A feasibility study of a multifaceted walking intervention to maintain functional mobility, ADL function, and quality of life among nursing home residents with dementia

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for the Degree of Doctor of Philosophy in Nursing Science

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ABSTRACT

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Aim: To determine the feasibility, acceptability, and efficacy of a multifaceted walking intervention (MWI) to maintain the functional mobility, activities of daily living (ADL) function, and quality of life (QOL) of nursing home residents with dementia.

Setting: Two nursing homes in the GTA.

Method and Analysis: An interrupted time series design was used with a 2-month pre-intervention phase followed by a 4-month intervention phase. Measures of functional mobility (2MWT, TUG, gait speed), ADL function (FIM), and QOL (ARQOL) were collected before and after the pre-intervention, and at the middle and end of the intervention by a blinded assistant. RM-ANOVA was used to explore efficacy over time.

The MWI components: a) one-to-one walking regime tailored to the resident up to 4 times a week for 4 months and b) individualized communication care plans that were used during the
sessions. The MWI was informed by multiple interviews to collect biographical data, communication assessments, and resident observations.

**Results:** The MWI was feasible, based on a high recruitment rates of resident (86.6%, n=26), PSWs (100%) and POAs (100%) and retention rate (96.1%). Interventionist adherence to the protocol was high (i.e. intervention could be delivered as designed). The POA and PSW staff acceptability was high before and after the intervention, and resident adherence also indicated high acceptability.

During the pre-intervention phase, residents experienced significant declines in functional mobility as measured by the TUG, 2MWT, gait speed, a significant decline in their ADL function, as well as QOL. Over the intervention phase, the TUG improved by 32.14% (P=0.000), 2MWT improved by 51.25% (P=0.000), gait speed improved by 55.11% (P=0.000), ADL function increased by 25% (P=0.000) and QOL by 7.8% (P=0.063). No adverse events were related to the intervention and no significant environmental influence was found.

**Significance:** This is the first intervention to deliver individualized physical activity to residents with dementia using a person-centered approach. The MWI appears to be a promising solution to maintain outcomes; however, a larger trial is required. This study informs a future trial, as well as provides a greater understanding about the role person-centered care can play when delivering physical activity to frail populations.
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TABLE OF CONTENTS

ABSTRACT........................................................................................................................................... ii

ACKNOWLEDGEMENTS....................................................................................................................... v

TABLE OF CONTENTS.......................................................................................................................... ii

LIST OF APPENDICES........................................................................................................................... xiii

LIST OF TABLES........................................................................................................................................ xiv

LIST OF FIGURES....................................................................................................................................... xv

CHAPTER 1: INTRODUCTION/CONTEXT OF THE PROBLEM............................................................... 14

Problem statement.................................................................................................................................. 10

CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK ........................................ 11

Normal aging .......................................................................................................................................... 11

Neuropsychology of dementia ............................................................................................................... 13

   Etiology of AD and vascular dementia .............................................................................................. 13

   Impact of dementia on memory systems .......................................................................................... 15

   Impact of dementia on communication ............................................................................................ 16

   Impact of dementia on functional mobility decline ......................................................................... 18

   Impact of dementia on ADL function ............................................................................................... 20

LITERATURE REVIEW ........................................................................................................................... 22

   Search strategy ................................................................................................................................. 22

   Literature review of physical activity studies .................................................................................. 23

   Objectives of the previous studies .................................................................................................. 23

   Research designs of previous studies .............................................................................................. 25

   Quality of studies .............................................................................................................................. 25

Samples from the previous studies ....................................................................................................... 32

   Outcome measures used in the PA interventions ............................................................................ 34

      Physical function measures used in the PA interventions .......................................................... 34

      ADL measures used in the PA interventions ................................................................................ 34
Communication outcomes used in the PA interventions ........................................ 35
Effectiveness of physical activity interventions .................................................. 36
Effectiveness of high intensity PA compared to walking alone ................................ 38
Intervention characteristics .................................................................................. 39
Adherence and attrition rates of previous studies .................................................. 40
Intervention implementation .................................................................................. 42
Major limitations of previous studies .................................................................. 44

CONCEPTUAL FRAMEWORK: INTERNATIONAL CLASSIFICATION OF FUNCTIONING, DISABILITY AND HEALTH (ICF) .................................................. 49
Constructs of the ICF and how they apply to this study ........................................ 49
Summary .................................................................................................................. 52

RESEARCH OBJECTIVES AND QUESTIONS ....................................................... 54
Primary research objectives .................................................................................. 54
Secondary research objective .................................................................................. 54
Exploratory questions .............................................................................................. 55

CHAPTER 3: METHODS ......................................................................................... 56
Feasibility study ........................................................................................................ 56
Study design ............................................................................................................. 57
Quasi-experimental time series ............................................................................. 57
Setting ....................................................................................................................... 59
Sampling ................................................................................................................... 59
Inclusion and Exclusion Criteria ........................................................................... 59
Sample size .............................................................................................................. 60
Usual care ................................................................................................................ 60
Intervention ............................................................................................................. 61
Intervention components
1) Individualized walking protocol ....................................................................... 61
2) Individualized communication and interactional care plan .................................. 64

Data collection .................................................................................................................. 66

Resident demographic and baseline data ................................................................. 66

  Cornell Scale for Depression in Dementia (CSDD) ........................................... 69

  PSW staff and POAs’ demographic information ........................................... 70

Environmental assessment of the nursing home (PEAP) ........................................... 70

MWI feasibility measures ............................................................................................. 71

Acceptability of the MWI by the resident ................................................................. 72

Acceptability of the MWI by the resident’s POAs and PSW staff ............................ 73

  Modified Treatment Evaluation Inventory ....................................................... 73

Health condition data to individualize the MWI to the resident .............................. 75

  Mini-Mental State Examination (MMSE) ......................................................... 76

  Functional Linguistic Communication Inventory ........................................... 76

Efficacy of the MWI on resident’s outcomes ........................................................... 78

  Timed Get up and Go ....................................................................................... 79

  2 Minute Walk Test (2MWT) ........................................................................ 80

  Gait speed ......................................................................................................... 81

  Functional Independence Measure (FIM) ....................................................... 82

  Alzheimer’s Disease-related Quality of Life scale (ADRQL) ............................. 84

Data about severity and number of adverse events ............................................... 85

Respondent burden ....................................................................................................... 86

Procedures to conduct this study .............................................................................. 86

  Sources of data .................................................................................................. 87

  Recruitment ....................................................................................................... 87

Retention ..................................................................................................................... 90

Threats to validity ....................................................................................................... 91

Data management ....................................................................................................... 93
Data Analysis ....................................................................................................................... 94
  Statistical analysis methods .......................................................................................... 95
  Primary research objective ......................................................................................... 95
  Secondary research objective ..................................................................................... 97
Exploratory research questions ...................................................................................... 98
  Handling missing data .................................................................................................. 100
Ethical considerations .................................................................................................... 101

CHAPTER 4: RESULTS ...................................................................................................... 102

Primary Research Objective: Feasibility and Acceptability ........................................ 104
  Research Question 1: Feasibility of MWI ................................................................. 104
    Recruitment rate ......................................................................................................... 104
    Retention rate ............................................................................................................. 112
    Interventionist adherence ......................................................................................... 113
      Enablers ...................................................................................................................... 113
      Barriers ....................................................................................................................... 114
  Research Question 2: Acceptability of MWI to residents ........................................ 114
    Resident adherence rate ............................................................................................ 114
      Enablers ...................................................................................................................... 115
      Barriers ....................................................................................................................... 117
  Research Question 3: Acceptability of MWI to the POAs and PSW staff ................ 121
    Pre-intervention acceptability of POAs ................................................................. 121
    Post-intervention acceptability of POAs ............................................................... 123
    Pre-intervention acceptability of PSW staff ......................................................... 125
    Post-intervention acceptability of PSW staff ....................................................... 127
Secondary Research Objective: Efficacy ........................................................................ 129
  Functional Mobility ....................................................................................................... 129
    TUG ............................................................................................................................. 129
2MWT .................................................................................................................. 132

Gait speed ........................................................................................................... 132

ADL function ......................................................................................................... 134

Quality of Life ....................................................................................................... 137

Exploratory research questions ........................................................................... 139

Number and severity of adverse events .................................................................. 139

Adverse events during the pre-intervention phase ............................................... 142

Adverse events during the intervention phase ...................................................... 142

Describe nursing home attributes that influenced feasibility measures ............... 143

Describe nursing home attributes that influenced on resident outcomes ............. 146

CHAPTER 5: DISCUSSION ....................................................................................... 149

Primary Research Objective: Feasibility and Acceptability .................................. 149

Feasibility of MWI ................................................................................................. 149

Recruitment rate .................................................................................................... 150

Participant retention rate ....................................................................................... 154

Interventionist adherence ....................................................................................... 155

Acceptability ........................................................................................................ 157

Secondary Research Objective: Efficacy ............................................................... 161

Efficacy of MWI on Functional Mobility ............................................................... 161

Efficacy of MWI on ADL function ........................................................................ 164

Efficacy of MWI on Quality of Life ....................................................................... 165

Exploratory research questions ............................................................................ 166

Adverse events ....................................................................................................... 166

Environmental trends ............................................................................................ 168

Study Strengths and Limitations ........................................................................... 169

CHAPTER 6: SUMMARY, STUDY IMPLICATIONS, AND CONCLUSION .............. 172

Summary ................................................................................................................ 172
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Implications</td>
<td>173</td>
</tr>
<tr>
<td>Research Implications and Areas for Future Research</td>
<td>173</td>
</tr>
<tr>
<td>Practice Implications and Recommendations</td>
<td>177</td>
</tr>
<tr>
<td>Conclusion</td>
<td>181</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>147</td>
</tr>
</tbody>
</table>
LIST OF APPENDICES

Appendix A Definitions used in the protocol ................................................................. 209
Appendix B Organization and definitions of memory systems ......................................... 215
Appendix C Person-centred care definitions ................................................................. 218
Appendix D Verbal and on-verbal communication strategies ........................................... 219
Appendix E Summary of Study Measures ..................................................................... 223
Appendix F Summary of Total Burden on data source at each data collection time .......... 226
Appendix G Cornell Scale for Depression in Dementia ................................................... 227
Appendix H Timed Up And Go (TUG) Test protocol and documentation ........................... 229
Appendix I 2 Minute Walk Test Protocol and documentation ........................................... 231
Appendix J The PEAP protocol, scoring page, and definitions ......................................... 234
Appendix K Ethics Protocol and Algorithm for Data Collection and Walking Session ....... 239
Appendix L Author Correspondence for ADRQL, ADRQL instructions and tool ............ 242
Appendix M Author Correspondence for Modified Treatment Evaluation Inventory (TEI) .... 247
Appendix N Pre-Intervention TEI tool and Post-Intervention TEI tool ............................... 248
Appendix O Functional Independence Measure (FIM) .................................................... 256
Appendix P Questions to ask POAs and PSW staff about the resident ............................... 259
Appendix Q Letter to the Nursing Home ......................................................................... 261
Appendix R Consent forms for POAs and PSW staff Participants ....................................... 262
Appendix S Tables from literature review ..................................................................... 277
Appendix T: Overview of sessions per resident, milestones, and missed sessions ............. 314
Appendix U Care plan example ..................................................................................... 318
Appendix V POA and PSW qualitative responses from TEI open-ended questions ......... 320
Appendix W Mean differences for resident outcomes ..................................................... 325
Appendix X TUG back-transformed data and graph ....................................................... 327
Appendix Y Three PEAP subscales and the environmental features of each home ......... 329
LIST OF TABLES

