Alpert, 2011).

The health benefits of dance are plentiful and standard forms of PA share many of the same benefits (Alpert, 2011; Warburton et al., 2006). There is strong evidence to suggest that regular PA results in lower risk of premature death, cardiovascular disease, type II diabetes, metabolic syndrome, certain types of cancer, as well as improved weight management, cardiovascular endurance, muscular fitness, and cognitive function (Office of Disease Prevention and Health Promotion, 2008). Research also shows that PA reduces depression, prevents falls in

older adults, lowers the risk of hip fracture, increases bone density, and improves quality of life (Warburton et al., 2006). Where dancing is concerned, theorists suggest that additional benefits may be present (Alpert, 2011; Verghese et al., 2003). First, dancing may contribute to the formation of new neural pathways in older persons. The complexities involved in remembering a sequence of body movements in time with music and in relation to other dancers and then executing those movements helps to form these new connections in the brain (Verghese, 2006). Dancing also increases blood flow to regions of the brain involved in memory and attention (Alpert, 2011). Verghese et al. (2003) substantiated the cognitive benefits of dance in their study of dementia risk in older adults. Frequent dancing was the only PA shown to reduce the risk of dementia. PAs such as swimming or cycling did not reduce the risk of dementia; reading reduced the risk by 35%; doing crossword puzzles several days per week reduced the risk by 47%; frequent dancing reduced the risk by 76%. Music is believed to play a role by engaging the mind of the dancer.

Second, dancing is known to be an emotional outlet; it is the art of expressing feelings and ideas through bodily movement through space. These expressions can encourage creativity, which is not necessarily seen in other types of PA such as walking (Alpert, 2011). Dancers are tasked with emoting a specific theme or narrative, whether or not it is familiar to them. In the case of unfamiliarity the dancer must strive to connect with the theme or narrative in a creative way. Furthermore, time spent learning to dance can foster an interest in making one's own original movement; movement makers, or choreographers, are first born as dancers and then seek to be creators (Osgood, Meyers, & Orchowsky, 1990; von Rossberg-Gempton, Dickinson, & Poole, 1999).

Third, dancing provides a social context for its participants. Individuals coming together for a group dance class or a social dancing event allows for the development of social connections and ties to fellow dancers, resulting in a community (Alpert, 2011; Hui, Chui, & Woo, 2009; Rabbia, 2010). Altogether, it is clear that dancing rewards its participants with good health. Researchers, recognizing the potential of this ever-evolving physical art form, have taken to examining the effects of dancing in the older population (Keogh, Kilding, Pidgeon, Ashley, & Gillis, 2009; Koch, Kunz, Lykou, & Cruz, 2014).

Dance research in the older adult community has taken two main avenues, therapeutic and physical. The first has focused primarily on therapeutic outcomes such as psychological health, cognition, socialization, and creativity, most of which were evaluated following dance movement therapy, a psychosomatic form of counselling (Gordon, 2014; Koch et al., 2014; Matherly, 2013; Ritter & Low, 1996). The second has focused on the physical health benefits of dancing, such as fall prevention, balance, agility, and muscular strengthening (Keogh et al., 2009; McKinley et al., 2008; Shigematsu et al., 2002). The literature surrounding dance movement therapy (DMT) has largely consisted of qualitative descriptions and case studies, however Koch et al. (2014) recently published a meta-analysis on the effects of DMT and dance programs on health-related psychological outcomes. Their review was a follow-up and update to the review conducted in 1996 by Ritter and Low. DMT has been used across a range of age groups and health conditions, which includes older adults. The studies that intervened with DMT aimed to address a myriad of health states, including psychological, behavioural, and medical conditions. In their review, Koch et al. (2014) also included studies using dance as an intervention for psychological-related health. In total 23 studies were reviewed across clinical, subclinical, and non-clinical populations. Data were extracted based on several different clusters:

quality of life, mood, affect and well-being, body image, and clinical outcomes (including sub-clusters on depression, anxiety, and interpersonal competence). Data from nine trials supported DMT and dance as having an effect on quality of life with a moderate effect size. In terms of mood, affect, and well-being, data from seven studies showed an effect of DMT and dance with a small effect size. Body image results also had a small effect size for the effect of DMT and dance, based on six studies. With respect to clinical outcomes in general, a moderate effect size was observed for the effect of DMT and dance from seven trials. Sub-cluster analyses showed moderate effect sizes of DMT and dance on depression, anxiety, and interpersonal competence (Koch et al., 2014). Clearly, the benefits of DMT and dance on psychological health are abundant, and these benefits have been shown specifically in older populations.

1.6.1 Psychological and Therapeutic Benefits of Dance in Older Adults

Observations of improved psychological health in older adults following DMT or dance interventions have been great. The research has been ongoing for the last couple decades. For instance, Osgood and colleagues (1990) conducted an exploratory study on the effects of creative dance with older adults in terms of life satisfaction. Men and women over the age of 65 were recruited from senior centres and senior housing developments in Virginia; approximately 80% of participants were women. All participants were in relatively stable physical and mental health states. The researchers chose a matched comparison group for the control. The intervention consisted of weekly one-hour creative dance and movement classes over the course of eight months. Each class consisted of warm-up, theme development, and cool-down. The aim of theme development was to allow creative and emotional expression to take place while encouraging cohesion among the group. Varying themes included: holidays, seasons, cultures, or styles of dance. Props were also introduced as an additional layer of creativity. The outcome variable of

interest was life satisfaction and it was assessed by two measures: 1) the Philadelphia Geriatric Center Morale Scale, and 2) a global measure of life satisfaction. Pre- and post-intervention measures were collected along with a qualitative assessment using field notes, instructor observations, and participant commentary. Results showed that participants in the intervention group scored significantly higher in post-scores than the control group, even after accounting for initial differences in the pre-scores. Qualitative findings were also positive. Dance participants reported increased vitality, self-esteem, and feelings of competence. For example, a 72-year old man commented as follows: “I can’t do much, but what I can do makes me feel great! The music inspires me. It makes me feel young again” (pg. 263). Another participant, a 75-year old woman, stated: “Since I’ve been dancing, everyday chores become a dance. It makes them so much more fun” (pg. 263).

Another example of psychological health benefits demonstrated through dance comes from a study conducted by Rossberg et al. (1999). This group developed an intergenerational creative dance program for enhancing social functioning in frail older adults and young children. The study was conducted in two groups, one intergenerational group and one group with children only. Children were between the ages of 7-8 and older adults ranged from 61 to 103 years of age. The creative dance program was implemented over 12 weeks with two 30-minute classes per week; classes included a warm-up, creative movement/exploration segment, and cool-down. Qualitative data were collected in the form of video recordings of classes from weeks 1, 4, 8, and 12, as well as field notes. Analyses showed that overall being in a creative dance class maintained or improved social skills in both children and older adults. Additionally, Thornberg, Lindquist, and Josephsson (2012) further explored the experiences of older adults participating in creative dance classes. A total of 13 participants over the age of 65 (eight women and five men)

were recruited to participate in this qualitative study. Purposive sampling was used to attain a cross-section of age, gender, and previous work experience. The dance workshops took place over a four-month period, occurring once to twice per week. Seven public performances were also part of the project. A professional dance choreographer led the workshops, aiming to elicit improvisational movement based on emotions, experiences, and memories. The choreographer pulled chunks of movement ideas from the improvisations to create a dance for the participants to perform with professional dancers in the public performances. Qualitative data were collected in the form of open interviews and DVD recordings of the dance workshops, participant commentary, and one of the public performances. Two themes emerged from the interpretative narrative method: 1) “A surprising awareness of the connection between body and mind” (pg. 73), and 2) “Participation leads to personal growth” (pg. 73). Overall the findings of this study demonstrated that older adults experienced health benefits from participating in creative dance (Thornberg et al., 2012). Besides the psychological and therapeutic benefits of dancing in older populations, researchers have also found physical health benefits that emerge from dancing.

1.6.2 Physical Benefits of Dance in Older Adults

The physical health benefits of dancing in the older adult have been explored extensively in various forms of dance (Eyigor, Karapolat, Durmaz, Ibisoglu, & Cakir, 2009; Guzmán-García, Johannsen, & Wing, 2011; McKinley et al., 2008; Shigematsu et al., 2002). In 2009, Keogh and colleagues published a review of the physical benefits of dance for healthy adults over the age of 60. The review investigated 18 studies in total, three were cross-sectional in design and 15 were longitudinal. Studies were included if the exercise intervention focused largely on dancing and lasted a minimum of eight weeks or a group of older dancers were compared to age-matched non-dancers. Each study was evaluated for scientific rigour based on five criteria: clarity of the

inclusion/exclusion criteria; adequate outline of the dance program; blinding of the assessors to treatment allocation; valid, reliable measurement tools; accounting for participants in the study. Results showed that across studies, a variety of different dance forms were used such as traditional styles (i.e., Korean, Turkish Folk, Ballet) and aerobic or line dancing. For the cross-sectional studies, outcomes showed that older dancers had significantly better balance, gait speed, muscle strength and endurance, bone-mineral content, and aerobic power. In terms of the longitudinal studies, six showed significant increases in muscular endurance; three showed significant increases in aerobic power; two showed significant increases in body flexibility. Overall, most of the studies concluded that static- and dynamic-balance were improved in the older adults that had participated in a dancing program. In addition, Hui et al. (2009) examined the effects of a dance program on the physical health of community-dwelling older adults in Hong Kong. The study was intended to be a randomized controlled trial, however, as participants were recruited from social centres they only agreed to participate in the study if they could be grouped with peers from their respective centres. Thus, the study morphed into a cluster-randomized trial to accommodate recruitment. A total of 111 participants aged 60-75 years were recruited to the study. The dance intervention group received 23 low-impact dance sessions over the course of 12 weeks. Sessions consisted of warm-up, active movement, and cool-down, as well as a short dance routine that the group progressed through. Assessments of physical health were conducted at baseline and following the 12-week intervention. Measures included: cardiopulmonary performance as measured by the Six-Minute Walking Test (6MWT); lower limb endurance and strength as measured by the Sit-to-Stand Test; trunk flexibility as measured by the Sit-and-Reach Test; dynamic balance and mobility as measured by the Timed-Up and Go (TUG) Test. Results showed significant differences between the control group and intervention

group on the following assessments: mean change in resting heart rate, TUG test, Sit-to-Stand Test, and the 6MWT.

More recently, Krampe (2013) piloted a study of the effects of a dance-therapy program on balance and mobility in older adults living in an aging-in-place facility. Twenty-seven participants with a mean age of 85 were recruited to participate in a randomized controlled trial of a dance-therapy program compared to a control group (no intervention). Inclusion criteria required participants to obtain a minimum score of 23 on the Mini-Mental Status Examination and be able to stand up with or without assistance for short durations. The six-week dance-therapy program consisted of three 45-minute dance sessions per week. Make-up sessions were offered to participants. The instructor was trained in the Lebed Method, which is a specialized method of movement therapy designed for individuals with limited mobility in the upper and lower body. All the Lebed movements can be performed standing and sitting (Williams, 2009). The program also included dance movements based in ballet and jazz and a short dance routine learned throughout the study so that participants could develop confidence in the movement sequences. Data collection occurred pre- and post-intervention in terms of mobility and balance as measured by the GAITRite electronic walkway system and the Multidirectional Reach Test, respectively. Results showed no significant differences however analysis of effect sizes demonstrated that dance-therapy might be mildly or moderately effective in improving certain components of mobility and balance (Krampe, 2013). It is apparent that both theory and evidence show the health benefits of dancing for older persons, no matter the state of their physical or mental health.

1.7 Summary

Older adults in Canada represent a large portion of the population and this segment is expected to grow over the coming years. This group has important health needs for maintaining quality of life and PA is one way to keep aging Canadians living independently. Importantly, women over the age of 60 are the least physically active segment of the population and thus are a crucial target for health behaviour change interventions. Behaviour change research highlights how SDT has the potential to explain PA behaviour in aging adults. However, this area is understudied, particularly when it comes to older women and experimental designs. The following manuscript-based thesis outlines a study and analysis that addresses these gaps in the literature.

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Chapter 2: Feasibility Mixed Methods Manuscript

2.1 Introduction

Physical activity (PA) is a health protective behaviour that is critical in the reduction of most major chronic diseases such as type II diabetes, cardiovascular disease, and many cancers (Warburton, Nicol, & Bredin, 2006). It also provides the participant with psychological benefits such as improved mood and stress management and reduced risk of depression and anxiety (Rebar et al., 2015; Warburton et al., 2006). Despite its well-established health benefits, PA engagement is low in the adult population. Only 15% of Canadians between the ages of 20-79 engage in enough PA to achieve health benefits. Of these, women over the age of 60 are the least physically active group (Colley et al., 2011; Statistics Canada, 2015b). Thus, the issue remains on how to promote adults, particularly older women, to engage in PA over the long term.