Table 1: PA feasibility studies aimed at nursing home residents with dementia .................. 27
Table 2: Experimental studies examining effects of PA on functional mobility in nursing home residents with dementia ................................................................. 28
Table 3: Components and activities in the MWI .................................................................. 62
Table 4: Measurement times of the outcome data ............................................................... 67
Table 5: Medications ........................................................................................................ 68
Table 5.1: Indictors and measures related to feasibility ..................................................... 72
Table 5.2: Classification of adverse events ........................................................................ 85
Table 6: Total respondent burden for nursing staff and residents’ families ..................... 87
Table 7: Procedure to Collect Resident Data ..................................................................... 88
Table 8: Baseline Characteristics of Enrolled Residents ..................................................... 107
Table 9: Baseline Characteristics of POAs ........................................................................ 110
Table 10: Baseline Characteristics of PSW staff ................................................................. 111
Table 11: Resident walking regimes, milestones, and missed sessions (Appendix T) .......... 313
Table 12: POA qualitative responses from TEI open-ended questions (Appendix V) ........ 320
Table 12.1: PSW qualitative responses from TEI open-ended questions (Appendix V) ...... 322
Table 13: Descriptive data of functional mobility measures throughout the study .......... 129
Table 14: Mean differences and SDs of functional mobility outcome measurements during the Pre-intervention Phase and the Intervention Phase (Appendix W) .......... 325
Table 15: Back-transformed values of parameter estimates (Appendix X) ....................... 327
Table 16: Descriptive data of ADL and QOL outcomes throughout the study ................. 137
Table 17: Mean differences and SDs of FIM and ADRQL scores during the Pre-intervention Phase and the Intervention Phase (Appendix W) ................................. 326
Table 18: Events per month per resident during the pre-intervention and intervention phase .... 139
Table 19: Adverse event data during the pre-intervention and intervention phases .......... 140
Table 20: Three PEAP subscales and the environmental features of each home (Appendix Y) ........................................................................................................... 329
LIST OF FIGURES

Figure 1: Applying the ICF to this study.................................................................50
Figure 2: Study design and timing of measurements...........................................58
Figure 3: Study measures and their application to the ICF....................................78
Figure 4: Flow diagram of resident recruitment .................................................105
Figure 5: Graph of back-transformed values of parameter estimates .................328
Figure 6: Mean differences and standard deviations of the TUG from baseline to immediately after the MWI.................................................................130
Figure 7 Mean differences and standard deviations of the 2-Minute Walk Test measurements from baseline to immediately after the MWI.................................132
Figure 8 Mean differences and standard deviations of gait speed measurements from baseline to immediately after the MWI..........................................................133
Figure 9 Mean differences and standard deviations of FIM total score from baseline to immediately after the MWI.................................................................134
Figure 10 Mean differences and standard deviations of FIM-motor and FIM-cognition subscale scores from baseline to immediately after the MWI...........................135
Figure 11 Mean differences and standard deviations of ADQRL scores from baseline to immediately after the MWI.................................................................136
Chapter 1: Introduction

An estimated one half million Canadians have dementia, and this number is projected to increase to over 1.2 million Canadians by 2038 (Alzheimer Society of Canada [ASC], 2010). In Ontario, approximately 60,000 or 58% of long-term care (LTC) residents have some form of dementia, including Alzheimer’s disease (AD) (Canadian Institute for Health Information [CIHI], 2011). The current economic burden of dementia care in Canada is $15 billion dollars annually in direct, indirect and opportunity costs (ASC, 2010). This figure is expected to increase substantially over the next 30 years as the number of adults over 65 years old increases to 10.4 million representing 25% of the Canadian population (National Institutes of Health & US Federal Government [NIH], 2010; Statistics Canada, 2010). The recent World Alzheimer’s Report 2013 (Alzheimers Disease International [ADI], 2013) echoed the World Health Organization’s (WHO) 2012 report and identified dementia as a “public health priority” due to dementia’s high global prevalence, economic impact of dementia on families, caregivers and communities, and impact on social and healthcare systems (ADI, 2013; WHO, 2012).

Dementia is characterized by a progressive global deterioration of cognitive abilities in multiple domains including memory, learning, orientation, language, comprehension, and judgment, that is severe enough to interfere with daily functioning (NIH, 2010). Of all the dementias, AD is the most common form of dementia in older persons and accounts for 60 to 80% of all individuals with dementia (Alzheimer’s Association., 2013; Khalsa & Stauth, 1997; NIH, 2010). Older people with dementia will suffer from progressive and irreversible loss of motor, cognitive and functional skills (ASC, 2010; American Psychiatric Association, 2000; Ashford & Schmitt, 2001; Emery, 2011; WHO, 1992). Over time they will take progressively smaller and slower steps, begin to tilt forward, backward or laterally and may develop a twisted
gait until they are unable to sit up independently (Aguero-Torres et al., 1998; Sclan & Reisberg, 1992). The deterioration in gait ability and postural control as the dementia increases in severity results in considerable limitations in activity and mobility (Allan, Ballard, Burn, & Kenny, 2005; Bloem & Rikkert, 2004; Morgan, Funk, & Crossley, 2007; Waite, Broe, Grayson, & Creasey, 2000). Consequently, many individuals will be admitted into a LTC facility or nursing home. In this study the term dementia will refer to AD, vascular and mixed dementia and the term nursing home will be used to refer to LTC facilities and nursing homes that provide 24 hour care. The individuals who reside in nursing homes will be referred to as nursing home residents or residents, and the unregulated nursing home staff will be referred to as personal support worker staff (PSW) staff.

Nursing home residents with dementia spend a significant portion of their day socially withdrawn and physically inactive which makes them highly vulnerable to further physical decline (Ballard et al., 2001) and muscle atrophy (Aoyagi & Shephard, 1992). Despite the increasing focus on LTC (Institute of Medicine: Committee on Improving Quality in Long-Term Care, 2001; McGilton et al., 2016; Morley, Rolland, Tolson, & Vellas, 2011), not much has changed in 35 years with respect to how nursing home residents spend their day. Early work from Gottesman and Bourestom (1974) reported that U.S. nursing home residents spent 56% of their day doing nothing, comparatively Nolan and colleagues (1995) reported residents in Wales spent approximately 70% of their time in passive activities. A cohort study of 451 residents from 15 Californian nursing homes reported that the majority of residents spend more than 17 hours per day in bed, with some residents spending more than 22 hours per day in bed (Bates-Jensen et al., 2004). Two other observation studies found that residents spent 65% to 75% of their day in passive activities, such as doing nothing, sleeping, or waiting, with the majority of their time
spent sitting alone in their room (Harper, 2002; Ikezoe, Asakawa, Shima, Kishibuchi, & Ichihashi, 2013) and only 12% of the day was spent engaged in social activities (Harper Ice, 2002). Consequently, residents commonly experience prolonged bed rest, physical inactivity, deconditioning, and chronic medical conditions, that exacerbates functional mobility decline (Rubenstein, Josephson, & Robbins, 1994; Ballard et al., 2001).

A Canadian prospective cohort study reported that 40.8% (95% CI: 32.7-50.2) of residents with AD lose some ability to walk within a year of being institutionalized in a nursing home, and that the loss was preventable in 27% (95% CI: 19.7-36.5) of cases (Slaughter et al., 2011). Likewise a prospective cohort study reports that 27% of nursing home residents with moderate dementia declined in their functional mobility over six months (Carpenter, Hastie, Morris, Fries, & Ankri, 2006). Alongside their loss of functional mobility, residents also lose their ability to perform activities of daily living (ADLs) (Ang, Au, Yap, & Ee, 2006; Bürge, von Gunten, & Berchtold, 2013). Two retrospective case control studies reported 36% (Ang et al., 2006) and 37.7% (Bürge et al., 2013) of nursing home residents with dementia lost their ability to perform two or more ADLs within one year of living in a nursing home and identified cognitive impairment as a significant risk factor associated with degradation in ADL performance.

Functional mobility refers to ambulation (e.g. walking from bed to bathroom) and transferring (e.g. from bed or chair to toilet and from sitting position to standing position) (DeLisa, 2004). Functional mobility is fundamental to the ability to engage in ADLs such as bathing, dressing, toileting, mobility, eating, and transferring from bed to chair. ADL function loss, described as the loss of independence in self-care ADLs or a deterioration in self-care skills (Hoogerduijn, Schuurmans, Duijnstee, de Rooij, & Grypdonck, 2007) is exacerbated by impaired
functional mobility which also increases residents’ dependency on nursing staff (Nordberg et al., 2007). Immobility is a significant risk factor for geriatric syndromes, like incontinence, pressure ulcers, delirium (Inouye et al., 2007), and other clinical issues like constipation (Hinriches, Huseboe, & Hsiao-Chen Tang, 2001), contractures (Souren, Franssen, & Reisberg, 1995), pneumonia (Loeb, McGeer, McArthur, Walter, & Simor, 1999), and bone loss (Chen et al., 2006). Older adults have approximately 30% less muscle mass than younger adults due to the normal aging process (Frontera et al., 2000) making them more susceptible to the consequences of immobility than younger people. Older adults lose approximately one kilogram of muscle mass after 10 days of immobility compared to younger adults who lose less than 500 grams of muscle mass loss after 28 days of immobility (Paddon-Jones, Sheffield-Moore, & Urban, 2004). This degree of muscle loss is associated with reduced strength and functional capacity (Paddon-Jones et al., 2004) and is especially devastating to nursing home residents who spend their days immobile.

The subsequent loss of functional mobility and ADL function prevents residents from engaging with their environment (Bainbridge, Davie, & Haddaway, 2006; Jirovec & Wells, 1990) and partaking in daily social activities (Davis et al., 2004) to result in a decrease of quality of life (QOL) (Ballard et al., 2001). Further, dependency upon others to perform ADLs was the main factor affecting the QOL of older adults with dementia (Andersen, Wittrup-Jensen, Lolk, Andersen, & Kragh-Sørensen, 2004). Such dependency due to physical impairment is one of the strongest risk factors for the onset of depression in later life, a common co-morbidity of dementia (Stewart, 2013). The rising prevalence of dementia and the loss of functional mobility and associated dependency underscore the health and economic impact of dementia care on individuals, their families, and the healthcare system.
Modifiable variables associated with functional mobility decline

To effectively address the multidimensional nature of functional mobility decline in nursing home residents with dementia, the causal risk factors of the problem must be considered. Primarily the amount of physical activity a resident receives (Evans, 2010; Kortebein, Ferrando, Lombeida, Wolfe, & Evans, 2007), and the use of an appropriate care approach by individuals working with residents who have dementia, such as person-centered dementia care (Dawson, Wells, & Kline, 1993).

Physical activity

Physical activity (PA) is recognized as the most effective means to attenuate the loss of muscle protein mass underlying mobility and functional decline in older adults (Borst, 2004; Cruz-Jentoft et al., 2010; Evans & Campbell, 1993; Evans, 2010; Francesco Landi et al., 2011; Morley, 2016b; Walston et al., 2006). The LTC environment is a common setting for PA intervention studies since the environment has been recognized to provide a minimal amount of PA, social engagement, and cognitive stimulation to residents with dementia (Egerton & Brauer, 2009; Bates-Jensen, Schnelle, Alessi, Alssamarrai, & Levy-Storm, 2004; Scherder et al., 2010; Ballard et al., 2001). PA interventions, like walking, show potential to maintain or improve the mobility and function of nursing home residents with dementia (Roach, Tappen, Kirk-sanchez Williams, & Loewenstein, 2011; Santana-Sosa, Barriopedro, López-Mojares, Pérez, & Lucia, 2008; Tappen et al., 2000; Toulotte, Fabre, Dangremont, Lensel, & Thévenon, 2003) and has been referred to as “the ultimate medicine” (Morley, 2015). PA is beneficial for older adults (Pate, Pratt, & Blair, 1995) and has been associated with improved cognitive function and well-being (Eggermont, 2006), agitation (Scherder, Bogen, Eggermont, Hamers, & Swaab, 2010), functional performance (Santana-Sosa et al., 2008) and mobility (Venturelli et al., 2011). The
majority of randomized control trials of PA interventions for nursing home residents reported statistically significant reductions in decline or improvements in mobility and ADL function when the PA intervention was at least three times a week for a minimum of 12 weeks compared to the control group (Kemoun et al., 2010; Roach et al., 2011; Santana-Sosa et al., 2008; Stevens & Killeen, 2006; Tappen et al., 2007). Among these studies, walking was most the common PA, but other interventions included functional movements, like sitting and standing (Littbrand, Rosendahl, Lindelöf, Gustafson, & Nyberg, 2006; Roach et al., 2011), and strength training (Toulotte et al., 2003). Several PA interventions that provided walking as the only form of PA were effective in reducing decline in mobility or ADL function compared to a usual care control group (Rolland et al., 2007; Tappen et al., 2000; Venturelli, Scarsini, & Schena, 2011), except for one study that was under powered (Cott, Dawson, Sidani, & Wells, 2002). Overall, previous studies indicate that PA is effective to maintain physical function and ADL functional outcomes (Littbrand, Stenvall, & Rosendahl, 2011).

While some previous PA intervention studies that aimed to improve functional mobility reported promising results with moderate effect sizes, many had high attrition rates and low levels of adherence from residents (Christofoletti, Oliani, Gobbi, & Stella, 2007; Rolland, Abellan van Kan, & Vellas, 2008). A review reported that implementation of interventions to promote PA in LTC is often sub-optimal (Benjamin, Edwards, Ploeg, & Legault, 2014) related to characteristics of residents, staff and the environment that provides the context that may explain previously reported high attrition and poor adherence. Related to staff, evidence suggests that PSW staff find mobilizing residents to be a challenge because they are unable to adequately manage residents’ dementia-related symptoms (Bourret et al., 2002) such as ataxia, apathy, spatial disorientation, and confusion. Given this challenge, PA interventions may not have been
delivered as intended due to time constraints from the heavy workload of PSWs and individual staff level differences has been an issue in other PA interventions in LTC (Slaughter & Estabrooks, 2013). Further, residents’ have negative perceptions of structured PA and viewed them as boring or monotonous and had little interest in participating (Baert, Gorus, Guldemont, De Coster, & Bautmans, 2015). Accordingly, previous studies cited residents’ unwillingness to continue and behaviour disorders as the reasons for low resident adherence rates and high attrition rates (Rolland et al., 2007). The lack of a person-centered care approach by the interventionists to deliver the PA interventions that were not designed to be interesting or motivating to the resident likely contributed to the low resident adherence rates and high attrition rates as well.

There have been PA interventions in which the dose and duration of PA were individualized to residents with dementia (Cott, Dawson, Sidani, & Wells, 2002; Roach, Tappen, Kirk-Sanchez, Williams, & Loewenstein, 2011; Rolland et al., 2007; Tappen, Roach, Applegate, Stowell, & Raton, 2000), but not the approach to ensure effective interactions and communication. No study explicitly included a person-centered component or communication component to account for the residents’ cognitive impairments or incorporated the residents’ biographical histories or preferences to increase their motivation to engage in PA (Lees, Clarkr, Nigg, & Newman, 2005). In addition, treatment fidelity and small sample sizes may have contributed to minimized effect sizes (Tappen et al., 2000; Rolland et al., 2007) or a lack of statistically significant findings (Cott et al., 2002).

**Person-centered care approach for residents with dementia**

Management of residents with dementia is complex because it requires competent assessment skills, understanding of dementia processes, and knowledge about the uniqueness of
the person or family’s experiences of illness (Penrod et al., 2007). *Person-centered care* refers to “knowing the person” (e.g. their values, biography, and subjective experience of illness) in order to individualize care so that it is sensitive to the individual’s needs and preferences as a whole (McCormack, 2004, p. 36; Souraya Sidani, Streiner, & Leclerc, 2012), and not just treating the disease or illness (Edvardsson & Innes, 2010). Person-centered care is a philosophy and value base contrary to the biomedical model that assumes the personhood of the resident is still intact despite the presence of the dementia (Brooker, 2004). While there are several definitions of person-centered care (see Appendix C), the consensus is that the construct includes the recognition of the resident’s personality, preferences, and values; individualization of the resident’s care and environment; and prioritizing shared decision-making and relationships between the caregiver and resident (Edvardsson, Winblad, & Sandman, 2008). The extent to which nursing home staff apply a person-centered care philosophy into their own practice and support residents’ functional abilities is an important characteristic of a person-centered nursing home environment (Murray, 2001). Thus, espousing a person-centered care approach has significant implications on how to care for, approach, and communicate with those with dementia in order to maintain functional mobility, ADL function, and QOL.

Dementia care best practices recognizes the benefit and value of person-centered care in managing the residents’ behaviours and communication impairments, namely by individualizing care and the environment to address residents’ underlying unmet needs (ASC, 2011; BC Ministry of Health, 2012). As such, person-centered care requires that caregivers use strategies to compensate for resident’s deficits in order to better meet resident’s needs that they are unable to articulate (Dawson et al., 1993). A comprehensive assessment of cognitive impairments and functional deficits is essential for care providers to identify effective communication strategies.
that can optimize and enable resident’s remaining abilities in self-care activities and mobility (Dawson et al., 1993; Attix & Walsh-Bohmer, 2005). The QOL of residents with dementia can improve with effective communication (Brush, Threats, & Calkins, 2003; Zimmerman et al., 2005), increased PA (Fox, Stathi, McKenna, & Davis, 2007; Littbrand et al., 2011; Van Malderen, Mets, & Gorus, 2013) and with higher physical functioning (Acree et al., 2006; Barca, Engedal, Laks, & Selbæk, 2011; Hoe, Katona, Roch, & Livingstone, 2005; Terada et al., 2013). For example, caregivers’ use of effective communication skills and person-centered approach when working with nursing home residents with dementia can either mitigate or exacerbate the resident’s mobility and functional decline (Brush, Threats, & Calkins, 2003; Bryan, Axelrod, Maxim, Bell, & Jordan, 2002). Additionally, a longitudinal study of nursing homes (n=35) reported that those who identified themselves to institutions that provided person-centered care had higher resident-staff communication scores which was associated with higher resident QOL scores (N=421) (Zimmerman et al., 2005). Despite such evidence that the use of a person-centered care approach can facilitate QOL and meaningful interactions while mitigating responsive behaviors, PA has not been delivered to nursing home residents with dementia using this approach.
Problem Statement

A major gap in the literature is the absence of a controlled study that examines the benefits of a PA intervention focused on applying a person-centred care approach to maintain the functional mobility, ADL function and QOL of nursing home residents with dementia. This feasibility study will begin to address this knowledge gap. A person-centered care plan will include a detailed description of communication and interactional strategies paired with a mobility regime that is individualized to the nursing home resident. Person-centered care has been recognized as best practice for dementia care, yet it has not been specifically applied to any PA interventions for nursing home residents in a rigorous way.

There is an urgent need for this study according to several international authorities. The International Survey of Nursing Home Research Priorities (Morley, Caplan, et al., 2014) declared the most important research areas in LTC are dementia care, improving QOL, and maintenance of physical function. The WHO and the International Association of International Association of Gerontology and Geriatrics (IAGG) Nursing Home Initiative (de Souto Barreto et al., 2016) reported that more studies need to address feasibility issues related to strategies that can support the effective implementation of PA interventions in nursing homes by increasing residents’ motivation, pleasure, and overall activity levels. Thus, this evidence suggests that the principles of person-centered care may be beneficial to the maintenance of the mobility, ADL function and QOL of nursing home residents with dementia. As such, the overall purpose of this feasibility study is to provide low-intensity PA while applying an individualized person-centered care plan that outlines specific communication and interactional strategies with the goal of maintaining residents’ functional mobility, ADL function, and QOL.
Chapter 2: Review of the Literature and Theoretical Framework

This chapter reviews the pathophysiology of normal aging and its influence on mobility, followed by the neuropsychology of dementia (AD and vascular dementia) and its consequences on communication, mobility decline, and ADL function loss. Then a critical review of previous PA studies aimed to address mobility decline and functional loss in nursing home residents with dementia will be reviewed to demonstrate the utility of PA interventions for this population. The limitations of previous studies will be summarized and the case will be made that PA provided with a person-centered care approach that includes communication and interactional strategies is an appropriate intervention to maintain functional mobility, ADL function and QOL of nursing home residents with dementia. The International Classification of Functioning, Disability and Health conceptual framework by WHO (2001) will be introduced and used to describe the risk factors for mobility decline and ADL function loss in residents with dementia. This chapter will conclude with the research questions guiding this study.

Normal aging

Normal physical changes associated with aging often include decreased muscle mass, decreased eyesight and hearing, slower reflexes, and bones and joints that may be damaged from wear and tear. Functional decline is common with normal aging, due to a confluence of factors, such as chronic illness and minimal physical activity.

Normal aging changes in the brain include longitudinal shrinkage of the grey and white matter, particularly in the frontal and parietal areas (Resnick, Pham, Kraut, Zonderman, & Davatzikos, 2003) in addition to overall cholinergic and dopaminergic decline (Friederici & Unglerleider, 2005) and the formation of beta-amyloid protein deposits and tau proteins in the walls of the cerebral vessels that supply the brain with oxygen (Tappen, 1997).
Sarcopenia is the aging-related loss of skeletal muscle, a condition referred to as the new geriatric giant” (Morley, 2016a) because it contributes to the inevitable physical decline in the elderly (Cruz-Jentoft et al., 2010; Evans & Campbell, 1993; Landi et al., 2011). Studies have estimated the prevalence of sarcopenia in nursing home residents to range from 32.8% (Landi et al., 2012) to 85% (Bahat, Saka, & Tufan, 2010), dependent upon the method used to quantify sarcopenia. Residents involved in leisurely PA for at least one hour per day have been shown to have a lower risk of sarcopenia (OR= 0.40; 95% CI=0.12–0.98) (Landi et al., 2012). The multitude of mechanisms involved in sarcopenia make it unclear if a lack of PA is the cause or the response of sarcopenia; however, it is evident that low levels of PA accelerate muscle loss, and thus may be most amenable to an exercise intervention (Fiatarone, O’Neill, Ryan, & Clements, 1994; Saligan, 2014).