Part of health behaviour promotion includes motivation, as it is often a necessary ingredient for behaviour change (Hagger & Chatzisarantis, 2008; Linke, Robinson, & Pekmezi, 2013). There is extensive literature on human motivation (Ajzen, 1991; Boslaugh, 2008; Ryan & Deci, 2000). One prominent framework is Self-Determination Theory (SDT). According to SDT, motivation lies on a continuum as follows: amotivation, non self-determined extrinsic motivation, self-determined extrinsic motivation, and intrinsic motivation. In SDT, humans engage in behaviours such that they meet three psychological needs: autonomy, competence, and relatedness. Autonomy is the urge to self-govern; competence is the ability to experience mastery; relatedness is the need to connect and interact with others (Ryan & Deci, 2000). The more these needs are satisfied, the higher on the motivational continuum an individual will be.

In the PA literature, SDT has received considerable attention. A systematic review of SDT and PA demonstrated the role of more self-determined regulations: self-determined

extrinsic regulations tended to predict short-term adoption of exercise behaviour, whereas intrinsic regulations tended to predict long-term adherence to exercise (Teixeira et al., 2012). Results for need satisfaction and exercise behaviour were mixed. There was considerable support for competence, mixed results for autonomy, and a lack of association for relatedness. Though research attention has been given to SDT and PA, little of it has focused on the older adult population.

With regard to the older adult population, there is a paucity of SDT-based PA research. However of the existing literature, findings for older adults tend to align with those for the general adult population (Dacey et al., 2008; Kirkland et al., 2011; Stephan, Boiché, & Scanniff, 2010). Correlational research shows that regular exercisers have high intrinsic, self-determined extrinsic, and introjected regulations and low external regulations, whereas non-exercisers have low intrinsic and self-determined extrinsic regulations and high external regulations (Dacey et al., 2008; Kirkland et al., 2011). In terms of experimental studies, SDT-based PA interventions have been well-received among older adults with adherence rates greater than 80% (Lee et al., 2016; Solberg, Halvari, & Ommundsen, 2013; Van Hoecke, Delecluse, Bogaerts, & Boen, 2014a). However there is limited evidence on follow-up PA behaviour post-intervention (Van Hoecke et al., 2014a). For the most part, SDT is promising for understanding PA in older adults but more research would help replicate findings.

It is worth noting that SDT-based research has focused broadly on PA. There is less research on how different types of activities might affect behavioural regulations and need satisfaction. Group-based and leader-guided walking and dancing are two activities that have the potential to satisfy psychological needs according to SDT (Kinnafick et al., 2014; Quested et al., 2011). A group walking leader can provide autonomy to participants by allowing them to choose

their walking pace and distance; they can also vary walking routes to challenge competence with different elevation changes and intensities. Additionally, the leader can promote a collegial environment by conversing with participants and encouraging conversation and interaction amongst the group. For a group dance class, the leader can also cultivate an environment to support autonomy, competence, and relatedness. Free and improvised dance leaves room for participant autonomy; graded skill and movement sequences plays into competence-building; dancing as a group or in partners and relating to the choreography and music gives relatedness an opportunity to blossom. Certainly, leadership becomes important in promoting need satisfaction in an SDT-based study.

A theory of leadership that has been tied specifically to SDT is servant leadership (Greenleaf, 1977). Though an accurate definition of servant leadership is lacking from Greenleaf (1977), he famously described the servant leader as such:

The Servant-Leader is servant first... It begins with the natural feeling that one wants to serve, to serve first. Then conscious brings one to aspire to lead... The best test, and difficult to administer is this: Do those served grow as persons? Do they, while being served, become healthier, wiser, freer, more autonomous, and more likely themselves to become servants? And, what is the effect on the least privileged in society? Will they benefit, or at least not further be harmed? (p. 7).

Greenleaf's writings on servant leadership led to many interpretations of the concept, and one review took on the challenge of synthesizing the existing servant leadership research, developing key characteristics, and proposing a theoretical framework (van Dierendonck, 2010). In this review, the servant leader is emphasized as creating opportunities for follower growth and being authentically concerned with follower well-being. There are six key characteristics of the servant

leader: 1) empowering and developing people; 2) humility; 3) authenticity; 4) interpersonal acceptance; 5) providing direction; 6) stewardship. From the description and characteristics we can see ties to SDT. A servant leader that develops people (competence), provides them with interpersonal acceptance (relatedness), and promotes their growth towards freedom and health (autonomy) is a leader that has created an environment for need satisfaction and potential for nurturing intrinsic motivation.

2.1.1 Situating the Current Study

It is important to recognize the gaps in the literature to situate the current study. There is a paucity of research on SDT-based PA with older adults, especially from an experimental perspective. Further, the work that has been conducted has addressed PA as a whole; it has not teased out how different types of activity might satisfy needs and affect motivation along the SDT continuum. As such, it is important to explore the feasibility of an experimental SDT-based intervention for different activity types in older women. Therefore the purpose of this mixed methods feasibility study was to explore the feasibility of six-week SDT-based dance and walking programs for older women. The study objectives were to: 1) assess participant recruitment, intervention adherence, retention, satisfaction, and interest in continuing, and recommendations for modifications to the programs; 2) explore effect sizes for PA, behavioural regulations, and psychological needs among the three groups: dance, walk, and wait-list control; 3) gain insights into participants' perspectives and experiences with dancing and walking sessions; and 4) identify, analyze, and describe any emergent themes reflective of participants' voices.

2.2 Methods

2.2.1 Trial Design

This mixed methods feasibility study used an open parallel randomized controlled trial and sequential explanatory design and followed CONSORT guidelines for pilot and feasibility trials (Eldridge et al., 2016). A feasibility study is done to establish whether an intervention is appropriate for further testing on a grander scale (Bowen et al., 2009). A sequential explanatory design is defined by collection of quantitative results first, and using them to inform the subsequent qualitative method of data collection (Pluye & Hong, 2014).

In this case, a three-arm trial with four measurement periods was used; the arms included the wait-list control group, dance group, and walking group. The primary researcher both enrolled participants and generated the randomization sequence. Randomization followed a permuted block design and participant allocation satisfied a 1:1:1 ratio, such that equal numbers of participants would be assigned to each of the three arms of the study. The random allocation sequence was concealed in a locked file. The randomized controlled trial occurred in two consecutive waves so that PA groups were manageable in size for one instructor to lead (e.g., approximately 10 women on a walk or in a dance session at a time). Measurement points were at baseline, six weeks (intervention endpoint), and 12 weeks (follow-up). Qualitative data were collected at the conclusion of the six-week programs via program evaluation questionnaires and focus group interviews. The University of Victoria Human Research Ethics board granted ethical approval for this study to proceed.

2.2.2 Eligibility Criteria

Eligible participants were English-speaking, community-dwelling women aged 55-70 years. At baseline, participants self-reported that they were not engaging in more than 150 minutes of moderate-to-vigorous PA per week and were able to walk and climb stairs without the

use of an assistive device. Participants were medically-cleared to increase their PA, as indicated by the Physical Activity Readiness Questionnaire for Everyone (PAR-Q) (Canadian Society for Exercise Physiologists, 2012). Participants were excluded from the study if they developed a life-threatening illness, required surgical intervention, or moved into long-term care.

2.2.3 Intervention

Participants randomized to the PA intervention arms participated in a six-week program with two weekly one-hour sessions of either studio-based group dance classes or outdoor group walks; these took place in the fall months of 2015. Both PA intervention programs were led by the primary researcher and were designed to encourage psychological need satisfaction as per SDT; Table 1 provides a summary of included behaviour change techniques (see Appendix 3 for additional details).

Walking Group

Each walk was organized in the same way: warm-up, effort phase, cool-down, and stretch. Participants were able to choose their pace under the directive of warm-up (easy pace to warm and lubricate the joints), effort phase (increased walking pace to breathe harder, perspire, and raise heart rate), or cool-down (gently bring the walking pace and heart rate down in order to cool the body). They also had a five-minute window to lengthen their effort phase or lengthen their cool-down of the walk. There were a few options for stretches that targeted the same muscle groups so that participants could select the one that best suited their bodies and abilities. Competence was addressed in that the walking program was graded in intensity; it was modelled after the Sole Sisters Women's Only Walking Clinic, which was founded and created by Mena Westhaver in Victoria, BC. Westhaver is a registered and certified Level IV Trainer of Trainers and Evaluator of Supervisors of Fitness Leaders & Weight Room Supervisors (M. Westhaver,

personal communication, August 2015). Finally, relatedness was promoted in the group walks: the leader encouraged conversation amongst group members and engaged with everyone by moving to different spots within the group.

Dance Group

Similar to the walking program, the dance program also promoted psychological need satisfaction, followed a structure with warm-up, active movement, and cool-down, and was graded in intensity. The leader provided an autonomy supportive environment by allowing participants to choose what level or difficulty of a skill they wished to perform and giving time for free and improvised dance. Competence was supported in that exercises and dance sequences were introduced in a graded manner, with many opportunities for repetition in order to get the movements grounded in the mind and body. This included learning a short modern choreographic phrase over the six weeks. The group practiced this dance all together and it lasted approximately one and half minutes. Finally, relatedness was brought into the program by: dancing as a unit or in partners; engaging in conversation before and after class; group breathing in warm-up and cool-downs. This program was also modelled after an existing community course; “Rust” was designed for older bodies that are not regularly active and is taught by freelance dance artist Kathy Lang at Raino Dance in Victoria, BC. Lang, with over two decades of experience as a professional dancer, instructor, and choreographer, provided training and guidance to the primary researcher in order to delivery this dance program (K. Lang, personal communication, July 2015).

Waitlist Control Group

This group was instructed to continue on with their usual day-to-day activities. They were offered to partake in either, or both, of the PA interventions upon conclusion of the study. These

wait-list programs that began in late January 2016 were also open to any participant who wished to join. That is, if a participant was randomized to the dance group, and wanted to try the walking, she had the opportunity to do so, and vice versa.

Table 1: Summary of behaviour change techniques across interventions

Behaviour Change Technique	Definition/Description	Dance Program	Walking Program
Set graded tasks	Behaviours were broken down into smaller, more manageable tasks	X	X
Prompting generalization of a target behaviour	Participants were encouraged to try performing PA in another situation or setting.	X	X
Prompt self-monitoring of behaviour	Participants were asked to complete questionnaires about their PA behaviour at baseline, post-intervention, and follow-up (12 weeks)	X	X
Provide information on where and when to perform behaviour	Participants were provided with a list of opportunities in the community to participate in dance classes or walking programs/clinics (included details on location and cost)	X	X
Provide instruction on how to perform the behaviour	Verbal instructions were given on how to be physically active via walking or dancing. Walkers were instructed on proper walking mechanics, footwear, and building endurance. Dancers were instructed about alignment, breathing, technique and musicality.	X	X
Model/demonstrate the behaviour	Demonstrations of how to perform walking and dancing were provided. The leader physically modelled proper walking mechanics and wore appropriate footwear. The leader also modelled dance technique, breath, how to count music/beats, and how to engage the right muscles to find body	X	X

alignment.

Plan social support/social change	Participants were prompted on how to elicit social support from others to help them engage in PA (e.g. buddy system)	X	X
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2.2.4 Procedures

The primary researcher recruited study participants from July to October 2015 with a goal of 10 participants per group to emulate typical community enrollment in group-based dance and walking programs. Brochures and posters were distributed throughout the community in recreation centres, medical offices, coffee shops, and senior centres. The primary researcher was also interviewed regarding the study, which resulted in a newspaper article that listed a call for participants.

During recruitment efforts, interested parties were invited to contact the researcher and set-up a screening and enrollment appointment. Following screening, the researcher explained the study and participation requirements and provided the informed consent form. After providing informed consent and completing baseline questionnaires, each participant was randomized to one of the three intervention arms. Those participants randomized to one of the PA arms were enrolled in Wave 1 of the intervention, beginning in September 2015. Any participants recruited during this time that were randomly assigned to the wait-list arm had their own timeline starting from the date of their baseline assessment. While Wave 1 was occurring, recruitment efforts continued using the same protocol until Wave 2 began in late October 2015. Like those in Wave 1, wait-list participants followed their own timeline beginning from the date of their baseline assessment.

2.2.5 Feasibility Measures

Recruitment Rate

Recruitment rate was calculated as the number of randomized participants divided by the number of screened participants.