Disuse muscular atrophy is a reduction in muscle mass due to the inactivity or disuse of the muscle resulting in mobility and functional decline (Appell, 1990; Carmeli, Reznick, Lavoie, & Propst, 1994). Extended periods of physical inactivity causes substantial loss of skeletal muscle mass in the elderly (Kortebein et al., 2008). Without contraction, muscle strength decreases by 5% a day (Creditor, 1993). PA can mitigate muscle loss from disuse muscle atrophy and significantly improve functional mobility (Fiatarone et al., 1994). The defining difference between sarcopenia and disuse muscle atrophy is that sarcopenia can be the result of various physiological factors (e.g. alterations in multiple physiological systems, a specific disease, or a decline in PA), whereas disuse muscle atrophy is the direct consequence of inactivity of the muscle.
Neuropsychology of dementia

Neuropsychology refers to a clinical field that studies the structure and function of the brain as they relate to psychological processes and behaviours. This section will briefly describe the etiology and neuropsychology of AD and vascular dementia in order to provide a baseline understanding of dementia. This section will then describe the pervasive effect of AD on 1) memory systems, 2) communication, 3) mobility decline, and 4) ADL functional loss. Understanding how dementia changes the brain to affect residents’ behaviour, intellectual and cognitive processes, interactions and responses to social and physical environments, will inform interaction and care strategies that can compensate for cognitive losses (Attix & Welsh-Bohmer, 2005).

Etiology of dementias (Alzheimer's disease, vascular dementia, mixed dementia)

Alzheimer's disease (AD) is a progressive, degenerative disorder that attacks the brain's neurons (NIH, 2012). Damaged neurons reduce the amount of acetylcholine, a neurotransmitter, to result in a loss of memory, thinking and language skills, and behavioural changes (NIH, 2012). AD is characterized by the beta-amyloid plaques and the neurofibrillary tangles in the brain found postmortem (NIH, 2012). The beta-amyloid plaques are formed by beta-amyloid protein deposits while the neurofibrillary tangles are formed by the tau protein. As the severity of the dementia advances, more plaques and neurofibrillary tangles build up to collapse neurons causing ischemic lesions in the brain and generalized cerebral atrophy (Chan et al., 2001; Tappen, 1997).

Dementia leads to tissue loss throughout the brain, but primarily begins as a disease of the cortex that affects the prefrontal cortex, hippocampus, and amygdala, areas that drastically impact an individual’s behaviour and cognition, including language and memory systems
(Alzheimer’s Association, 2011). The prefrontal cortex is responsible for executive functioning (e.g. plans and organizes actions, focusing attention, task switching, moderating social behaviour in various contexts), personality, complex cognitive behaviour, and decision making (Tappen, 1998; Yang & Raine, 2009). The hippocampus is functionally related to the prefrontal cortex and crucial for episodic memory, which is the explicit recollection of incidents that occurred in the past (Dickerson & Eichenbaum, 2010), verbal memory (i.e. word memory of what we read, say or hear), and visual memory (i.e. recognizing objects, faces and places to guide us around our environment) (Attix & Welsh-Bohmer, 2005). The lack of initiative and interest is a common behavioural symptom of AD and vascular dementia, and is related to significantly lower perfusion of blood to the right temporal lobes (Robert et al., 2006). The amygdala, which is responsible for emotions, becomes hypersensitive and hyperresponsive in order to compensate for the decreased function in the prefrontal cortex and the hippocampus (Grady, Furey, Pietrini, Horwitz, & Rapoport, 2001; Wang et al., 2007). As such, despite the dramatic deterioration of overall executive cognitive functions residents with AD are still able to process the emotional content of others’ faces and voices to a greater degree than residents without AD as indicated by increased activity in the amygdala on MRI images (Grady et al., 2001).

Vascular dementia (VaD) is the second leading form of dementia, accounting for up to 20% of all cases (ASC, 2010). The cause of VaD is the narrowing or blocking of blood vessels in the brain, most frequently related to cerebrovascular accidents/strokes. The clinical presentation is similar to AD, but VaD has a more sudden onset and progresses in a characteristic “step-wise” fashion compared to AD. This means that the resident is likely to show symptoms, plateau for some time, and then suddenly develop more severe symptoms (ASC, 2010).
When AD presents with coincident vascular pathology (Kalaria & Ballard, 1999) this type of dementia is called a “mixed dementia” (Román, 2003). According to the consensus recommendations for the diagnosis of AD from the National Institute on Aging (Hyman et al., 2012) on diagnostic criteria for the neuropathological assessment of AD, post-mortem neuropathic examination is the only definite way to determine the pathology of the dementia to diagnose the specific type of dementia. Hyman and colleagues (2012) report that while AD is the most common cause of dementia and can exist in a “pure” form, it commonly coexists with pathologic changes of other diseases (e.g. Lewy-body, frontotemporal lobe dementia, Wernicke-Korsakoff) that also contribute to cognitive impairment.

Despite the uniqueness of the neuropathic cause and risk factors of dementias, they share common symptoms: gradual and ongoing decline of short- and long-term memory, heightened emotional sensitivity, a tendency towards agitation, disinhibition, substantial loss of language, judgment and reasoning abilities, and changes in mood and behaviour (ASC, 2010; Davidson, Putnam, & Larson, 2000). Residents are eventually no longer able to perform simple tasks. There are immense communication implications for individuals caring for the resident to effectively manage residents’ behaviours. An understanding about the clinical manifestations of dementia is required to identify compensatory strategies to amend the resident’s cognitive losses and enable their residual abilities (Attix & Walsh-Bohmer, 2005). Seeing that AD is the most prevalent type of dementia the next section will be specific to AD.

**Impact of AD on memory systems**

There are multiple parallel memory systems in the brain, either implicit or explicit memories, which are affected differently by AD (Schacter, 1992) (refer to Appendix B for a figure of the memory systems and a summary of the memory systems and the affected brain
regions). Studies have indicated that patients with AD show normal *implicit memory* abilities (Schacter & Graf, 1986; Schacter, 1987) in situations where no explicit conscious recollection of a previous episode is required. *Implicit memory*, the memories that are not necessarily conscious (Attix & Welch-Bohmer, 2005), includes *procedural memory*, a type of muscle memory that refers to life-time entrenched skills or habits of the individual. For example, residents with AD often possess the physical ability to accomplish motor tasks, like walking, but not the capacity to recognize where/who they are. This common description of a resident who displays intact procedural memory (e.g. the act of putting one foot in front of the other to walk) despite not being able to recall explicit memories. *Explicit memories* comprises three types of memory: episodic memory (recollection of a past event), semantic memory (memories of facts, knowledge, concepts), and working memory (short term retention of information for a few seconds). The resident is no longer able to recall their episodic, working, or semantic memory due to the brain atrophy in the prefrontal cortex and hippocampus, and so they are unable to communicate effectively. For example, it may be near impossible for the resident to understand multi-step commands because they have minimal working memory and are unable to recall the steps.

**Impact of AD on communication**

As previously mentioned, the impact of disease-based neurological changes in various affected brain regions impact cognition, memory systems, and communication skills. Residents with dementia will have impairments related to language and comprehension, for example they will have difficulty understanding instructions and articulating their needs or preferences. Despite impairments in expressive or receptive aphasia, the resident will usually be able to correctly interpret and respond to the non-verbal language of others (Attix & Welsh-Bohmer,
Non-verbal communication includes facial expressions, body posture, and tone of voice provides the most effective strategies for interacting meaningfully with the resident (Hamilton et al., 2008). A study by Williams and Herman (2011) rated 16 participant videos of responsive behaviours, like agitation, during bath time. They reported that caregivers who conveyed a tone that was considered to be “domination/bossiness/directive/controlling” during the bath was significantly correlated with residents exhibiting responsive behaviours ($r=0.49, p<.05$). Findings also showed that a tone of voice that was perceived by the resident’s POA to be caring towards residents during the bath was not associated with an increase in responsive behaviours. Such evidence indicates that resident hypersensitivity to emotions requires that caregivers are cognizant of the emotions they express in their voices and apply a more thoughtful approach when communicating with individuals with dementia.

The resident’s inability to adequately communicate their needs and preferences requires that care providers utilize compensatory strategies to address resident’s inabilities and deficits (Dawson, Wells, Kline, 1993). Dementia disrupts the brain’s ability to create episodic memories about earlier events (Attix & Welsh-Bohmer, 2005; Tappen, 1998; WHO, 2012), for example events which occurred earlier in the day. The combined effects of the residents’ amnesia and aphasia may cause them to repeat comments or questions, perseverate (repeating the same words), exhibit psychomotor slowing of speech, and become easily overwhelmed because they are unable to recall the series of events leading up to the present time (Hamilton et al., 2008). Consequently, the resident will exhibit behaviors that reflect agitation, frustration, or anger.

Additionally, residents experience agnosia which is the inability to recognize people or objects (Attix & Welsh-Bohmer, 2005; Tappen, 1998). The resident’s inability to mentally
abstract objects makes it challenging for resident’s to follow verbal instructions especially when compounded with amnesia. A typical example would be if the resident is asked to put on shoes, they may not be able to initiate the task without first seeing the shoes as a visual cue. Thus, clinicians must be aware of the manner in which they communicate with residents with dementia. An understanding of these neuropsychological deficits and how they influence the residents’ abilities to communicate will inform the communication and interactional strategies that are embedded into this intervention.

**Impact of AD on functional mobility decline**

There is a gradual mobility decline in both dementias, including gait abnormalities like ataxia (impaired tandem gait and balance), backwards or lateral postural sway, and taking smaller steps until walking becomes more deliberate (Tappen, 1998). A cross-sectional study of 245 residents found that gait and balance disorders were observed in 79% of residents with VaD and in 25% of residents with AD (Allen et al., 2005). Where a person without dementia would normally determine their position in space from both visual and somatic signals, residents with dementia depend more on visual input rather than on somatic signals to determine their position in space and maintain behaviour (Whipple, Wolfson, Derby, Singh, & Tobin, 1993); and the lack of somatic input exacerbates gait abnormalities and smaller steps. As the disease progresses in severity, these percentages increase until residents become immobile (Sclan & Reisberg, 1994; Tappen, 1998). This functional decline and subsequent increased dependency presents a considerable care challenge for nursing home staff.

A study of 467 people with AD revealed that the extrapyramidal system, a neural network that is part of the motor system in the motor cortex that initiates movement, controls involuntary movements and reflexes, and modulates coordinated activity, is affected by AD
The inability to initiate purposeful movement is called apraxia. Due to extrapyramidal dysfunction, residents with AD have difficulty swinging their arms freely during walking and taking steps that are even in length, so they end up developing a shuffle-like walk (Funkenstein et al., 1993). It is also expected that it will take longer for them to turn around and walk in the other direction due to these mobility issues (Tappen, 1998).

The loss of the functional mobility is associated with poor resident QOL, loss of independence, and substantial economic consequences (Taylor et al., 2001). Impaired mobility results in increased risk of mortality (Studenski et al., 2011; van Dijk, van de Sande, Dippel, & Habbema, 1992) and has been associated with other adverse outcomes in the elderly, such as geriatric syndromes (Engberg, Kincade, & Thompson, 2004; Inouye, Studenski, Tinetti, & Kuchel, 2007; Reddy, Gill, & Rochon, 2006). In addition to gait abnormalities, residents are more likely to experience unsteadiness, falls, urinary incontinence, and sudden mood changes (Tappen, 1998).

However the resident’s memory for entrenched and life-long motor skills, like walking, are still functional into the later stages of AD. In particular, walking is an over learned and entrenched behaviour, and when enabled with the appropriate communication strategies, procedural memory can be accessed to increase the acceptability of a PA program in a cognitively impaired population (Kemoun et al., 2010; Tappen & Kronk, 2001). With adequate monitoring, most deconditioned nursing home residents with AD who are still mobile can safely engage in a walking program which has been shown to reduce decline in ambulation (Kemoun et al., 2010). Recent recommendations acknowledge the heterogeneity of this vulnerable population and stress that any increase in PA to reduce sedentary activity is likely beneficial and can play a
preventative role in functional decline (de Souto Barreto et al., 2016). Mobility, even a few steps, is preferred to immobility and may ameliorate fall risk (Tappen, 1998).

**Impact of AD on ADL function**

Dementia has been identified as a major risk factor for loss of ADL function (Ang et al., 2006) primarily coupled with mobility decline. As previously mentioned, agnosia prevents the resident from recognizing objects (Hamilton et al., 2008), for example they may no longer be able to recognize their walker or how it is used. A qualitative study that aimed to understand nurses’ perceptions regarding resident’s mobility in LTC and mobility enhancing strategies found that functional mobility loss and ADL loss was exacerbated because the residents were unable to recognize or locate their own gait aids in the room (Bourret, Bernick, Cott, & Kontos, 2002). As such, residents quickly lose the ability to walk to the bathroom or transfer from the chair to the bed.

Receptive aphasia prevents residents from understanding directions (Tappen, 1998). As a result, nursing staffs’ attempts to encourage residents to participate in daily self-care may be futile. Staff will often complete the task for the resident which unintentionally encourages deconditioning (Miller, 1985). As the resident becomes more dependent, they experience a reduction in self-esteem and mastery (Edberg & Hallberg, 1996) which consequently exacerbates depressive symptoms (Espiritu et al., 2001). One step commands with verbal and visual cueing are strategies that should be used simultaneously to compensate for the cognitive and physical deficits related to dementia. Moreover, to maintain ADL function, the person with AD should be provided with only as much help as needed in order to prevent deconditioning (Dawson, Wells, & Kline, 1993; Tappen, 1998). Independent function in day to day activities provides the resident with a sense of control, self-esteem, and accomplishment; feelings that will be rarely
experienced as the dementia becomes more severe (Tappen, 1998). The loss of ADL function is also associated with the increased number of responsive behaviours by nursing home residents (Leonard, Tinetti, Allore, & Drickamer, 2006) which consequently results in more social isolation of the resident within the home (O’Connor, Ames, Gardner, & King, 2009).

Another hallmark of dementia is also apathy, the loss of initiation of an action or social engagement and is often interpreted as a symptom of depression (Hamilton et al., 2008; Tappen, 1998). Depression has been linked to ADL functional decline in older adults with dementia (Espiritu et al., 2001). One study found through regression analysis that depression scores were more predictive than MMSE scores of functional ability in nursing home residents with dementia (Forsell & Winblad, 1998).

In summary, dementia has devastating effects on communication, functional mobility and ADL function (Leonard et al., 2006; Tappen, 1998; WHO, 2012). Amnesia, aphasia, ataxia, agnosia, apraxia, and apathy are the foremost cognitive, language and behavioural symptoms of dementia which have significant care implications. Assessing the resident’s remaining abilities and then utilizing a person-centered approach that compensates for residents’ communication deficits can enable residual functional mobility and ADL function to improve QOL.

Undoubtedly, as the world population ages there is an imperative to ensure that caregivers are fully equipped to meet the needs of people with dementia and combat functional mobility and ADL functional decline (Traynor, Inoue, & Crookes, 2011). Previous studies have attempted to prevent mobility decline with PA interventions for nursing home residents with dementia but negated to include a person-centered approach. This next section will provide a critical review and synthesis of these studies.
Literature review

In this literature review, a synthesis of systematic reviews and PA interventions with nursing home residents with dementia to maintain functional mobility and ADL function will be presented. Few studies have examined the effect of PA interventions on nursing home residents with dementia in regards to various outcomes like ADL function, physical performance like functional mobility, and QOL (Binder, 1995; Brill, Drimmer, Morgan, & Gordon, 1995; Christoforetti et al., 2008; Cott et al., 2002; Eggermont, Swaab, Hol, & Scherder, 2009; Francese et al., 1997; Kemoun et al., 2010; Rolland et al., 2007; Santana-Sosa et al., 2008; Tappen et al., 2007; Toullette et al., 2003; Venturelli, Scarsini, & Schena, 2011). The purpose of this chapter is to review existing literature, and find gaps in the literature to propose a PA intervention that is warranted to maintain functional mobility in nursing home residents with dementia. This section will provide tables to synthesize existing literature in regards to: the study objectives and goals, methodology, sample, instruments used to measure the outcome, intervention components, results and effectiveness of the intervention. Then the major limitations and gaps will be discussed and this section will discuss the conceptual framework that will be used to guide this study.

Search Strategy

A search of articles published from 1995 to September 2013 was conducted in six major online databases of peer-reviewed literature: Medline/PubMed, SportDiscus, PsycInfo, PEDRO, CINAHL, and the Cochrane Library. Literature prior to 1995 was excluded due to the advances in knowledge regarding dementia living since that time. Articles that met the following criteria were considered: 1) population: population diagnosed with dementia in a nursing home; 2) intervention: involved any structured PA program with the focus of improving physical
outcomes; 3) outcomes: primary outcome goal to improve mobility, physical function, or ADL function. Only English articles were included. The search was widened to also include non-randomized studies as well (e.g. case studies). The following keywords were combined to identify primary articles (synonyms used are shown in brackets): physical activity (exercise, activity, walk*, resistance, strength, balance, training, ADL); physical function (balance, endurance, cardiovascular, flexibility, mobility); older adults (seniors, elderly, aged, residents), dementia (cognitive impairment, Alzheimer disease, mental decline); long-term care homes (nursing homes, long-term care facilities). A snowballing method (Greenhalgh et al., 2005) was used after primary articles were identified, this method involved manually searching the references of all identified papers for other relevant works, and searching the references of these secondary articles until no new material meeting the search criteria had been found.

This search generated 14 possible studies and an additional nine research studies were found by hand, totaling 23 articles. Of these articles, nine were excluded (six were excluded because their participants did not have a diagnosis of dementia, two described a protocol instead of an intervention, and one was not in LTC) and 14 individual research studies were included in this review. Of the 14 studies, 12 were RCTs and two quasi-experimental studies (tables summarizing these 14 studies can be found in Appendix S). Additionally, four systematic reviews, one Cochrane review, and one meta-analysis, were retrieved and included in the review, so this review included a total of 20 studies.

Results of literature review

Objectives of the previous physical activity studies

The objectives of the reviewed 14 studies were inconsistent which demonstrates variation in the interpretation of intervention success. The majority of authors aimed to determine the
effects or influence of their specific intervention on a functional mobility outcome (Christofoletti et al., 2008; Kemoun et al., 2010; Littbrand, Lundin-Olsson, Gustafson, & Rosendahl, 2009; Santana-Sosa et al., 2008; Tappen et al., 2007; Toulotte et al., 2003). Two studies were interested in the feasibility of specific activity programs for nursing home residents with dementia (Brill et al., 1997; Binder, 1995). Another study had no stated purpose, but hypothesized that the intervention would “influence level of disability related to ADLs” (Stevens & Killeen, 2006, p. 2).

Of the studies which aimed to determine the effect of the intervention, only three studies specifically stated that their purpose was to “improve” various outcomes with their intervention (Cott et al., 2002; Francese et al., 1997; Roach, Tappen, Kirk-Sanchez, Williams, & Loewenstein, 2011), and two other authors aimed to “reduce decline” over time compared to the usual care (Rolland et al., 2007; Venturelli et al., 2011a). This contrast in objectives is worth mentioning because it implies that there is a difference in underlying assumptions of the problem and the extent to which the outcomes can be realistically impacted by PA. For example, Venturelli et al (2011) justifies the objective to “reduce decline” in order to account for the physiologic and neurologic factors of the aging process that make it difficult to improve function in aging individuals (CIHI, 2005). It is with this understanding that individuals with dementia may not possess the physical capacity to significantly improve their baseline functional mobility over time, therefore improvement in physical activity may be too idealistic. Literature is fairly evenly divided in whether the goal should be to “reduce functional mobility decline” or “improve functional mobility”. For many older adults with dementia who have some measure of physical independence, maintaining or slowing decline in physical function is just as important to overall QOL (Doran, 2011) and a worthwhile objective that is clinically relevant to residents.
Research designs of previous studies

The majority of the studies utilized an experimental design (RCTs), with the exception of two quasi-experimental feasibility studies with pre and post measures (Binder, 1995; Brill et al., 1995). Table 1 below summarizes the quasi-experimental studies. Twelve studies were RCTs examining the efficacy of PA on nursing home residents with dementia (Table 2 summarizes the RCTs). The most common timing for intervention measurement was pre-intervention and measured post-intervention (immediately after the intervention) with no longitudinal follow-up (Santana-Sosa et al., 2008; Venturelli et al., 2011).

Various combinations of control conditions were used to account for the inevitable physical decline due to the effects of sarcopenia, the degenerative loss of skeletal muscle mass and strength associated with the aging process, as well as the social attention provided to the intervention group. Control conditions for the majority of the RCTs were either usual care (Rolland et al., 2007; Santana-Sosa et al., 2008; Toulotte et al., 2003; Venturelli et al., 2011) or a social interaction condition (Francese et al., 1997; Kemoun et al., 2010; Littbrand et al., 2009). Two studies utilized a three-arm RCTs to determine the effects of the intervention compared to a walking group and usual care group (Christofoletti et al., 2008), or a walking and social interaction group (Roach, Tappen, Kirk-sanchez, et al., 2011; Tappen, Roach, Applegate, Stowell, & Raton, 2000). The social interaction condition is supported by evidence that suggests increases in mental and social stimulation is related to physical function (Fratiglioni, Paillard-Borg, & Winblad, 2004; Heyn et al., 2004).

Quality of studies

The majority of the studies were of poor methodological quality according to a Cochrane (Forbes et al., 2008) and two systematic reviews (Littbrand, Stenvall, & Rosendahl, 2011;
Pitkälä, Savikko, Poysti, Strandberg, & Laakkonen, 2013) which used criteria for RCTs developed by the Cochrane library and the PEDro scale (Morton, 2009). Though the meta-analysis (Heyn, 2004) and three of the systematic reviews (Blankevoort et al., 2010; Potter, Ellard, Rees, & Thorogood, 2011) reported that evidence was of medium quality as assessed by the Downs and Black checklist (Downs & Black, 1998) and the Evidence-based Medicine checklist (Sackett, Straus, & Richardson, 2002).