Intervention Adherence

Adherence was measured by participant attendance rates in the two intervention arms of the study. The intervention instructor recorded attendance within the first ten minutes of each intervention session.

Retention

Participant retention was calculated at the primary (six weeks) and secondary (12 weeks) endpoints.

Intervention Satisfaction and Evaluation

At the conclusion of the six-week programs, participants completed a satisfaction and evaluation questionnaire using open-ended questions to assess overall impressions (e.g., two things you liked, two things you would change, etc.) and close-ended program structure questions (e.g., program length, session duration, location, ease/difficulty of program, etc.).

Interest in Continuation

Participant interest in continuing was assessed during the qualitative focus group interviews with open-ended questions.

Wait-list Program Attendance

Waitlist program attendance was assessed as the number of wait-list control participants that returned to attend the wait-listed dance and walking programs divided by the number of total wait-list control participants.

Adverse Events

Events such as physical injury were recorded and categorized as unsure if related, unrelated, possibly related, or definitely related.

2.2.6 Quantitative Measures

Physical Activity

PA was measured by self-report using the Godin Leisure-Time Exercise Questionnaire (GLTQ) (Godin, 2011). This questionnaire includes three open-ended questions for reporting frequency and duration of mild, moderate, and vigorous physical activity. It has been shown to be valid and reliable in different settings, populations and countries (Gionet & Godin, 1989; Godin, 2011). Participants were advised to only record PA done during leisure time (e.g., not occupation or housework). For the purpose of this study, only moderate-to-vigorous data were extracted, which is in accordance with Canadian PA guidelines (Canadian Society for Exercise Physiologists, 2014).

Behavioural Regulations

Behavioural regulations were measured using the Behavioural Regulations in Exercise Questionnaire, version 2 (BREQ-2) (Markland & Tobin, 2004). The BREQ-2 is a measure of behavioural regulations of PA behaviour according to SDT (Markland & Tobin, 2004; Mullan, Markland, & Ingledew, 1997). It assesses the continuum of regulations in the exercise context: amotivation, external regulation, introjected regulation, identified regulation, and intrinsic motivation. The validity of the updated BREQ-2 was shown to be good with a population with mean age of 54 years; reliability coefficients were considered acceptable (Markland & Tobin, 2004). The baseline assessment of behavioral regulations was conducted in week one of the intervention programs instead of prior to intervention commencement as this tool uses past-tense

terminology and thus would not accurately measure regulations for a program that participants had yet to experience.

Psychological Needs

Psychological needs were measured using the Psychological Need Satisfaction in Exercise Scale (PNSE) (Vlachopoulos & Michailidou, 2006; Wilson, Rogers, Rodgers, & Wild, 2006). The PNSE measures the satisfaction of the three basic psychological needs autonomy, competence, and relatedness in an exercise setting. This instrument has been validated with an older adult population and been shown to have acceptable reliability (Vlachopoulos & Michailidou, 2006). The baseline assessment of psychological need satisfaction was conducted in week one of the intervention programs instead of prior to intervention commencement as this tool uses past-tense terminology and thus would not accurately measure need satisfaction for a program that participants had yet to experience.

2.2.7 Qualitative Measures

Focus Group Interviews

On the final day of the PA programs, all participants were verbally offered to partake in the focus group discussions and given a consent form to take home. The one-hour focus groups were conducted one week following the end of the PA programs, with one interview for dance group participants and one for walking group participants. The questions were developed to assess overall participant experiences and impressions and expand on the quantitative data collected from the Behavioral Regulations in Exercise Questionnaire-2 and Psychological Need Satisfaction in Exercise Scale, which both evaluate key constructs of SDT. Question examples for psychological need satisfaction are listed below:

1. For what reasons did you sign up for and continue to participate in the program?
(Autonomy)

2. What do you feel you have accomplished? How have your skills and knowledge of different activities improved, if at all? (Competence)
3. Describe the relationship you have had with others in this dance/walking group. How did this influence your experience, if at all? (Relatedness)

Table 2: Measurement times

Item	Baseline	1-week	6-week (post-intervention)	12-week (follow-up)
Feasibility measures and focus group interview*			X	
MVPA/PA	X		X	X
Behavioral regulations*		X	X	
Psychological needs*		X	X	

*Only measured in the intervention arms (dance and walking groups)

2.2.8 Analytic Plan

Feasibility measures were first assessed, followed by quantitative and then qualitative findings according to the sequential explanatory mixed methods design.

Quantitative Analyses

Prior to running any quantitative analyses, the data were evaluated for missingness. Little's Missing Completely At Random (MCAR) Test was conducted to ensure that data were not significantly associated with dependent or demographic variables (age, education, minority, marital status, and employment status). Since Little's MCAR test was non-significant ($\chi^2 = .000$, $DF = 44$, $p = 1.000$), the data could undergo multiple imputations (Schafer & Graham, 2002). This method has previously been used in PA randomized controlled trials (Jeffery et al., 2009). All statistical analyses were conducted using SPSS version 23.0 software for Windows. Descriptive statistics were computed for the study constructs and data were assessed to ensure they met assumptions for analyses. An independent t-test was used to compare program

attendance between the two intervention arms. Analysis of Co-Variance (ANCOVA) tests were used to compare PA data and SDT constructs among the three groups, while controlling for baseline PA values (co-variate); PA data were evaluated at the primary (six weeks) and secondary endpoints (12 weeks). ANCOVAs are the preferred method of analysis in randomized trials with baseline and post-intervention measures; they are generally superior to the non-parametric Mann-Whitney test in most situations with non-normal data (Vickers, 2005). Effect size d was calculated as follows: $d = (\text{group1 mean change score} - \text{group2 mean change score}) / \text{pooled standard deviation at baseline}$ (Eather, Morgan, & Lubans, 2013). Effect size conventions followed Ferguson's (2009) recommendations: minimum practically significant effect ($\eta^2 = .04$; $d = .41$), moderate effect ($\eta^2 = .25$; $d = 1.15$), and strong effect ($\eta^2 = .64$; $d = 2.70$).

Qualitative Analyses

Program evaluation questions were administered during the final session of the six-week PA programs and responses were inputted into Microsoft Excel 2011, tabulated and summarized. Audio-recorded focus groups were conducted following the conclusion of the six-week dance and walking programs. An assistant aided the primary researcher in transcribing the audio. NVivo 11 (QSR International) software was used for data management and organization. The analysis of focus group data adopted an orientational perspective, which is defined as follows: 'Orientational qualitative inquiry begins with an explicit theoretical or ideological perspective that determines what conceptual framework will direct fieldwork and the interpretation of findings' (Given, 2008). The inquiry began with an SDT lens, using the three psychological needs as general guiding constructs for open coding of the data. For example, using an editing analysis approach (Crabtree & Miller, 1999), open coding of concepts autonomy, competence, and relatedness described participants' experiences as being enjoyable, re-energizing,

challenging, and collegial. After this preliminary and data reduction analysis of the data using the psychological needs categories, the primary researcher summarized the data with exemplary quotes and sent them to participants for member-checking. Two of the 11 member checks were lost to follow-up; the returned member-checks showed that participants felt the data summaries were accurate. Upon a further thematic analysis of the data, using more interpretive strategies such as clustering, factoring and axial coding (Strauss & Corbin, 1990), an important emergent theme was identified: leadership in the walk and dance groups, which transformed the data from categories to themes (Morse, 2008). The guiding constructs of autonomy, competence, and relatedness helped to reveal an underlying pattern of leadership from the PA leader in both groups. In the results section, the data are recontextualized in terms of the current literature and theory of servant leadership and SDT (Morse, 2008). Data saturation, the point at which no more new information exists in the data, was thought to be reached. As per Fusch and Ness (2015), the focus groups in this study adhered to the recommended size, there were enough people to elicit several viewpoints on the topics of interest, the primary researcher consulted with her committee member on coding, and she avoided use of singular phenomena that showed only the dominant perspective of one participant. It should be noted that the primary researcher consulted with her committee member regarding analysis, theming, and data presentation.

Establishing Trustworthiness

A number of strategies were implemented to ensure trustworthiness of the data (Creswell, 2003). Data were triangulated from at least two of the following sources to build a sound reasoning for themes: quantitative survey results, qualitative program evaluation responses, use of theory, peer debriefing with a member of the supervisory committee, and focus group transcripts. Member-checks were also conducted to solidify the accuracy of the focus group

analyses. Furthermore, the primary researcher sought to provide a rich description in the presentation of the themes. Finally, the primary researcher acknowledges the bias she brings to the research. She trained for eight years in Cecchetti ballet, 12 years in nationally competitive rhythmic gymnastics, and four years in modern and contemporary dance with additional courses in modern choreography. Her teaching experience also spans seven years and she currently continues to train in contemporary dance. She places much value on dance as an emotional and creative outlet, a social support system, a source of physical challenge, and a stress-reliever. Though she is also a recreational runner, she has less experience in walking/hiking and leading walking groups. She acknowledges the many benefits of walking, especially outdoor routes where time is spent in nature, and that it is a much more accessible activity to the general public (Canadian Fitness & Lifestyle Research Institute, 2016).

2.3 Results

2.3.1 Participants

Baseline characteristics are presented in Table 3. The mean age of participants was 62.8 years (SD = 4.8) and they were predominantly well-educated, retired, Caucasian women. At baseline, participants were engaging in an average of 48.8 minutes (SD = 48.6) of moderate-to-vigorous PA. There were no differences between the three groups in terms of any demographic variables.

Table 3: Baseline demographic data

Characteristic	Overall (n = 36)	Control (n = 13)	Dance (n = 11)	Walk (n = 12)	Effect size (η^2)	<i>p</i>
Mean age in years (SD)	62.8 (4.8)	62.8 (4.9)	63.8 (4.3)	61.8 (5.5)	.030	.601

% completed university	69.5	69.2	63.6	75	n/a	.840
% visible minority	5.6	7.7	9.1	0	n/a	.582
% retired	58.3	61.5	54.5	58.3	n/a	.942
% married/ common-law	66.7	69.2	63.6	66.7	n/a	.959
Mean minutes of moderate-to-vigorous PA (SD)	48.8 (48.6)	57.3 (47.7)	41.4 (46.0)	46.3 (52.7)	.019	.727

2.3.2 Feasibility

Recruitment Rate

Ninety-four women were screened for this study over a three-month period; 57 were excluded as they did not meet eligibility criteria ($n = 19$), declined to participate ($n = 21$), or other reasons, such as scheduling conflicts ($n = 17$). Thirty-seven participants were randomized within the study: 13 to the wait-list control, 12 to the dance, and 12 to the walking group; overall 39% of screened individuals were randomized. Two participants dropped out of the study after the PA programs began due to the following: personal reasons ($n = 1$) and the PA program did not meet expectations ($n = 1$) (Figure 1). One of the two participants that dropped out requested that her data not be used in any analyses or presentations therefore the baseline n value is 36 and not 37 (Table 3).

Intervention Adherence

Of the 12 sessions, the dance group participants attended an average of 9.55 (SD = 1.97) sessions and the walking group participants attended an average of 9.92 (SD = 1.93) sessions. An

independent t-test showed no significant difference between the experimental groups for adherence: $t(21) = -.457$, $p = 0.653$, $d = .20$.