Risk of bias was increased in low quality methodological quality studies due to unclear blinding, lack of concealed allocation, lack of intention-to-treat analysis, and attention to control comparability, and poorly described randomization methods (Francese et al., 1997; Kemoun et al., 2010; Santana-Sosa et al., 2008; Stevens & Killeen, 2006; Tappen et al., 2000). The differences between the intervention and control patients were unequal at baseline but were not adjusted in the final analyses (Francese et al. 1997, Christofoletti et al. 2008, Santana-Sosa et al. 2008, Kemoun et al. 2010). However, some studies ensured that outcome measures were assessed by a blind staff member (Roach et al., 2011; Rolland et al., 2007; Santana-Sosa et al., 2008; Tappen et al., 2007; Venturelli et al., 2011). Only three studies were considered to be of moderate to high quality (Rolland et al., 2007; Tappen et al., 2007; Toulotte et al., 2003).
<table>
<thead>
<tr>
<th>Author, year, Country</th>
<th>Design</th>
<th>N</th>
<th>Intervention</th>
<th>Outcome measures</th>
<th>Attrition (n)</th>
<th>Significant results</th>
</tr>
</thead>
</table>
| Binder, 1995. USA     | Three groups (PA, PA and vitamin D, and usual care) with pre-post measurement | 34 | 1. PA: leg exercise, walking, floor exercise 2. Oral Vitamin D supplement 1 hr x 3 times a week for 2.5 months | Physical: Stand-ups, Knee extensor torque, Hip extensor | 36% (9) | Results related to physical function: SS Hip extension improved (p=0.04); Balance improved (p=0.02) compared to pre-scores  
Results related to ADLs: NA  
Other results: Vit D made no difference in performance outcomes  
Decline in knee extension (p.=0.03) |
| Brill et al., 1995 USA | One group Pre-post | 10 | PA: Timed chair stand; hand grip strength; Cybex chest press; sit and reach; standing reach; gait 20 mins x 3 times a week for 11 months | NA | NA | Results related to physical function: and ADLs: NA  
Other results: Training programs can be successfully administered |
Table 2: Experimental studies examining effects of PA on functional mobility in nursing home residents with dementia

<table>
<thead>
<tr>
<th>Author, year, Country</th>
<th>Design</th>
<th>N</th>
<th>Intervention</th>
<th>Outcome measures</th>
<th>Significant results</th>
</tr>
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<tbody>
<tr>
<td>Christofoletti et al., 2008; Brazil.</td>
<td>RCT; 3 arm design</td>
<td>54</td>
<td>1. PA: Walking sessions; Bobath balls, elastic ribbons and proprioceptive stimulation plates; lower and upper exercises 2. Arts and crafts 1-2 hrs x 3-5 times a week for 6 months</td>
<td>Physical: Berg Balance, TUG</td>
<td>Results related to physical function: SS improved balance in both PA groups (F=10.3, P&lt;0.05) compared to control Results related to ADLs: NA Other effects: Cognitive decline noted (NS)</td>
</tr>
<tr>
<td>Cott et al. (2002) Canada</td>
<td>3 arm RCT (Walking and talking (n=30), talking (n=25), control (n=19))</td>
<td>54</td>
<td>1. Walking 2. Talking 30 mins x 5 times a week for 4 months</td>
<td>2 MWT, LPRS, FACS (social and basic communication subscales only)</td>
<td>Results related to physical No SS changes Results related to ADLs: NA Other effects:SS improvements in mean independence scores (F=−2.81; p = 0.012), as did the talk-only group (F=−2.11; p =0.046).</td>
</tr>
<tr>
<td>Francese et al., 1997. USA</td>
<td>RCT (intervention vs. usual care group)</td>
<td>11</td>
<td>1. Leg exercises 20 mins x 33 times a week for 7 weeks</td>
<td>Tinetti Balance scale, Muscle Strength assessment</td>
<td>Results related to physical function: SS Improved strength and balance scores (t score = 3.20, P&lt;0.01) Results related to ADLs and Other</td>
</tr>
<tr>
<td>Author, year, Country</td>
<td>Design</td>
<td>N</td>
<td>Intervention</td>
<td>Outcome measures</td>
<td>Significant results</td>
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</tr>
<tr>
<td>Kemoun et al., 2010.</td>
<td>RCT</td>
<td>31</td>
<td>1. PA: walking and dance</td>
<td>ADLs: Changes of Advanced Dementia Scale (CADS)</td>
<td>effects: NA</td>
</tr>
<tr>
<td></td>
<td>(Control vs. usual care with social activities)</td>
<td></td>
<td>1 hr x 3 times a weeks for 15 weeks (approx 4 months)</td>
<td></td>
<td>Results related to physical function: SS improvement in all mobility measures in the intervention group ( p&lt;0.01) compared to control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Functional mobility (walking speed m/sec; stride length, limb support time)</td>
<td>Results related to ADLs: NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cognitive: French Rapid Evaluation Of Cognitive Functions</td>
<td>Other effects: SS improved overall cognitive score (p&lt;0.01) compared to control</td>
</tr>
<tr>
<td>Littbrand et al., 2009</td>
<td>RCT (intervention vs. control)</td>
<td>191</td>
<td>PA: high intensity functional exercise</td>
<td>results related to physical function: SS in mobility subscale of Barthel (p&lt;0.01)</td>
<td>Results related to ADLs: NS but clinically significant (mean difference of 1.1 points)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>45 mins x 2-3 times a week for 13 weeks</td>
<td>Barthel ADL, mobility subscale</td>
<td></td>
</tr>
<tr>
<td>Roach et al., (2011)</td>
<td>3 arm RCT, single blinded</td>
<td>135</td>
<td>PA: exercises and walking</td>
<td>results related to physical function: 6MWT: Exercise group improved 29.5%, walking group improved 23.2% and control increased 7% but NS</td>
<td>Results related to physical function: 6MWT: Exercise group improved 29.5%, walking group improved 23.2% and control increased 7% but NS ACIF: Control group declined 11% but no</td>
</tr>
<tr>
<td>USA</td>
<td></td>
<td>82</td>
<td>15-30 mins x 5 times a week for 4 months</td>
<td>Acute Care Index of Function (ACIF);</td>
<td></td>
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<tr>
<td>Author, year, Country</td>
<td>Design</td>
<td>N</td>
<td>Intervention</td>
<td>Outcome measures</td>
<td>Significant results</td>
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</tbody>
</table>
| Rolland et al., 2007, France | RCT (single blind) | 134 | 1.PA: walking, flexibility, and strength training  
1 hr x 2 times a week for 12 months | Physical: 6m walk speed; get up and go, one leg balance.  
Nutrition  
Functional: Katz ADL  
Cognitive: NPI, MADRS | Results related to physical function: SS improved 6m walking speed compared to control (p=0.001)  
Results related to ADLs: SS less decline compared to control (p=0.02).  
Other results: NA |
| Santana-Sosa et al., 2008 | Single blind RCT (intervention vs. usual care) | 16 | PA: mobility and balance exercises  
75 mins x 3 times a week for 12 weeks | TUG,  
2 min step test,  
Tinetti balance, Sit-to stand,  
Seniors fitness test  
Barthel index for ADLs  
Katz Index | Results related to physical function: Stat Significant improvements in upper body strength (F=73.1, p<0.001), chair stand test (F=48.7; p<0.001), 2MWT (F=8.9; p<0.010), TUG (F=36.7, p<0.001), Tinetti balance (F=45.13, P<0.001),  
Results related to ADLs: Stat Significant improvements ADL ability according to the Barthel (F=89.60, P<0.001)  
Other effects: NA |
<table>
<thead>
<tr>
<th>Author, year, Country</th>
<th>Design</th>
<th>N</th>
<th>Intervention</th>
<th>Outcome measures</th>
<th>Significant results</th>
</tr>
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<tbody>
<tr>
<td>Stevens &amp; Killeen, 2006 Australia</td>
<td>RCT – 3 arm</td>
<td>75</td>
<td>PA: strength training 30 mins x 3 times a week for 3 months</td>
<td>Physical: The revised Elderly disability scale (REPDS) Cognitive: Clock drawing</td>
<td>Results related to physical function: SS improvement in function (&lt;p=0.006) and balance in both PA groups (F=10.3, P&lt;0.05) compared to control Results related to ADLs: NA Other effects: SS improvement in sociability (&lt;p=0.000) compared to control group</td>
</tr>
<tr>
<td>Tappen et al., 2000 USA</td>
<td>3 arm RCT</td>
<td>71</td>
<td>1. PA: walking 2. Talking 30 mins x 3 times a week for 16 weeks.</td>
<td>6 minute walk</td>
<td>Results related to physical function: SS decline in walking group (p=0.011) Results related to ADLs: NA Other effects: effect of treatment fidelity was SS</td>
</tr>
<tr>
<td>Toulette et al., 2003 France</td>
<td>RCT</td>
<td>20</td>
<td>PA: walking, balance and flexibility 45 mins x 2 times a week for 16 weeks</td>
<td>TUG, chair sit and reach, walking speed over 10 m, posturigraphy platform</td>
<td>Results related to physical function: SS walking speed improvement SS improvement in Balance (p&lt;0.01) Results related to ADLs &amp; Other effects: NA</td>
</tr>
<tr>
<td>Venturelli et al., 2011</td>
<td>RCT (single blind)</td>
<td>24 → 21</td>
<td>PA: Walking</td>
<td>Physical: 6MWT</td>
<td>Results related to physical function: Stat. sig improvement of 6MWT in WG</td>
</tr>
<tr>
<td>Author, year, Country</td>
<td>Design</td>
<td>N</td>
<td>Intervention</td>
<td>Outcome measures</td>
<td>Significant results</td>
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<tr>
<td>Italy</td>
<td></td>
<td></td>
<td>30 mins to 1 hour x 4 times a week for 6 months</td>
<td>Functional: Barthel index of ADL Cognitive: MMSE</td>
<td>within and between groups (P&lt;0.05) SS decrease in CG within group (P&lt;0.05) <strong>Results related to ADLs:</strong> Stat. sig improvement of Barthel in WG within and between groups (P&lt;0.05) <strong>Other results:</strong> SS decrease in MMSE scores in the CG group (P&lt;0.05)</td>
</tr>
</tbody>
</table>
Samples from the previous intervention studies

The mean ages of participants in the studies were over 65 years old. The youngest sample had the mean age of 76 years old (SD = 4 years) (Santana-Sosa et al., 2008) and the oldest sample had a mean age of 88 years old (Binder, 1995; Roach et al., 2011). Several studies did not describe demographics of the final sample (Francese et al., 1997; Toulotte et al., 2003). The percentage of females varied, but all studies had over 50% females. The lowest reported percentage of females in the included studies was 53% females (Cott et al., 2002) and the highest was 84% (Tappen et al., 2007).

Generally sample sizes were small and under powered, for example there were sample sizes of 11 (Francese 1997), 16 (Santana-Sosa et al., 2008) and 21 (Venturelli et al., 2011) participants. Small sample sizes contribute to insufficient power to detect a difference, if one is present (Sidani & Braden, 2011). As such, several studies with small sample sizes failed to allow enough power to detect a difference between the intervention and control groups and reported that no differences were found between groups (Christofoletti et al., 2007; Cott et al., 2002; Kemoun et al., 2010; Santana-Sosa et al., 2008; Venturelli et al., 2011). Power calculations were not reported in some studies (Christofoletti et al., 2008; Venturelli et al., 2011). Studies that reported a power calculation had a slightly smaller sample size than their original power calculations, like Cott et al (2002) as well as Stevens and Killeen (2006) who both aimed to enroll 90 residents but enrolled 86 and 75 participants, respectively. Only one RCT (Rolland et al., 2007) had an adequate sample size (N=134) that exceeded their power calculation.

Assessments used in the PA interventions

The most common assessment measure used in the studies was the MMSE that was used in almost all the studies. Initial assessments also included anthropometrics (height, weight, BMI)
and vital signs (Venturelli et al., 2011), and various mobility tests such as walking speed, timed up and go (TUG), 2-minute walk test (2MWT), or 6-minute walk test (6MWT). Other information that was commonly collected at baseline were diagnoses, medications, exposure to physiotherapy in the nursing home, as well as participation in leisure programs. In one study, observation over a 6 hour time period was used to record resident participation in activities to document accurate baseline activity levels (Venturelli et al., 2011).

The majority of the studies assessed the participants with an outcome measure, only one study screened participants with a measure that was not used an outcome. Venturelli et al (2011) used the Tinetti Performance Oriented Mobility Assessment (POMA), a valid and reliable performance-oriented assessment of mobility that measures balance and gait in the older adult (Tinetti, 1986). The POMA has been used as a falls screening tool in previous studies with older adults, however falls was not an outcome measure and no one was excluded based on their POMA score. Venturelli et al (2011) did not report any issues with using the POMA with his participants (mean age 84, mean MMSE 13), but the POMA is reported to be more cognitively challenging than other balance and gait tests. The POMA requires the individual to be able to follow commands, which makes the administration of the test to some individuals who are cognitively impaired difficult (Whitney & Rossi, 1999). Feasibility issues with the POMA have been reported with people who have moderate to severe dementia (Sterke, Huisman, van Beeck, Looman, & van der Cammen, 2010). Sterke et al (2010) found that 41% of participants had difficulty understanding the instructions and concluded that despite the predictive validity of falls, the POMA is not recommended for those with moderate to severe dementia.
Outcome measures used in the PA interventions

Physical function measures used in the PA interventions

The most common measure used for functional mobility was the valid and reliable TUG test (Toulotte et al., 2003; Rolland et al., 2007; Christofoletti et al., 2008) and iterations of the test, like the 8 foot TUG (Santana-Sosa et al., 2008). Walk tests of different durations and lengths were used. The 6MWT was used (Tappen et al., 2000; Roach et al., 2011; Venturelli et al., 2011) as well as the 2MWT (Cott et al., 2002 Santana-sosa et al., 2008). Participant’s gait was also measured with gait speed (Toulette et al., 2003; Rolland et al., 2007; Kemoun et al., 2009; Binder, 1995).

Balance was commonly measured with the Berg Balance Scale or the Tinetti balance scale (Francese et al., 1997; Santana-Sosa et al., 2008). Other physical function measures of leg strength and functional mobility included timed chair stands (i.e. sitting and standing with arms across your chest for 10 repetitions) (Brill et al., 1995; Binder, 1995).

ADLs measures used in the PA interventions

Five PA studies included ADLs as a primary outcome. The tools that were used twice to measure ADLs were the Katz Index of ADLs (Rolland et al., 2007) or the Barthel’s ADL scale (Littbrand et al., 2009), and one study used both tools (Santana-Sosa et al. 2008). The six items on the Katz scale (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963) assesses eating, transferring, walking, toileting, bathing, and dressing with a dichotomous (“independent” or “dependent”) scale. The Barthel’s scale (Collin, Wade, Davies, & Hoene, 1988) has 10 items: feeding, bathing, grooming (scored independent or dependent); dressing, bowels, bladder, toilet, climbing stairs (graded independent, needs help, or dependent); and transfer and mobility (graded on a 0-4 scale.
of independence). Santana-Sosa (2008) reported a p values of <0.05 and <0.001 for the Katz and Barthel, respectively, when he included both scales to assess ADL function.

Other measures that were used to measure ADLs included the Revised Elderly Persons Disability Scale (REPDS) used by Stevens and Killeen (2006). It has 53 items to assess self-help skills, behaviour, and six other categories reflecting functional ability on a 4-point scale. Lastly, the Acute Care index of Function (ACIF) had 20 items assessing mental status, bed mobility, transfers, and mobility was a dichotomous (independent or dependent) scale and authors reported no statistically significant improvements for the PA group compared to the walking group (Roach et al., 2011).

**Communication outcome used in the PA interventions**

One study included a communication outcome (Cott et al., 2002) but the authors used only two out of four domains of the Functional Assessment of Communication Skills (FACS) for Adults. The FACS assesses the functional communication skills used on a daily basis, but has only been shown to be valid and reliable in adult populations with left hemisphere stroke and adults with cognitive communication disorders resulting from traumatic brain injury (Frattali, Thompson, Holland, Wohl, & Ferketic, 1995). Another study reported engaging with the resident during the conversation group but provided no details or tools for this process aspect of the intervention (Tappen et al., 2000). No communication assessment was used to guide or aid in the development or delivery of any walking regime.

**Effectiveness of physical activity interventions**

Four systematic reviews (Blankevoort et al., 2010; Littbrand et al., 2011; Pitkälä et al., 2013; Potter et al., 2011) and a meta-analysis (Heyn et al., 2004) examined the effect of PA on
the physical function of older adults with dementia, and consistently concluded that PA improves their physical functioning - especially walking performance (Littbrand et al., 2011). Despite the heterogeneity of the interventions included in the reviews, the systematic reviews reported that PA was efficacious in improving physical functioning. For example, Potter and colleagues (2011) reported three out of the six trials that had walking as an outcome found an improvement, as did four of the five trials reporting TUG tests. Three other systematic reviews (Blankevoort et al., 2010; Littbrand et al., 2009; Pitkälä et al., 2013) concluded that PA interventions are suggested to be effective in slowing functional decline. The meta-analysis by Heyn and colleagues (2004) included a total of 2020 subjects from 30 trials and suggested exercise training increases fitness, physical function, cognitive function, and positive behaviour in people with dementia and related cognitive impairments. Significant summary effect sizes (ES) were found for strength (ES=.75; 95% CI, .58 –.92), cardiovascular fitness (physical fitness (ES=.69; 95% CI, .58 –.80), functional performance (ES=.59; 95% CI, .43–.76), cognitive performance (ES=.57; 95% CI, 0.43–1.17), and behaviour (ES=.54; 95% CI, .36 –.72). The overall mean ES between exercise and non-exercise groups for all outcomes was .62 (95% CI, 0.55–0.70) (Heyn, 2004).

The state of the science has advanced since a Cochrane Review (Forbes et al., 2008) concluded that there was insufficient evidence to determine the effectiveness of PA interventions in managing or improving cognition, function, behaviour, depression, and mortality in people with dementia. Only two studies were included in the review (Rolland et al., 2007; Francese et al., 1997) due to poor reporting about the randomization process in other RCTs. But there was valuable existing evidence applicable to interventions that could have been drawn from quasi-
experimental studies (Sidani & Braden, 2011) that were excluded because they did not meet the Cochrane Review criteria.

Effectiveness of PA on ADLs has been demonstrated in two out of three studies. The study by Santana-Sosa (2008) reported P values of <0.05 for the Katz (no effect size reported) and an effect size of 5.06 and a P value of <0.001 on the Barthel ADL scale. Rolland et al (2007) reported an effect size of 0.22 and a statistically significant improvement (P < 0.02) in ADLs as well, whereas Littbrand et al (2009) found non-statistically significant results but reported a clinically significant improvement using the Barthel Index. Overall, PA can result in improved functional mobility and ADL outcomes according to the findings of multiple systematic reviews and a meta-analysis. These results highlight the benefit of PA and the need to ensure that PA can be effectively delivered to nursing home residents with dementia using the appropriate strategies (de Souto Barreto et al., 2016).

**Effectiveness of high intensity PA compared to walking alone**

There is evidence to indicate that there is a statistically significant difference in the effectiveness of higher intensity PA interventions with many different types of exercise (e.g. flexibility, strength training, balance, walking, etc.) compared to walking alone. However, more intensive exercises may have contributed to the high attrition rates reported during these interventions. Roach et al (2011) conducted a three arm RCT (N=82) to improve the basic mobility and transferring of nursing home residents with dementia (mean MMSE=10.7 and age = 88). The authors compared a higher intensity exercise intervention, a self-paced walking intervention, and a conversation/control group. Improvement was noted in both activity groups and there was no statistically significant difference between the activity groups in transferring or mobility. Both activity groups improved in bed mobility (rolling side to side and sitting supine)
(P = 0.02) measured by the Acute Care Index of Function, whereas the control group declined by 11%. The 6MWT was used to measure functional mobility and the exercise group improved by 29.5%, the walking group improved by 23.2% and the conversation group improved 7.1% (no mean differences were reported in the study). The marked improvement of the walking groups suggests that the general activity of walking may be sufficient to at least maintain functional mobility and transferring.

Additionally, two other studies conducted walking studies ranging from four to six months long, 30 minutes, three times a week (Tappen et al., 2000; Venturelli et al., 2011) reported statistically significant (P < 0.05) improvements in walking performance. Venturelli et al (2011) included severely cognitively impaired participants and reported improvements in ADL function in the walking group compared to the usual care control group and a moderate effect size (d=1.19; r=0.51). The results from these studies further support that walking is a feasible, practical and effective PA that can improve physical function and ADL function in residents with dementia.

**Intervention characteristics**

The interventions included a variety of exercises but all of them consistently included a walking component. The other common activities included in the interventions were strength training and flexibility exercises. Generally, the interventions were delivered in groups of two or more to maximize the interventionist’s time (Cott et al., 2002); however challenges were reported. For example, a group exercise by Binder (1995) with a ratio of 1:8 (interventionist:residents) was limited in success and the author discussed the difficulty in conducting the intervention due to the unanticipated level of supervision and attention required to work alongside residents with dementia (Binder, 1995). The author recommended that groups
should not exceed 1:4 in future work in order to provide the level of supervision and assistance the resident’s required. This conclusion was echoed in a systematic review that stated walking interventions provided on an individual basis were more effective to improve walking performance because the efficacy of the intervention may be diluted in group settings (Littbrand et al., 2011).

The systematic review by Littbrand et al (2011) also indicated that the duration and dose of an effective intervention should be at least three times a week and four months long, and that overall an exercise program at a lower intensity but longer duration is suggested when adverse events and attendance is considered. Walking interventions were also shown to be effective at reducing mobility decline at four months, for example a walking program at a self-selected speed conducted for 16 weeks reduced decline of walking performance among older people with AD (Tappen et al., 2000). Moreover, the most common duration of interventions was four months long from five RCTs. Of these five, three studies (Rolland et al., 2007; Tappen et al., 2000; Toulette et al., 2003) were also repeatedly identified as high-quality studies by systematic reviews.

Notably, only two studies reported measures to assess intensity of the PA during the sessions, the studies used verbal encouragement when walking at a comfortable pace to assess and increase intensity (Tappen et al., 2000; Venturelli et al., 2011).

**Adherence and attrition rates of previous studies**

Generally, previous studies reported poor adherence rates despite their intentions to maximize adherence during the intervention (Rolland et al., 2007). Low adherence rates ranged from 33.2 (+/- 25.5%) (Rolland et al., 2007), 53% (Littbrand et al., 2009) to 57% (Tappen, et al., 2000). The highest adherence rates reported were 98% and 94% in studies that used family
members as the interventionists (Santana-Sosa et al., 2008; Venturelli et al., 2011). These notable adherence rates can be attributed to the personal and social relationships between the interventionists and the resident; relationships that can be enhanced by the interventionist applying a person-centered approach based on knowing who the resident is as an individual. This notion that relationships with social support and engagement improves adherence to the intervention is supported by other studies (Tappen et al., 2001; Cott et al., 2002). Reasons for low adherence rates were only reported in two studies (Rolland et al., 2007; Binder, 1995): unwillingness to continue (35%), behaviour disorders (40%), increased disability (5%) (Rolland et al., 2007) and 25% left sessions early because they did not want to continue (Binder, 1995).