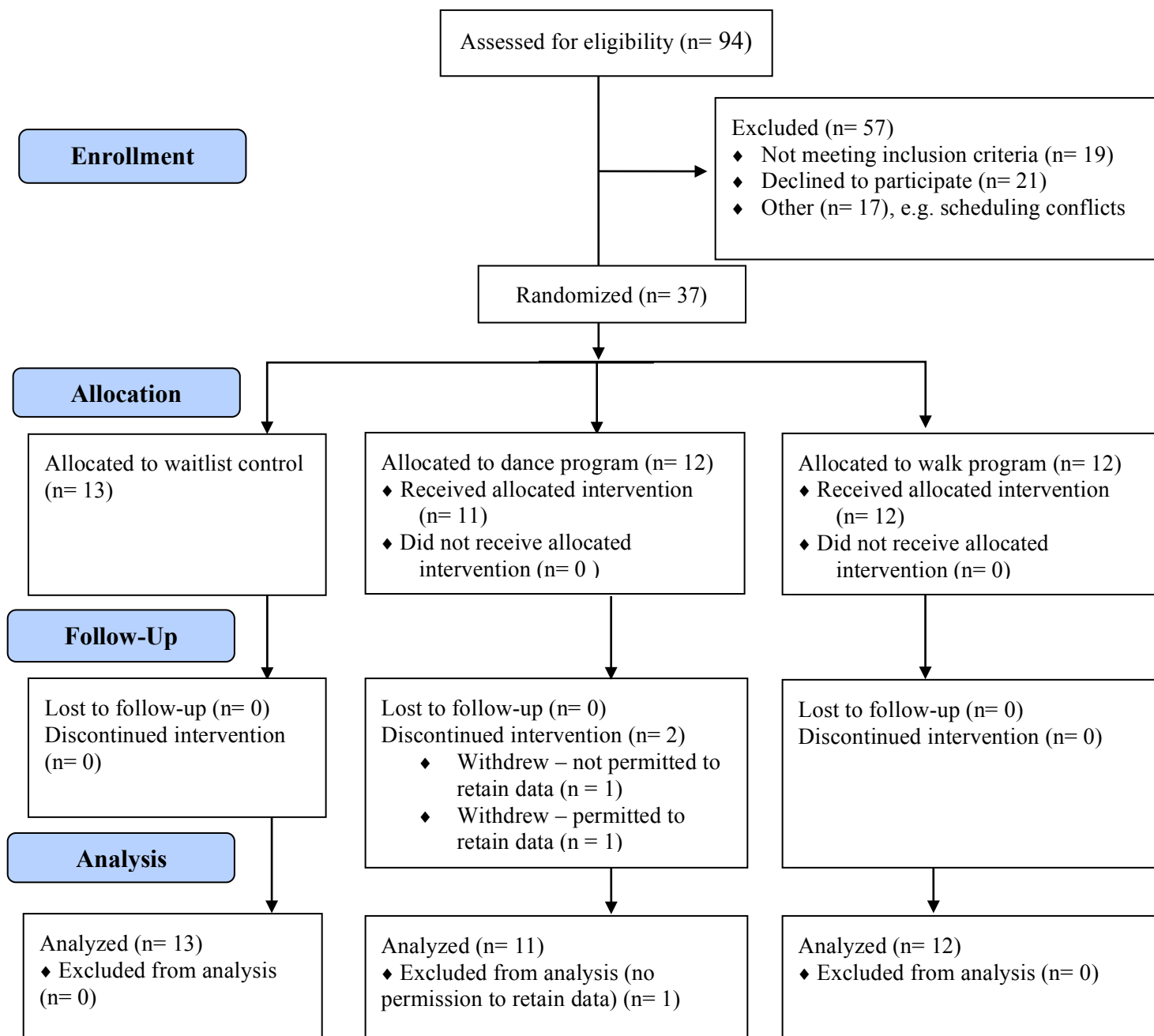


Figure 1. CONSORT flow diagram of enrollment, allocation, follow-up, and analysis

Retention

Of the 37 enrolled and randomized participants, 35 completed the study protocols, representing a 95% retention rate at the primary and secondary endpoints; this value is indicative of a strong trial (80-100% retention) (Jackson & Waters, 2005).

Intervention Satisfaction and Evaluation

Dance program. The three most common words used to describe the overall experience in the dance group were: fun (n = 8), challenging (n = 3), and enjoyable (n = 2). When asked about two things they would keep the same, participant responses were as follows: movement vocabulary and development of body and spatial awareness (n = 6), the instructor (n = 5), music (n = 4), and the choreographed routine (n = 4). When asked about two things they would change, participants responded as follows: content change, e.g., fewer repetitions, less movement complexity, no floor work, more stretching, etc. (n = 7), logistics, e.g., parking challenges, location too far away, etc. (n = 4), more intense cardiovascular workout/more like an aerobics class (n = 3), and would change nothing (n = 3). Finally, when asked about the single most important thing they learned, they said: how good and joyful it is to dance (n = 5), body awareness (n = 3), and body competence (n = 2).

Walking program. The three most common words to describe the overall experience were: friendly/collegial (n = 5), revitalized/re-energized (n = 4), and accomplished/improved (n = 3). Participants wished to keep the same: number of walkers/companionship (n = 5), regular scheduling (n = 4), location and route variety (n = 3), pacing and intensity of the walks (n = 2), and leader (n = 2). For walk participants, responses were to change: structure and timing, e.g., session length, program length, time of day, start time, etc., and nothing (n = 7). Finally, the most important things they learned were: body awareness (n = 7) and that they can keep committed to a regular walking group (n = 2).

Interest in Continuation

Participants were asked during the focus group interviews about their interest in and comfort to continue on in their respective physical activities (group-based dancing or walking). Participants in both groups expressed enthusiasm to continue. In the walking group, participants described the value of having a leader for their walks and that the group setting aids in their commitment and accountability to show up for themselves and be active. For example, participant #39 explained:

but the thing about walking in a group, it just makes it much more fun. And it-it, for me, I need I need to be disciplined because on my own I can think of a million and one reasons why I won't do it. So, but if there's a group waiting, oh well then I get motivated and go, so I really appreciate the group motivation.

Similarly, participant #23 described that she did not want the program to end and her need for structure and the group: “Cause I, I do need that... obligation: ‘Oh it's 1:30 on Tuesday, I have to be somewhere and walk’”. In the dance group, participants were very interested in continuing, but did not know how to go about accessing something similar in the community. Participant #6 said: “I would like to continue but it's, I just don't know how—how to access that in the community”. Furthermore, participant #31 felt that access and affordability were considerations for her to continue:

I don't know what's out there because I've never looked um, and I don't know what it's going to cost either, which is always a consideration for me anyway um, pensions are very meager but I would really like to continue.

Overall, no participants stated disinterest in continuing; they only showed enthusiasm in keeping the programs up and possibly doing more.

Wait-list Program Attendance

There was an attendance rate of 53.8%; that is, seven of 13 wait-list control participants attended the wait-listed dance and/or walking programs.

Adverse Events

There were no reported experiences of harms or adverse events related to the study.

2.3.3 Quantitative Data

Table 4: Moderate-to-Vigorous PA data across groups and endpoints

Mean Minutes of MVPA	Overall (n = 36)	Control (n = 13)	Dance (n = 11)	Walk (n = 12)
At endpoint (SD) [95% CI]	148.5 (95.6)	117.5 (93.3) [60.6, 167.4]	179.4 (111.5) [124.5, 240.3]	153.8 (78.5) [99.5, 210.0]
At follow-up (SD) [95% CI]	139.8 (172.4)	80.0 (99.9) [-20.4, 175.1]	200.9 (255.6) [97.1, 308.9]	148.6 (128.9) [48.2, 250.7]

Note. 95% Confidence Intervals were estimated from the model including the co-variate (baseline MVPA = 48.8)

Primary Endpoint

There was a small-to-moderate effect ($\eta^2 = .091$) of Intervention Group on minutes of MVPA at six weeks after controlling for baseline MVPA, $F(2,32) = 1.593$, $p = 0.22$. Pairwise comparisons are displayed in Table 5.

Table 5: MVPA post-hoc paired comparisons of the three interventions at the primary endpoint (six weeks)

Intervention	Intervention	Effect size (<i>d</i>)	p
Control	Dance*	1.66	.087
	Walk*	0.94	.288
Walk	Dance*	0.615	.486

*Favoured group

Secondary Endpoint

Overall there was a small-to-moderate effect ($\eta^2 = .091$) of Intervention Group on minutes of MVPA at 12 weeks after controlling for baseline MVPA, $F(2,32) = 1.591$, $p = 0.22$.

Pairwise comparisons are displayed in Table 6.

Table 6: MVPA post-hoc paired comparisons of the three interventions at the secondary endpoint (12 weeks)

Intervention	Intervention	Effect size (<i>d</i>)	p
Control	Dance*	2.91	.087
	Walk*	1.59	.305
Walk	Dance*	1.15	.460

*Favoured group

Comparison of Experimental Groups to Control Group

Primary endpoint. There was a small effect ($\eta^2 = .076$) of Intervention Group on minutes of MVPA at six weeks after controlling for baseline MVPA, $F(1,33) = 2.732$, $p = 0.11$. There was a moderate effect for the mean change over six weeks in MVPA between the experimental groups and the control group ($d = 1.27$), favouring the experimental groups.

Secondary endpoint. There was a small effect ($\eta^2 = .075$) of Intervention Group on minutes of MVPA at 12 weeks after controlling for baseline MVPA, $F(1,33) = 2.658$, $p = 0.11$. There was a moderate-strong effect for the mean change over 12 weeks in MVPA between the experimental groups and the control group ($d = 2.19$), favouring the experimental groups.

Behavioral Regulations

Amotivation. There was no effect ($\eta^2 = .010$) of Intervention Group on amotivation at six weeks after controlling for baseline amotivation, $F(1,20) = 2.227$, $p = 0.160$. There was no effect for the mean change over six weeks between the dance and walking groups for amotivation ($d = .281$).

External regulation. There was no effect ($\eta^2 = .026$) of Intervention Group on external regulation at six weeks after controlling for baseline external regulation, $F(1,20) = .533$, $p = 0.524$. There was no effect for the mean change over six weeks between the dance and walking groups for external regulation ($d = .205$).

Introjected regulation. There was no effect ($\eta^2 = .003$) of Intervention Group on introjected regulation at six weeks after controlling for baseline introjected regulation, $F(1,20) = .055$, $p = 0.834$. There was a small effect for the mean change over six weeks between the dance and walking groups for introjected regulation ($d = .634$), favouring the walking group.

Identified regulation. There was a small-moderate effect ($\eta^2 = .204$) of Intervention Group on identified regulation at six weeks after controlling for baseline identified regulation, $F(1,20) = 5.152$, $p = 0.038$. There was no effect for the mean change over six weeks between the dance and walking groups for identified regulation ($d = .060$).

Intrinsic regulation. There was a small effect ($\eta^2 = .067$) of Intervention Group on intrinsic regulation at six weeks after controlling for baseline intrinsic regulation, $F(1,20) = 1.443$, $p = 0.253$. There was a small effect for the mean change over six weeks between the dance and walking groups for intrinsic regulation ($d = .508$), favouring the dance group.

Basic Psychological Needs

Autonomy. There was no effect ($\eta^2 = .007$) of Intervention Group on autonomy at six weeks after controlling for baseline autonomy, $F(1,20) = .215$, $p = 0.801$. There was a small effect for the mean change over six weeks between the dance and walking groups for autonomy ($d = 0.43$), favouring the dance group.

Competence. There was small effect ($\eta^2 = .040$) of Intervention Group on competence at six weeks after controlling for baseline competence, $F(1,20) = .847$, $p = 0.368$. There was a small effect for the mean change over six weeks between the dance and walking groups for competence ($d = .428$), favouring the dance group.

Relatedness. There was no effect ($\eta^2 = .007$) of Intervention Group on relatedness at six weeks after controlling for baseline relatedness, $F(1,20) = .138$, $p = 0.782$. There was no effect for the mean change over six weeks between the dance and walking groups for relatedness ($d = .235$).

Table 7: Self-determination theory variables for the experimental groups (dance and walk)

Variable	Baseline		Endpoint	
	Dance (n=11)	Walk (n=12)	Dance (n = 11)	Walk (n = 12)
Amotivation (mean, SD)	0.11 (0.30)	0.02 (0.07)	0.15 (0.33)	0.00 (0.00)
External Regulation (mean, SD)	0.18 (0.42)	0.19 (0.36)	0.08 (0.20)	0.17 (0.37)
Introjected Regulation (mean, SD)	0.67 (0.93)	1.61 (0.96)	0.72 (0.91)	1.06 (0.72)
Identified Regulation (mean, SD)	2.59 (0.83)	3.48 (0.77)	2.85 (0.68)	3.69 (0.36)
Intrinsic Regulation (mean, SD)	3.50 (0.68)	3.63 (0.54)	3.85 (0.28)	3.67 (0.54)
Autonomy (mean, SD)	4.58 (1.30)	6.14 (0.74)	5.58 (1.43)	6.69 (0.39)
Competence (mean, SD)	4.11 (1.85)	6.13 (0.52)	4.97 (1.64)	6.42 (0.64)
Relatedness (mean, SD)	5.47 (1.58)	5.03 (1.02)	5.84 (1.28)	5.71 (0.85)

Note. Scale range for behavioural regulations is 0-4. Scale range for psychological needs is 1-7.

2.3.4 Qualitative Data

Contextualizing Leadership

Taking an orientational approach with SDT led to deeper insights and the identification of leadership traits as emergent themes. Participants in both the dance and walking groups commented on their experience as it related to leader behaviour and their appreciation of the leader. In the program evaluation, seven participants responded that one of the two things they

would keep the same in the program was the leader. The data concerning leadership appear to fit well under the model of servant leadership. In reviewing participant expressions about leadership, three themes were identified that align strongly with characteristics of servant leadership: feeling welcomed, freedom to be me, and pointing us in the right direction. Themes are summarized in Table 8 and discussed below.

Table 8: Qualitative focus group data summary

Focus Group Theme	Description	Exemplary Quote	Psychological Needs	Servant Leadership Characteristic
Feeling Welcomed	A leader that fosters a trusting environment in which people feel accepted no matter who they are or what mistakes they might make. It involves empathy, letting go of any previous wrongdoings, and letting followers know that they will not be rejected.	“... it’s really pleasurable to be around women my own age and doing things where I don’t feel the pressure like you were talking about, that you can’t keep up or you can’t you know do the right thing or you look stupid or you know that kind of thing. I’m – I felt there was... it was really, very, widely accepted, anything that you could do and that made it so much nicer – so much nicer.” [participant #31]	Competence Relatedness	Interpersonal Acceptance
Freedom to Be Me	A leader that motivates people by enabling them, seeking to promote sharing of information and self-directed decision-making. This characteristic of the servant leader also includes placing intrinsic value on every follower, with the followers’ personal growth at the	“I have trouble leaving the house, um, um, from a psychological point of view. And it proved to me that I could do that twice a week and my whole life wasn’t shattered; I could still get stuff done [laughs]. Um, and so uhh, what that uhh, translates into for me is that I can give this gift to myself. I can take the time to uh, dance or walk or do something physical, um and still, yeah, still get other stuff done.” [participant #6]	Autonomy Competence	Empowering and Developing People

forefront.

Pointing Us in the Right Direction	A leader mechanism to ensure that followers know what is expected of them. It also allows the servant leader to tailor the expectations of each follower to his/her abilities and personal input.	“It was um, do it as you can and as best as you can if you want to. So I... that way you weren’t looking around to make sure you haven’t done something wrong so that made it a lot more fun.” [participant #26]	Autonomy Competence	Providing Direction
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Theme 1 – Feeling welcomed. Interpersonal acceptance involves empathy, letting go of any previous wrong-doings, and letting followers know that they will not be rejected. Between both groups, there were more than nine participants who expressed examples of interpersonal acceptance voiced with specific comments, nods, and vocal agreements from the leader. For example, one woman stated:

Yah, I really enjoyed the whole thing, I would just make the class a bit longer ... uh and more frequent! [Laughs]. But um yah it was nice to be in a group that we were all in the same kind of boat. And you know, nobody would judge anyone because we were just kind of a-struggling, sometimes [laughs]. [participant #11]

Her description of her experience echoed not only interpersonal acceptance, but constructs of SDT too. She felt the enjoyment of being with her own peer group (relatedness) and that her abilities were sufficient – she did not worry about competence because the environment accepted her the way she was. In the same vein, participant #31 described her experience in the program evaluation as enjoyable, despite changes in her physical abilities, of which the group was

accepting: “There are some things I can no longer do, but I can still enjoy”. Participant #26 also described the accepting environment set by the leader: “I like the way the class was uh, non-judgmental, it wasn’t about being better than the other person or trying to keep up with somebody else or doing everything exactly the way it’s supposed to be”. Participant #26’s comments also touched on the competence construct of SDT: whatever your abilities were, you were welcome and supported by the leader. Furthermore, a fourth participant described the leader and elaborated on how accepted she felt, no matter how often she could attend the program:

Sympathetic, um compassionate, um easy-going, ’cause I had a ripped Achilles and I’d be hobbling along for part of it. And sometimes I couldn’t show and she was always um, very supportive no matter if I was letting her down, and I didn’t want to let her down [laughs in background], or the group. [participant #39]

Here in the context of a chronic ankle plague, #39 provided leader descriptors that match with those of servant leaders. Though her competence sometimes wavered, she felt no rejection from the leader. In a lighthearted way, she stated her wish to avoid disappointing the leader and the group. Lastly, a fifth participant described leader attributes and her appreciation of the environment and the experience of being part of a group of women (relatedness).

... When you mentioned kindness that-that triggered something in me because I think Samantha set the tone... Samantha was um, [throat cleared] I found her just really lovely and – and kind and... accepting of us and uh, and hopefully she um, hopefully [big sigh] she found that in us too. So thank you for the group. [participant #35]

Moreover, participants felt welcomed by the leader, in the environment created by the leader, and by others in the group. Interpersonal acceptance was also experienced in parallel with feelings of relatedness and competence.

Theme 2 – Freedom to be me. Across the two groups there were at least eight expressions describing the program empowering and developing people, with an emphasis on overcoming psychological barriers. For instance, one woman described her personal growth in physical and psychological terms, noting how enabling and competence-building the experience was for her:

I find that getting older has been difficult [laughs], for me anyway, and um psychologically I tend to say that I can't accomplish this or I can't do that or I-I kind of sit in my house and-and bemoan my fate and I-I tend to get wound up in my own head and this has really brought me out of that. And I realize how, how bad that is for me, to do that, to stay alone all the time thinking you know, 'I'm old and can't do anything' [laughs]. And it's-it's, you know, it seems silly saying it out loud but coming to this dance class has done more than physically um, enabled me to do more, it's uh mentally enabled me to get out of some of the pits that I dig for myself. [participant #31]

Another participant commented on her personal growth, with an emphasis on psychological benefits that encompass autonomy: the freedom of feeling connected to one's body again and being able to implement self-care.

Can I just add a little bit to what 31 said? Um, I – I to um, have spent a lot of ti – of [laughs] few years anyway um, being fearful or uh, of getting out of my house um, and I've taken and I've had a lot of counseling on this and uh I wish could concise this up um, normally the counselor would said 'Where's that in your body?' and I'm like 'I don't

know' [laughs] you know it's, I've been cut off, my body and mind almost, well yeah and so um, this was freeing. [participant #35]

Finally, participant #28 discussed overcoming psychological barriers in relation to menopause, emphasizing how the program helped her look at physical activity in a different way:

... Seemingly everything that goes wrong with you is something to do with menopause and um, I was finding that there was really nothing that I could get engaged with and – and I, when I got to sort of October-time I realize that I kinda over most of it and so, this was an opportunity for me to um, look at exercise in a different way 'cause I couldn't – I haven't been able to do anything just psychologically or any - for any reason for the last sort of four-five years. So this was a really good – the timing I guess was – was perfect for me.

Overall, participants shared stories of personal growth and enablement that were tied to their experience in the PA programs. With reference to the most important thing she learned, participant #46 commented in the program evaluation: “It reaffirmed the joy of movement. Interesting that the ballet lessons I took 55 years ago came in handy again!”; she could draw on childhood experiences and use them to reconnect to her body and the pleasure of moving. The collection of participant stories was situated within the context of aging, getting out of the home environment, and menopause. Participant comments heavily emphasized the construct of competence with some notes on autonomy.

Theme 3 – Pointing us in the right direction. Again in both groups more than seven participants recounted how the leader provided direction to the class. For example, participant #6 stated: “One of the things I really, really appreciated about the thing, was how responsive you were to our... um complaints really isn't the word, but um terror at certain things”. Participant #6

then referred to a specific example of when the leader guided the dance group through a plank series, which was intended to cultivate core strength. This exercise proved quite challenging to arrive in, due to difficulty with knees and/or hips. Hearing participant distress and discomfort with these movements, the leader dropped the activity and proceeded via another avenue to tap into core strengthening. Two other participants were also appreciative of the leader's directives and considerations of follower abilities. Participant #11 contrasted a prior experience with tango dancing and this contemporary dance program, emphasizing how the leader structured the activities to be inclusive and appropriate to the abilities of the group: "So this is fantastic because you don't need that partner, you can just make your mistakes and miss a step and all that and nobody's gonna care. No partner is better [laughs]!" Appreciation for directives was also evident in the walking program:

When we were walking the idea of looping around so bringing the slowest walkers to the front was-was brilliant. Uh and uh that wa- and Samantha did that consistently throughout. So it-it accommodated for speed and a variety of levels. Very, very good.

[participant #34]

In both of these comments, participants highlighted the constructs of autonomy ("you can make your mistakes and miss a step...") and competence ("accommodated for speed and a variety of levels"). An appreciation of directives and structure was also expressed in the program evaluation questions. Participant #40 was happy that she learned "how to engage" muscles in the proper body alignment. Additionally, participant #23 reported that she would keep the pace changes and timing the same; she stated: "It's allowed me to think about the structure of the walk. I hadn't actually considered that, that warming up, cooling down, increased pace... That did-- I didn't, never considered it before. So that was nice".

On the whole, participants described experiences of clear communication with the leader and understanding of program expectations. These sentiments included details related to the psychological needs of competence and autonomy.

2.4 Discussion

The purpose of this mixed methods feasibility study was to explore the feasibility of six-week SDT-based dance and walking programs for older women. The study objectives were to: 1) assess participant recruitment, intervention adherence, retention, satisfaction, and interest in continuing, and recommendations for modifications to the programs; 2) explore effect sizes for PA, behavioural regulations, and psychological needs among the three groups: dance, walk, and wait-list control; 3) gain insights into participants' perspectives and experiences with dancing and walking sessions; and 4) identify, analyze, and describe any emergent themes reflective of participants' voices.

The results of this study are summarized herein. In terms of feasibility, there was a 39% recruitment rate, combined 81% intervention adherence rate, 95% retention rate, and zero adverse events. In addition, only 7.7% of wait-list control data and 4.3% of experimental data was incomplete. Participants described a high degree of satisfaction and interest in continuing. Program evaluation data showed that there were certain logistical challenges such as limited parking and suggestions for some structure changes: collect survey data that does not interfere with program PA time, simplify dance sequences, fewer repetitions in dance sequences, and increasingly longer walks. On the whole participants were pleased with the programs and were enthusiastic about continuing to be active.

The quantitative objectives of this study were to explore effect sizes for PA, behavioural regulations, and psychological needs among the three groups: dance, walk, and wait-list control.

Effect size η^2 was used to represent the omnibus effects of the ANCOVA; effect size d was calculated to represent the difference in mean change over time between groups, using pooled standard deviations at baseline. Using Ferguson's (2009) conventions for social science data, there were small-to-moderate effect sizes for group on MVPA data at both the primary (six-week) and secondary (12-week) endpoints when controlling for baseline MVPA. For the experimental groups at the primary endpoint, there was a small effect over time favouring the dance group for MVPA; this effect was moderate at the secondary endpoint, again favouring the dance group. There was a moderate intervention effect of dance on MVPA and a small-moderate effect of walking on MVPA compared to the control group at both endpoints. For behavioural regulation data, there were no effects of group on amotivation or external regulation. For introjected regulation, there was a small effect for the mean change over time, favouring the walking group. There was also a small-moderate effect of group on identified regulation when controlling for baseline. There was a small effect of group on intrinsic regulation when controlling for baseline and a small effect for the mean change over time, favouring the dance group. Furthermore, for the psychological needs there were no group effects for autonomy or relatedness when controlling for baseline, but there was a small group effect for competence. For autonomy, there was a small effect for mean change over time, favouring the dance group. For the mean change in competence over time, there was a small effect favouring the dance group. Finally, emergent themes within the qualitative data highlighted the importance of leadership to the overall experience in the two group-based PA programs.

In the following sections the findings are discussed in terms of feasibility, moving ahead with a full-scale trial, integration of quantitative and qualitative findings within the SDT

literature, and the role of leadership. Strengths and limitations are also noted, as well as recommendations for future directions.

2.4.1 Feasibility

As a feasibility trial, one of the main objectives was to determine whether the intervention was appropriate for further testing. As such, several feasibility measures were taken to evaluate its acceptability. First, within a three-month recruitment period, the rate of recruitment (39%) was comparable to other PA studies (Hawkes, Gollschewski, Lynch, & Chambers, 2009; Lee et al., 2016). Second PA program attendance was high: the dancers attended an average of 9.55 (SD = 1.97) sessions out of 12 and the walkers attended an average of 9.92 (SD = 1.93) sessions out of 12. These data were not significantly different, even when accounting for weather conditions. Third, study protocol adherence was also high; 35 of 37 randomized participants completed the study, which was a 95% retention rate. Fourth, participants were satisfied with the overall experience and this was expressed in both program evaluation responses and the qualitative focus groups. Participants in both the dance and walking groups felt that the program length, difficulty, and session duration were either too short/too easy or just right. No one felt that any component was too hard or too long. In focus group discussion, participants showed how keen they were to continue on beyond the study dates. For example, one participant explained:

I'd like to continue to go, if I were going to be doing this same group or similar group. Um, I really like the pace you know I mean the understanding too, that we're not that weak at grabbing concepts [laughs]. And so I'd like to continue and if I could do more that would be even better [participant #11].

All of these indicators point to the acceptability of the intervention to participants and the ease with which the study was conducted. Though participants certainly made suggestions for modifications moving forward, nothing deterred participation in the current study and participants readily expressed their interest in continuing. Some suggested changes included having increasingly longer walks to account for endurance gains, changing the dance studio location to accommodate for parking challenges, coming in early on survey collection days so that time is not lost from the PA session, and longer dance classes.

Another important component of this feasibility study was to explore the effect sizes as a way to gauge whether a full-scale trial is worthwhile. Effect sizes, which provide estimates of the magnitude of the association between two or more variables, are relatively resistant to the influence of sample size. Therefore in a feasibility study such as the current one, the effect sizes give a better measure of the size of the effect among variables and provide a foundation for taking the feasibility to a full-scale trial. Of note, this study was not powered to detect moderate effects as is typical in PA trials, nor did this study aim to justify sample sizes using feasibility data (Kraemer, Mintz, Noda, Tinklenberg, & Yesavage, 2016). However, we followed Ferguson's conservative (2009) recommendations for effect sizes in social science data and found that PA findings were within the typical range of other PA intervention trials (O'Brien et al., 2015).

Given the promising effect sizes, participant satisfaction and interest to continue, as well as high study protocol adherence, a full-scale trial is recommended. A post-hoc power analysis to detect a moderate effect size at 80% power would require a sample size of at least 90 participants.

2.4.2 SDT & PA Interventions for Older Adults

Apart from recommending a full-scale trial of this study, it is important to consider how this study relates to existing literature on older adults and SDT-based and PA interventions broadly. The existing literature base on SDT-based PA interventions for older adults is limited. To date, only three studies (Lee et al., 2016; Solberg et al., 2013; Van Hoecke et al., 2014b) have reported on PA behaviour as a result of an SDT-based intervention. All three demonstrated high adherence rates to these interventions (>80%), yet less is known about PA behaviour following interventions; only one of these three studies followed-up with participants (Van Hoecke et al., 2014b). The current study aligns with the high intervention adherence rates and improves upon the literature base by including a follow-up on PA behaviour six weeks post-intervention.

In considering PA interventions for older adults more broadly, a number of systematic reviews and meta-analyses in the literature have appraised PA intervention effectiveness for older adults. In van der Bij, Laurant, and Wensing's 2002 review of 38 studies, three main intervention types were identified: home-based, group-based, and educational. Results showed that intervention participation rates were highest in group- and home-based interventions in the short-term (less than one year). As intervention durations become longer, participation rates declined. Data on the effectiveness of educational interventions varied greatly. Long-term effectiveness was inconclusive. In Conn et al.'s 2002 meta-analysis, the overall effect size for PA interventions on behaviour was $d = 0.26$, when weighted by sample size. This very modest effect was larger when the interventions were delivered in groups, used centre-based activity and intense contact time between interventionists and participants, recommended moderate intensity PA, included self-monitoring behaviours, and excluded general educational information on health. Finally, a recent review and meta-synthesis of qualitative studies on community-dwelling older adults in PA interventions revealed that fun and enjoyment of social interactions were

critical components for being active (Devereux-Fitzgerald, Powell, Dewhurst, & French, 2016). The current study situates well within the findings of these reviews: high participation rates in a group-based study (van der Bij et al., 2002); modest effect sizes (Conn et al., 2002); group- and centre-based, moderate-intensity activities with plenty (twice per week for six weeks) of intervention-participant contact time (Conn et al., 2002); and fun and social components of the intervention (group-based dancing with great music and group-based outdoor walking in scenic areas) (Devereux-Fitzgerald et al., 2016).

2.4.3 Behavioural Regulations and Psychological Needs

For the behavioural regulations, there were no differences between the dancers or walkers for amotivation or external regulation. For introjected regulation, there was a small effect for the mean change over time, favouring the walking group. There were small-moderate group effects for identified regulation when controlling for baseline, where the walk participants reported higher scores than did the dance participants. There was also a small group effect for intrinsic regulation when controlling for baseline, where the dancers reported higher scores than did the walkers; there was also a small effect for mean change over time, favouring the dance group. Furthermore, psychological needs data revealed no group effects for autonomy or relatedness. For autonomy, we note a small effect for the mean change over time, favouring the dance group. Additionally, there was a small group effect for competence, where walkers reported consistently high scores than dancers. There was a small effect for mean change over time for competence favouring the dance group: dancers reported competence increasing over time (though it was always less than that of walkers). It is important to consider these findings in the context of the current literature.

Recent research in SDT-based PA with older adults has provided motivational profiles for those who are regularly active and those who are not. Regularly exercising older adults tend to be high in intrinsic, self-determined extrinsic (integrated and identified), and introjected regulations; they are also low in external regulation (Ferrand, Martinent, & Bonnefoy, 2014; Kirkland et al., 2011; Stephan et al., 2010). Non-exercisers tend to be low in intrinsic and self-determined (integrated and identified) regulations and high in external regulations (Kirkland et al., 2011). The current study findings align well with these data – where participants regularly participated in PA for six weeks and reported low external regulations and high identified and intrinsic regulations at the primary endpoint. The differences between the dance and walk participants are not as easily situated in the literature.

To our knowledge, no other published studies have reported on differences in behavioral regulations and psychological need satisfaction between different types of PA. As such we refer to the qualitative focus group data collected in this study to contextualize our findings. Overall, walking was a familiar activity for all study participants, whereas dance was novel for all but one participant. In the quantitative data there were no group effects for autonomy and there was a small effect for the mean change over time favouring the dance group. When we compare to the qualitative data, some differences are highlighted: among walkers, there were many comments pertaining to autonomy and they were all positively oriented. For the dance participants, there were also many comments on autonomy, however some had a less positive orientation. The walk participants expressed that the program accommodated for personal needs and choices. They felt free to choose their walking speed and negotiate time constraints. In addition, it was clear that participants were engaged in the walking for themselves (e.g., to get in touch with their physical body again) and that they chose to be there. For example, walk participant #23 stated: “She

always said we could go at...at our pace whatever we could manage [agreement in background]”. The dance participants discussed ideas that fell under two sub-categories of autonomy. One was that participants did not enjoy when the class leader gave too much freedom in the session, that is, when they were given an improvised section of class. It seemed the experience of coming up with movement on one’s own was more nerve-wracking than freeing. The other was that participants appreciated the accepting class environment and that they were free to make choices that suited their bodies. For instance, participants could take breaks when necessary, or try body skills at the level that best suited how they were feeling; the novelty of the dance setting likely explains why it took participants some time to feel more comfortable and thus more autonomous. Similarly, findings for competence can be better understood with the integration of qualitative data.

Competence results showed that walk participants reported higher scores than did dance participants, but that there was a small effect for mean change over time favouring the dance group. Given that dance was a novel activity for almost all participants, they likely experienced a steep learning curve that was not present for the walkers. Dance is a complex activity involving body awareness, strength, flexibility, coordination, musicality, and emotional expression; walking was a common, accessible activity familiar to all participants. The qualitative data reflected these differences. Participant #26 explained how the dance experience was new and challenging:

I found it really challenging, um, because when I signed up I was, you could either do dance or you could do walking, and I was thinking of walking. I don’t dance. I never have. And I’m uncoordinated. So for me this was very challenging, um, a really different experience, it was really outside of my comfort zone.

In contrast, many of those in the walking group were already partaking in walking before the study, albeit at a lower intensity: “I considered myself a good walker and yet there was moments when I realized I could be better I could—I could perhaps make more effort” [participant #34]. Overall, walk participants were generally competent with walking and dance participants had more to learn and master in the activity.

The current findings for relatedness build upon other SDT-based PA research with older adults. Though there were no group effects, both the dance and walking groups reported increases in relatedness over time as they became more regularly active over the six weeks. The qualitative data demonstrated that both dancers and walkers felt they could relate to other women within their respective groups. Other studies have cited that relatedness satisfaction is greater in exercisers than non-exercisers (Kirkland et al., 2011) and that social/emotional benefits as a motive was the single significant discriminatory factor between newly active and regularly active women aged 60-69 years (Dacey et al., 2008). Relatedness and belonging appear to be important factors for older women in the PA setting.

2.4.4 Integration of Quantitative & Qualitative Findings

One of the aims of a sequential explanatory mixed methods design is to interpret the quantitative findings by mobilizing the qualitative findings (Pluye & Hong, 2014). The qualitative findings of the current study provided context and explanation for some of the quantitative results. Three themes emerged from the analysis of the qualitative data and they all related to leadership in the group PA setting: feeling welcomed, freedom be to me, and pointing us in the right direction.

In support of the qualitative thematic narrative, we present numeric evidence that mobilizes the qualitative findings. For theme 1, Feeling Welcomed, participants described the

interpersonal acceptance they felt from the leader as well as the other group members and how enjoyable it was to have a supportive group. From the quantitative data, we see that scores of relatedness increased over time in both the dance and walking groups, which follows logically given that all participants were unacquainted at the outset of the study. The development of feelings of relatedness is clearly demonstrated as participants discussed the kindness in the groups, where no matter your abilities, you felt accepted and could enjoy yourself. Again, the quantitative results support the narrative: results indicated that intrinsic regulation, which refers to the inherent pleasure derived from performing a behavior, was high throughout the study. There was also a small effect of group on intrinsic regulation when controlling for baseline. These results can be understood more deeply with insight from the qualitative data; participants described the dance program as fun, joyful, and novel and emphasized the enrichment that music brought to the experience. While the walking program was also described in positive terms, it lacked the musicality and novelty of the dance program. The data also supported theme 2, Freedom to Be Me.

For the theme Freedom to Be Me, participants described that the leader had facilitated personal growth experiences both on a physical and psychological level, which is indicative of the SDT constructs of autonomy and competence. Referring to the quantitative results, there were no group effects for autonomy when controlling for baseline, but there was a small effect for mean change over time favouring the dance group. The qualitative data support these findings to an extent and show some differences. Autonomy is defined as the urge to self-govern and be the causal agent of one's actions and participants described their experiences as ones where they re-connected with their bodies, became more body-aware, overcame psychological barriers (e.g., getting out of the house), and felt free. Differences between the dance and walk

participants were evident in the qualitative data. Dance participants discussed that while they felt free to be themselves, they found the experience of improvised dance to be a little anxiety-inducing rather than liberating. By contrast, the walk participants' comments were all positively oriented regarding autonomy. In terms of competence, the survey data showed a group effect where again walk participants reported higher scores than dance participants, but that the dance group showed a small effect for mean change over time. While there was much discussion around increased competence in the dance group, the competence-building presented itself in more than simply the dance activity. Participants highlighted how the experience got them engaging with their peers, committing to a program, and regularly looking forward to getting out of the house and joining the group; these improvements were likely not captured by the survey as it was specific to competence in the dance alone. In addition, dancing was a novel activity for all but one participant and generally involves more intricacies than walking: coordinating body parts, musicality, and spatial awareness, to name a few. For walk participants, high walking competence was well-captured by the survey and shown in the qualitative data too. Many participants felt they were pretty good walkers and yet they hadn't considered how much walking could be a more intense and structured activity until this program. They felt they had improved their endurance and ability to negotiate elevation changes on the different walking routes. Finally, there was also support for the third theme, Pointing Us in the Right Direction.

For the final theme of Pointing Us in the Right Direction, participants expressed their appreciation for clear directives from the leader as well as leader responsiveness to participant feedback. Much of this leadership theme had to do with competency and being supported by the leader. As previously noted, competence scores were greater in the walking group than the dance group. Still, dance participants felt their competence increased in ways that likely were not

captured by the survey; they also felt that the leader was responsive to feedback and provided options for different physical abilities. Walk participants also noted the provision of options for different fitness and ability levels. They described how the leader accommodated for different pace and fitness levels, so they knew what was expected of them: only their best on that day.

2.4.5 Servant Leadership

The relationship between servant leadership and SDT has been identified in the literature. From Greenleaf's (1977) early writings on the servant leader, he described how the servant helps followers to become healthier and more autonomous. In SDT it is posited that humans tend to evolve toward a coherent self, seeking to act as causal agents in their own behaviour (to feel autonomous), and that satisfaction of psychological needs leads to the most fulfilled and effective organisms. From these descriptions, it is clear that a relationship is present between servant leadership and self-determination. A servant leader can provide an environment rich in the nutrients necessary for self-determination: the basic psychological needs. The servant leader also needs to achieve self-determination in order to serve effectively (van Dierendonck, 2010). van Dierendonck (2010) described that a leader who has their psychological needs fulfilled will have enhanced self-motivation and thus mental well-being will ensue. This then creates a leader who is able to tap into their personal resources and is able to build positive, connected, and cohesive relationships with others, ultimately helping followers to achieve self-determination themselves. While the connection has been discussed in theory, there is limited study on the relationship, and even fewer avenues of research on the servant leader in the PA and exercise settings.

One of the reasons for limited research on servant leadership and self-determination is due to measurement issues surrounding servant leadership. There are at least seven different

measurement tools for servant leadership (Barbuto, 2006; Dennis & Bocarnea, 2005; Laub, 1999; Liden & Maslyn, 1998; Sendjaya, Sarros, & Santora, 2008; van Dierendonck & Nuijten, 2011; Wong & Davey, 2007), most of which have been developed separately by researchers and often loosely based on the original writings by Greenleaf (1977) (van Dierendonck, 2010). The tools have different numbers of items and target varying characteristics of servant leadership. A recent review demonstrated that there is no consensus on measurement of servant leadership (Parris & Peachey, 2013). In addition to measurement challenges, there is limited work on servant leadership in the PA, exercise, and sport milieu.

In reviewing the literature base, only a few empirical studies on servant leadership in the activity context were identified. Specifically, these studies have focused on servant leadership as a mode of coaching in sports settings (Hammermeister et al., 2008; Rieke, Hammermeister, & Chase, 2008). In the work by Rieke, Hammermeister, and Chase (2008), they aimed to evaluate how coaches were perceived by their athletes in terms of servant leader traits and how these traits were then related to motivation, performance, and other sport-related outcomes. Results showed that athletes who perceived their coaches as displaying servant leader traits were athletes that demonstrated higher levels of intrinsic motivation, were more satisfied, and performed better than athletes with non-servant leader coaches. This study provides some initial support for the link between servant leadership and self-determination in an activity setting as the athletes showed higher intrinsic motivation, which is essential to SDT.

While there is limited study on servant leadership in the activity setting, the current study provides some basis of qualitative knowledge to start advancing the literature base. To our knowledge, there are no studies on servant leadership with older adults (or older women) in the PA setting. As the servant leadership themes were emergent in this study, we did not collect any

data on the concept with existing measurement tools for servant leadership. Specifically, our three themes closely resonated with three of the key servant leader characteristics as described by van Dierendonck (2010): Feeling Welcomed with the trait Interpersonal Acceptance; Freedom to Be Me with the trait Empowering and Developing People; and Pointing Us in the Right Direction with the trait Providing Direction. These findings could act as a foundation for further study, where measurement of servant leadership in SDT-based PA interventions utilizes measurement tools of servant leadership (including those three traits), while still employing exploratory methods such as program evaluation and focus group interviews to further probe the concept of servant leadership.

2.4.6 Strengths

There are a number of strengths of this study. First, in using a randomized controlled design with a waitlisted control group, we helped control for attrition by offering the PA intervention programs to control participants at the end of the study. When the wait-list programs were offered, participants were free to choose between walking and dancing; they were also given the option to attend both if they so wished. Second, there was ecological validity in the PA programs; both were modelled after existing programs in the community. Third, the study also addressed knowledge gaps, where there is limited literature on SDT-based PA interventions for older adults and even fewer that compare different activity types. Fourth, by implementing a mixed methods design, we were able to use the qualitative findings to help explain the quantitative results as well as identify emergent themes from the focus group data and relate it to the quantitative results. Finally, the dance program was picked up by a local community centre and offered as a recreation option that started in September 2016; this strength is important to recognize in relation to the issue of knowledge translation and exchange (KTE).

Generally, uptake of research into real world practice is very slow, and sometimes, it does not happen at all. Green, Ottoson, García, and Hiatt (2009) discussed the pipeline of research into practice as being a 17-year process, where the flow of knowledge becomes more and more constricted, as the research has to pass several hurdles to meet quality standards for practitioners and policy makers but it does not necessarily fit the needs and demands of the specific context and practice. Thus, by the time an evidence-based product reaches the practitioner level, it might have little relevance or practical fit for the target population and context. The strength of the current research lies in the use of a strong design (randomized control trial) with a community basis that helped to bridge that gap between research and practice. Furthermore, in conducting the program evaluation with participants, we were practicing a two-way exchange of information that resulted in KTE.

2.4.7 Limitations

This study was not without limitations. As a feasibility study, the sample was under-powered to detect moderate effects. This sample was composed of healthy older women, which limits the generalizability of results as it does not represent older adults in poorer health or older men. In addition, the six-week intervention was short in duration; it may take longer for behavioural changes to take place (Alpert et al., 2009; Conn, Valentine, & Cooper, 2002; Keogh, Kilding, Pidgeon, Ashley, & Gillis, 2009). Participants volunteered to be in the study so they had some level of motivation for PA already in place; these participants may not represent unmotivated individuals. In addition the sampling frame, the list of all those within a population who can be sampled, is unknown in this study. When it comes to the PA data, there may be a lack of objectivity. Attendance was recorded across the intervention duration however the rest of the PA was self-reported by participants. There was also no measure of PA intensity to ensure

that both the dance and walk participants were achieving the same intensity levels in their sessions. Furthermore, caution should be used in reading the qualitative findings as the focus group data reflect only the views of those women that agreed to participate in the qualitative component of the study. It should also be noted that the focus group interviews were conducted by the interventionist and thus represent potential bias in the qualitative data when it comes to negative recall; participants may have been less likely to raise negative issues with the PA group leader facilitating the group interviews. Another limitation is that though member checks were conducted on the focus group data, two participants were lost to follow-up. Finally, an opportunity to conduct a negative case analysis was lost as one participant that withdrew early on in the study cited that the program did not meet expectations.

2.4.8 Future Directions

There are a number of avenues by which to expand this research in the future. It would be important to evaluate a longer trial with an extended follow-up to assess long-term intervention effectiveness; this could include extending the timeline between measurement points to help mitigate measurement fatigue. Also, as a consequence of the promising effect sizes and high adherence rates in this study, it would be worthwhile to expand this mixed-methods feasibility trial to a full-scale trial and include manipulation checks for the intervention content. In doing so, we would recommend powering to detect moderate effects at 80% power and collecting information on PA preferences prior to randomization to see if this might affect enjoyment or attendance or dropout. We also recommend evaluating either: 1) the choice of walking or dancing programs against a wait-list control group or 2) the walking program in comparison to the wait-list control group. In order to improve PA measurement, we recommend using accelerometers to track overall PA at time-points of interest, e.g., baseline for screening, post-

intervention, and follow-up. In terms of the theoretical approach, we suggest one that extends SDT and perhaps takes into consideration components of the social ecological model; additional measures might include habit (given the scheduled nature of the programs) and social cohesion to capture the group dynamics. In addition, we suggest exploring the leadership construct further, especially servant leadership. This could include more specific program evaluation questions on leadership style and behaviours, structured focus group questions, and perhaps a survey measure for the quantitative component of the study.

The advantage of including a program and process evaluation in the current study was that it could be used to inform future implementation. The community-based approach was viable and acceptable; however a studio other than UVic's McKinnon studio would be ideal as participants often struggled to find parking on campus during the busy daytime hours. Furthermore, future implementation of this trial should extend the dance sessions from 60 minutes to 75 or 90 minutes; participants felt that it was not enough time per session and the instructor would have preferred extra teaching time as classes in the community are typically in the 75-90 minute range. The walk participants also felt that sessions could be extended as the program progressed – incremental increases as their endurance and stamina improved. Future implementation could possibly use a mixed-methods approach with a concurrent triangulation design – collection of the quantitative and qualitative data simultaneously where neither method is given priority (Pluye & Hong, 2014). This design allows the researcher to confirm or corroborate findings and offset limitations inherent to one method with the strengths of the other (Creswell, 2003). For instance, given the limitations in measurement of servant leadership, collecting both survey data and qualitative data on leadership concurrently could help to understand the mechanisms of leadership in this study. Also, collecting qualitative program

evaluation data earlier in the study could help to make as-needed modifications or adjustments to meet participant needs.

2.4.9 Conclusion

Poor rates of PA in women over the age of 60 are alarming (Canadian Society for Exercise Physiologists, 2014; Colley et al., 2011). This feasibility study was novel in its comparison of two PA types under a self-determination lens in a sample of older, community-dwelling women. It also addressed a gap in the literature to increase knowledge on SDT-based PA interventions for older adults that were not meeting PA guidelines. The high study protocol adherence, promising effect sizes, program evaluation satisfaction, and the dance program being taken on by a recreation centre provide a foundation for expanding this trial to a full-scale study.

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Appendix 1: Quantitative Measures

Godin Leisure-Time Exercise Questionnaire

1. During a typical **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 on each line the appropriate number)?

When answering these questions please:

- ✓ Only count physical activity that was done during free time (i.e., not occupation, school or housework).
- ✓ Note that the main difference between the three categories is the intensity of the activity.
- ✓ Write the average frequency on the first line and the average duration on the second line.

Activity	Times Per Week	Average Minutes
a. STRENUOUS physical activity (HEART BEATS RAPIDLY, SWEATING) (e.g., running, jogging, hockey, soccer, squash, cross country skiing, vigorous swimming, vigorous aerobic dance classes)	_____	_____
b. MODERATE physical activity (NOT EXHAUSTING, LIGHT PERSPIRATION) (e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)	_____	_____
c. MILD physical activity (Minimal effort, no perspiration) (e.g., light yoga, archery, fishing from river bank, bowling, snow-mobiling, easy walking)	_____	_____

Behavioural Regulations in Exercise Questionnaire-2

WHY DO YOU ENGAGE IN THE DANCE/WALKING PROGRAM?

We are interested in the reasons underlying peoples' decisions to engage, or not engage in the dance/walking program. Using the scale below, please indicate to what extent each of the following items is true for you. Please note that there are no right or wrong answers and no trick questions. We simply want to know how you personally feel about the dance/walking program. Your responses will be held in confidence and only used for our research purposes.

Personally, I participate in the dance/walking program ...

		Not true for me	1	Sometimes true for me	2	3	Very true for me	4
1	because other people say I should	0	1	2	3	4		
2	because I would feel guilty if I didn't participate	0	1	2	3	4		
3	because I value its benefits	0	1	2	3	4		
4	because it's fun	0	1	2	3	4		
5	I don't see why I should have to participate	0	1	2	3	4		
6	because my friends/family/partner say I should	0	1	2	3	4		
7	because I would feel ashamed if I missed a dance/walking session	0	1	2	3	4		
8	because it's important to me to dance/walk regularly	0	1	2	3	4		
9	I can't see why I should bother dancing/walking	0	1	2	3	4		

	Not true for me		Sometimes true for me		Very true for me
10 because I would enjoy my dance/ walking sessions	0	1	2	3	4
11 I dance/walk because others will not be pleased with me if I don't	0	1	2	3	4
12 I don't see the point in dancing/walking	0	1	2	3	4
13 I feel like a failure when I haven't danced/walked in a while	0	1	2	3	4
14 I think it is important to make the effort to dance/walk regularly	0	1	2	3	4
15 I find dance/walking a pleasurable activity	0	1	2	3	4
16 I feel under pressure from my friends/family to dance/walk	0	1	2	3	4
17 I get restless if I don't dance/walk regularly	0	1	2	3	4
18 I get pleasure and satisfaction from participating in dance/walking	0	1	2	3	4
19 I think dancing/walking is a waste of time	0	1	2	3	4

Thank you for taking part in our research

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Psychological Needs in Exercise Scale

The following is a list of experiences and feelings that people may have when engaging in physical activity such as dancing/walking. Thinking about the dance/walking program, respond to each question (using the scale given), on the basis of how true that response is for you.

1	2	3	4	5	6	7
not at all						very
true for me						true for me

- ___ 1. I feel free to dance/walk in my own way.
- ___ 2. I feel attached to my dance/walking companions because they accept me for who I am.
- ___ 3. I feel that I am able to complete dance/walking exercises that are personally challenging.
- ___ 4. I feel free to make my own decisions in my dance class/walking program.
- ___ 5. I feel confident I can do even the most challenging dance/walking exercises.
- ___ 6. I feel like I share a common bond with people who are important to me when we dance/walk together.
- ___ 7. I feel a sense of camaraderie with my dance/walk companions because we participate for the same reasons.
- ___ 8. I feel like I am in charge of my dance/walk program decisions.
- ___ 9. I feel close to my dance/walk companions who appreciate how difficult the program can be.
- ___ 10. I feel confident in my ability to perform dance/walk exercises that personally challenge me.
- ___ 11. I feel like I have a say in choosing the dance/walk exercises that I do.
- ___ 12. I feel connected to the people who I interact with while we dance/walk together.
- ___ 13. I feel capable of completing dance/walk exercises that are challenging to me.
- ___ 14. I feel free to choose which dance/walk exercises I participate in.
- ___ 15. I feel like I am capable of doing even the most challenging dance exercises/walks.
- ___ 16. I feel like I get along well with other people who I interact with while we dance/walk together.
- ___ 17. I feel like I am the one who decides what dance/walk exercises I do.
- ___ 18. I feel good about the way I am able to complete challenging dance/walk exercises.

Appendix 2: Qualitative Measures

Program Evaluation Questions

Overall Impressions:

Please answer the following questions honestly about the physical activity program you participated in during this study (dancing/walking).

1. What are two things about the dance/walking program that you would keep the same?
2. What are two things about the dance/walking program that you would change?
3. What is the single most important thing you learned?
4. List three words or phrases that best describe your experiences.

Program Structure – (two 1-hour sessions per week for 6 weeks)

5. What did you think of the length of the dance/walking program? (Too long/just right/too short)
6. What did you think of the duration of the dance/walking sessions? (Too long/just right/too short)

7. What did you think of the location of the dance/walking program?

8. How did you find the level of difficulty of the dance/walking program? (Too hard/just right/too easy)

9. How much would you pay on a drop-in basis for a similar recreation program in the community?
 - a. \$5-10 per session
 - b. \$11-15 per session
 - c. \$16-20 per session

10. How much would you pay for a similar recreation program in the community?
 - a. \$50-59 for 12 sessions (6 weeks)
 - b. \$60-69 for 12 sessions (6 weeks)
 - c. \$70-79 for 12 sessions (6 weeks)
 - d. \$80-89 for 12 sessions (6 weeks)
 - e. \$90-99 for 12 sessions (6 weeks)

Focus Group Questions

Now that the dance/walking program has been over for about a week... we are interested in hearing about how the program relates to motivation about being physically active.

1. Describe your overall experience... Here are the most common words/phrases that participants used to describe their experience:

DANCE: Fun, challenging, enjoyable

WALK: Friendly/collegial, revitalized/re-energized, accomplished/improved

Was this true for you? Can you provide an example of how these words/phrases were experienced in the dance/walking program?

 - a. How would you describe your enjoyment and interest in this dance/walking program? (What did you like about it? What would you change?)
 - b. How have the activities you've done in the dance/walking program influenced your feelings towards physical activity in general?
2. For what reasons did you sign up for and continue to participate in the program?
3. To what extent do you think this experience has motivated you to be physically active?
 - a. Has there been enough variety?
 - b. Has the content been challenging, enjoyable, boring...?
4. What do you feel you have accomplished?
 - a. How have your skills and knowledge of different activities improved, if at all?
5. How comfortable are you to continue on with dancing/walking? Why or why not?
6. Describe how the dance/walking program accommodated for your individual modifications/adaptations, if at all? How did this influence your experience? What else would you have liked to have a say about, if anything?
7. Describe the relationship you have had with others in this dance/walking group. How did this influence your experience, if at all?

Appendix 3: Detailed Procedures & Intervention Content

Procedures

Prior to recruitment and data collection, the University of Victoria Human Research Ethics board granted ethical approval for this study to proceed. The researcher recruited study participants using a number of methods from July to October 2015. Recreation programmers in Vikes Recreation at the University of Victoria assisted with advertising, both in electronic and paper formats and using social media outlets. In addition, the researcher contacted local recreation centres to conduct presentations on the study and distribute paper advertisements and brochures. A presentation was also conducted at local women's group in the Greater Victoria Area with a reach of about 250 women. Finally, the researcher contacted a local community newspaper for an interview regarding the study resulting in an article publication that listed a call for participants.

During recruitment efforts, interested parties were invited to contact the researcher and set-up a screening and enrollment appointment. Screening and enrollment appointments took place in the Behavioural Medicine Laboratory at the University of Victoria. Following screening, the researcher explained the study and participation requirements and provided the informed consent form. Participants were given time to review the consent form and, if she so wished, take it home to discuss with family members, friends, or healthcare providers. Participants were given the right to withdraw from the study at any time without explanation or consequence; those who withdrew from the study were asked to complete a form to consent to the use of any data collected prior to withdrawal.

After providing informed consent and completing baseline questionnaires, each participant was randomized to one of the three intervention arms. The researcher conducted

randomization using electronic randomizing software with a permuted block design. The allocation sequence satisfied a 1:1:1 ratio, such that equal numbers of participants were allocated to each of the three arms of the study. The random allocation sequence was concealed in a locked file. Those participants randomized to one of the PA arms were enrolled in Wave 1 of the intervention, beginning in September 2015. Any participants recruited during this time that were randomly assigned to the wait-list arm had their own timeline starting from the date of their baseline assessment. While Wave 1 was occurring, recruitment efforts continued using the same protocol until Wave 2 began in late October 2015. Like those in Wave 1, wait-list participants followed their own timeline beginning from the date of their baseline assessment.

Interventions

Instructor Qualifications

The primary researcher was the intervention instructor, and led both intervention arms. The researcher trained as a nationally competitive rhythmic gymnast for 12 years and received supplemental dance training in ballet and modern as an adolescent; she continues to train in advanced modern dance and choreography at Raino Dance Studio in Victoria, BC. In addition, the researcher coached provincially competitive rhythmic gymnastics for five years and taught adult drop-in, open-level dance classes for one year in Vancouver, BC. Adult participants ranged in age from 20-65 years, with varying levels of experience and fitness. Furthermore, she volunteered in a long-term care facility in Vancouver, BC, for three and a half years, where she assisted with the occupational therapy programs for residents between the ages of 50-90 years. Finally, she volunteers with Special Olympics BC in the rhythmic gymnastics program (Vancouver and Victoria, BC). Working with Special Olympics athletes has given the researcher experience with younger and older women, where many athletes require physical adaptations.

Wait-List Control Group

This group was instructed to continue on with their usual day-to-day activities. They were offered to partake in either, or both, of the PA interventions upon conclusion of the study. These wait-list programs began in late January 2016 and all participants (no matter their assigned group) were invited to participate.

Dance Group

The dance group met twice per week for one-hour sessions over the six-week intervention period. Each session was conducted in the dance studio in the McKinnon Building at the University of Victoria. Sessions were broken down as follows: warm-up, active movement, and cool-down. The dance components of each session were graded in duration and intensity over the course of the intervention, as is recommended for individuals becoming more physically active (Canadian Society for Exercise Physiologists, 2014). The dance sessions in this study were grounded in ballet foundations and modern principles of movement. Ballet technique included pliés, tendues, dégagés, rond de jambes, port-de-bras, and grand battements (Grant, 1982). The modern approach included basics of Horton technique and Graham technique, exploring roll-ups, curves, contractions, tilts, and flat-back series, to name a few. Across the floor sets included triplets, tilts, tosses, and gallops (Legg, 2006, 2007). Over the six weeks, a short choreographic modern phrase was learned and practiced as a group dance, which lasted about a minute and 30 seconds.

The researcher modelled the study dance program after the “Rust” class taught by freelance dance artist/instructor/choreographer Kathy Lang at Raino Dance Studio in downtown Victoria, BC. Lang has over two decades of experience as a professional dancer, instructor, and choreographer; she has trained in dance since childhood and continued her education at the University of Calgary and Grant MacEwan College. Lang’s “Rust” is intended for older bodies

that are not regularly active. It is taught at a beginner dance level but modified to exclude jumps (for a low-impact experience) and reduce floor work (that can be difficult on the knees and hips) (K. Lang, personal communication, July 2015).

Walking Group

The walking group also met twice per week for one-hour sessions over the six-week intervention period. Each walking session took place in scenic areas surrounding the University of Victoria with walks starting and ending on campus. Each session included a warm-up, effort phase, cool-down, and stretch. Walks were graded in duration and intensity over the course of the intervention. An outdoor walking program was chosen, despite its effect on internal validity. Keeping the program indoors would control for aspects of nature and eliminate weather issues. However outdoor walking is more ecologically valid; most walking programs or clinics take place outdoors in scenic areas (Branco et al., 2015; Cheng et al., 2009; Diehr & Hirsch, 2010). In addition, since the walking program started and ended at the university campus, the site transportation issues will be the same for both the control and dance groups. The researcher modelled the walking program after the Sole Sisters Women's Only Walking Clinic, which was founded and created by Mena Westhaver in Victoria, BC. Westhaver is a registered and certified Level IV Trainer of Trainers and Evaluator of Supervisors of Fitness Leaders & Weight Room Supervisors. Westhaver trained the researcher as a walk leader for older, inactive women to incorporate safe PA practices (M. Westhaver, personal communication, August 2015).

Appendix Table 3.1

Self-determination theory constructs as applied to the interventions

Group	Autonomy	Competence	Relatedness
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Dance	1) Participants could choose level or difficulty or number of repetitions of a skill/sequence they wished to perform. 2) Time was allotted for free and improvised dance. 3) Participants could take breaks or rest when needed.	1) Exercises and dance sequences were introduced in a graded manner, with many opportunities for repetition. 2) Program included a choreographed phrase that was developed over the 6 weeks to help participants feel they had mastered a routine.	1) Instructor promoted conversation before and after class. 2) Warm-up and cool-down included group breathing exercises. 3) Many dance sequences were done in partners or as a whole group.
Walking	1) Participants were given directives for each component of the walk (warm-up: easy pace; effort phase: increased pace to breathe harder and sweat more; cool-down: gently bring pace and breathing rate down) but ultimately could choose their own pacing.	1) There were a few options for stretches that targeted the same muscle groups so that participants could choose what best suited their body and ability. 2) The walking program was graded in intensity over the course of the 6 weeks so that participants could build mastery of more challenging walking routes. 3) The loop-and-scoop technique was used to accommodate slower walkers from getting left behind.	1) The leader engaged in conversation with all group members by moving to walk in different spots within the group. 2) The leader promoted conversation amongst group members.

Appendix 4: Additional Tables

Appendix Table 4.1

Demographic data for participants that participated in program evaluation and focus group discussions

Participant	Age	Minority	Education Status	Marital Status	Employment Status	Data
03	60	No	Professional/ graduate degree	Married	Homemaker	PE
06	58	No	Some college	Married	Homemaker	PE FG
07	60	No	Professional/ graduate degree	Married	Retired	PE
11	64	Yes	Some college	Married	Part-time	PE FG
17	62	No	Some college	Single	Retired	PE
18	71	No	College degree	Married	Retired	PE
23	63	No	Some college	Divorced/ separated	Retired	PE FG
26	62	No	College degree	Widowed	Other	PE FG
27	68	No	Professional/ graduate degree	Married	Retired	PE FG
28	54	No	Professional/ graduate degree	Common-law	Other	PE FG
31	68	No	Some college	Divorced/ separated	Retired	PE FG

34	66	No	College degree	Common-law	Part-time	PE FG
35	66	No	Some college	Single	Retired	PE FG
39	60	No	Professional/ graduate degree	Common-law	Full-time	PE FG
40	69	No	College degree	Married	Retired	PE
42	58	No	High school	Married	Retired	PE
43	69	No	College degree	Married	Retired	PE FG
46	64	No	Professional/ graduate degree	Married	Retired	PE

Note. PE = Program evaluation; FG = Focus group.

Appendix Table 4.2

Program structure evaluation – tabulated responses

Item	Too Short/Too Easy	Just Right	Too Long/Too Hard
Length of dance program	5	5	0
Duration of dance sessions	6	4	0
Difficulty of dance sessions	1	9	0
Length of walking program	4	4	0

Duration of walking sessions	3	5	0
Difficulty of walking sessions	1	7	0

Appendix Table 4.3

Tabulated responses on prospective community program costs

Item	\$5-10 per session	\$11-15 per session	\$16-20 per session	No cost
How much would you pay on a drop-in basis for a similar dance program in the community?	7	2	1	N/A
How much would you pay on a drop-in basis for a similar walking program in the community?	6	0	0	2

Item	\$50-59 for 12 sessions	\$60-69 for 12 sessions	\$70-79 for 12 sessions	\$80-89 for 12 sessions	\$90-99 for 12 sessions	No cost
How much would you pay for a similar 12-session dance program in the community?	4	1	3	1	1	N/A
How much would you pay for a similar 12-session walking program in the community?	6	0	0	0	0	2

Note. Two participants opted not to select one of the listed options; they felt the program should be free of charge.