Furthermore, reported attrition rates show a considerable variance: 49% (Rolland et al., 2007), 39% (Roach et al., 2011), 36% (Binder, 1995), 26% (Binder, 1995), 24% (Christofoletti et al., 2008), 18% (Kemoun et al., 2010), 14% (Cott et al., 2002), 13% (Littbrand et al., 2009) and 12% (Eggermont et al., 2009). Taken as a whole, the most commonly cited reasons for resident attrition were passing away, not wanting to continue and withdrew, or acute illness. Reasons for not wanting to continue included refusing to do the exercises (88%) (Binder, 1995), revoked consent (12%) (Binder, 1995) and lost motivation (15%) (Kemoun et al., 2010). Participants tended to drop-out of the intervention group (Christofoletti et al., 2008; Eggermont et al., 2009; Littbrand et al., 2009) and the walking only arm of the intervention rather than the walk and talk group (Cott et al., 2002; Tappen et al., 2000) regardless of the length of the intervention (ranged from three to six months). Therefore, participants were more likely to withdraw from the intervention group or the group without a social aspect, and the only modifiable reason cited was “no longer wanted to participate”. One can conclude that this string of evidence indicates a
missing component from previous PA studies which failed to address residents’ social needs or appeal to their interests/keep them motivated causing them to withdraw from the study.

**Intervention implementation (feasibility and acceptability)**

Only a few studies reported residents’ reactions to the intervention. The quasi-experimental studies reported that residents and caregivers who participated in the study appreciated the program based on direct observation (Brill et al., 1995; Binder, 1995); however, information regarding the acceptability of the intervention was not mentioned in any of the previous feasibility studies. Additionally, the acceptability of the intervention to nursing home staff or family (or power of attorneys) was never evaluated in any of the 14 studies.

Feasibility issues are important to the implementation of similar interventions in the future, yet feasibility issues like recruitment challenges were infrequently reported in the literature. Some attention was paid to the challenge of getting residents to co-operate during the PA interventions. For example, one study reported that a considerable amount of supervision and verbal encouragement is required to provide assurance and verbal cuing to the residents (Brill et al., 1995). Verbal encouragement to compensate for the residents’ decreased attention span and inability to follow instructions during standardized measurements was recommended for good test-retest reliability (Binder, 1995). Such information regarding the feasibility of data collection is important but was not mentioned in any of the RCTs. Moreover, recruitment and enrollment rates of participants were not commonly reported in the literature despite this information being crucial to determine if the intervention can be replicated in the future (Sidani & Braden, 2010).

Due to the cognitive impairments associated with dementia, the practical challenges of delivering PA interventions should be considered. One researcher noted difficulty with all
exercises that involved the residents sitting on the floor or crouching because residents were scared of falling and losing their balance (Brill et al., 1995). Binder (1995) eliminated floor and mat exercises from the activity intervention because “participants were unable or unwilling to do them” (p. 387). Further, any exercises that required leaning against a wall to improve balance were eliminated for the same reasons. Balancing exercises were difficult to administer because residents were unable to understand the instructions for foot placement or footwork of balance tests or maintain their balance (Brill et al., 1997). Moreover, PA delivery in the morning was most effective because residents were most alert and lucid at that time (Brill et al., 1995). Binder (1995) and a systematic review by Littbrand et al., (2011) recommended frequent and shorter opportunities twice a day for PA to accommodate the shortened attention span of participants.

The environment is also a variable that should also be considered during intervention implementation. Cott et al (2002) implemented the only study that discussed the effect of a program rich nursing home environment on resident’s adherence to the intervention. The authors hypothesized that environments that were program rich (i.e. offered several programs and activities throughout the day) may yield lower adherence rates due to fatigue and over stimulation from the participating in programs compared to nursing homes with fewer programs (Cott et al., 2002).

Lastly, a familiar and comfortable relationship between the interventionist and the resident appears to be important. Ideally, the same intervener would work with the same residents throughout the PA intervention to ensure that residents became familiar with the research personnel (Roach et al., 2011). Several studies believed this familiarity contributed to the successful implementation of their PA intervention (Roach et al., 2011; Tappen et al., 2000) Venturelli et al., 2011).
Major limitations of previous studies

Nine major trends from prior studies minimize their translation into LTC: a) a lack of consensus on the best tools to measure outcomes for PA interventions; b) no consideration or inclusion to any dementia related care approaches, like person-centered care, communication or interactional strategies; c) low adherence rates and variable attrition rates reported; d) increased risk of bias; e) heterogeneity interventions; f) no inclusion of nursing staff or family/Power of Attorneys (POAs) input; g) neglect to address issues of feasibility, acceptability, risk, (e.g. adverse events); h) lacking an understanding of the environmental influences of the nursing home environment; and i) the absence of a theoretical framework.

First, heterogeneity in the valid and reliable tools used indicates numerous options to measure the intervention effects. Studies did not discuss the ease of use or practicality of the assessments or outcomes measures, which are relevant characteristics to consider in order to decrease resident burden. Another aspect to consider is the responsiveness and scoring of items in the measures; nursing home residents with dementia are frail and dichotomous measures (i.e. “independent” or “dependent”) may be unable to capture minor improvements in ADL function that may be clinically significant by participating in PA alone. Considering the aging process and cognitive impairment associated with dementia, “reducing functional mobility decline” is clinically relevant (Doran, 2011) and appears to be more feasible than aiming for complete independence.

Second, no previous study included person-centered care approaches when working with this cognitively impaired population, despite person-centered care being dementia care best practice (ASC, 2010). Further, aspects of PA that enhance pleasure or motivation that should be considered when working with this population (de Souto Barreto et al., 2016) were not included
in any of the interventions. Communication and interactional impairments related to dementia has important implications on the interventionist approach to compensate for these deficits. Individualization of care has been demonstrated to improve the quality of care for LTC residents with severe dementia (Allen-Burge, Stevens, & Burgio, 1999; Attix & Welsh-Bohmer, 2005; Hallberg & Norberg, 1993). Yet, these PA studies negated to include the communication assessment, skills, and strategies required to work alongside residents with dementia in any of the previous studies. Previous work did not formulate strategies to individualize the PA or accompanying communication to correspond with the resident’s abilities which would optimize the efficacy of the interventions (Forbes et al., 2008). Cott et al. (2002) mentioned that the research assistants (RAs) have to assume the “conversational burden” (p. 82) to provide the opportunity for residents to use their remaining communication capacity but the author did not expand on the matter. Tappen et al (2001) described a few strategies that were reported to be helpful during implementation of her study such as guiding the resident towards a large picture window to appeal to the resident’s need to go outside, but no further reflection about the communication needs of the participants was reported in any of the reviewed studies.

Third, ignoring patient preference and strategies to enhance motivation contributes to poor adherence and attrition resulting in non-generalizable conclusions (Eckhert & Hintze, 2000) which was a common problem in previous studies (Littbrand et al., 2011). Poor adherence and attrition are significant limitations and have a profound effect on the training effects from these walking interventions. For example, even though Rolland and colleagues (2007) had a methodologically strong RCT, the fact that adherence was poor likely reduced their effect size. The most obvious strategy to combat adherence and attrition issues is to include person-centered care when delivering the PA intervention, this may mitigate issues that were previously reported
such as unwillingness to continue and behavioural disorders. As well as offering shorter sessions, having meaningful social interaction during the walk, and the need for a light gradual increase of training over time as tolerated by the resident (Littbrand et al., 2011).

Fourth, low quality studies that are not conducted in a rigorous manner may provide invalid results. Although the majority of studies used an RCT design, many studies used nonequivalent groups that were not comparable at baseline due to the number of medications and comorbidities of the sample.

Fifth, heterogeneity in the type of PA offered in previous studies indicates numerous options to address functional mobility decline. A PA intervention will likely be best adhered to if it is straightforward and a simple task with no special equipment required. Walking was selected as the PA because not only is it straightforward, residents with severe dementia are still able to access their procedural memory and have the ability to walk, to thereby enable a remaining ability and maintain functional mobility. Walking has also been recognized as the easiest and safest of the low-impact activities for the person with AD from the perspective of limiting cardiovascular and orthopedic risks (Tappen, 1998). In order to accurately capture the effects of the intervention, the ADL measurement must be sensitive to small changes and responsive over time.

Sixth, the family or POA perspectives about the resident and their mobility status were generally not included in previous work. Major stakeholders have more knowledge about the resident compared to the researchers/interventionists who are only interacting with the resident for the purpose of the research study. PSW staff are intimately familiar with the residents (Bowers, Esmund, & Jacobson, 2000) and play a key role in optimizing and facilitating the independent function of residents with AD (Dawson et al., 1993). POAs, who are typically
family members, can also be instrumental to provide information that can increase adherence and reduce attrition over time (Santana-Sosa et al., 2008). Despite this, no PA interventions incorporated input from PSWs or asked POAs about the resident. In view of this, keystones of person-centered care like shared decision making and care planning were not integrated, for example developing meaningful goals collaboratively with family members or POAs in a way that is easily understood to the resident, like “walking better” (Tappen, 1998).

Seventh, previous studies failed to consider other important issues that affect the success of an intervention: a) feasibility (e.g. the costs of expensive equipment, and physiotherapy (PT) or occupational therapy (OT) supervision of training, sustainability) is a major oversight especially as many LTC residents with multiple co-morbidities are not able to perform the PA programs without a physiotherapist; b) acceptability to residents and stakeholders or the perceptions of the POAs or PSW staff, is important to intervention adherence; and c) risks or adverse events related to the intervention were only minimally reported. Only three previous studies reported adverse events (Santana-Sosa et al., 2008; Rolland et al., 2007; Steinberg et al., 2009) with no significant differences between the intervention and control groups regarding number of falls, fractures, or deaths after the intervention. Overlooking these critical issues related to feasibility and acceptability indicates little attempt to narrow the research-to practice-continuum and integrate research into the health care system and clinical practice (Canadian Institutes of Health Research [CIHR], 2011; de Souto Barreto et al., 2016).

Eighth, related to the feasibility issues mentioned above, the environmental influence on the implementation of the study can influence adherence and effect size of the intervention (Cott et al., 2002; Sidani & Braden, 2011; Slaughter & Estabrooks, 2013). The environmental context is an important variable to consider when testing a new intervention because it can influence the degree to which the intervention can be delivered as designed.
Lastly, no previous intervention was designed using a theoretical framework. A theoretical framework in an intervention study highlights the relationships and salient variables to guide the design of the intervention (Sidani & Braden, 2011). Past PA interventions were delivered based on the physiological benefits of PA to prevent muscle atrophy and its role as a protective factor in elderly participants. A patho-physiological framework has limited appropriateness in this heterogenous population, as the delivery and outcomes are focused on the physical functioning of the resident only while failing to incorporate the personhood of the resident into the intervention or the influence of the environment. In order to better meet the needs of residents with dementia, interventions should be individualized to the resident’s unique interests, behaviours, abilities, and communication and cognitive needs.

In summary, 20 research studies were included in this literature review and nine major knowledge gaps have been identified that are important to accurately and rigorously evaluate the efficacy of PA in maintaining functional mobility, ADL function, and QOL of residents with dementia. Given the major limitations of previous studies, a study to determine the feasibility and acceptability of a theoretically sound person-centered care intervention that delivers PA to maintain functional mobility, ADL function, and QOL in LTC residents with dementia is warranted. This next section will introduce the International Classification of Functioning, Disability and Health (ICF) as the proposed theoretical framework that will guide the intervention.
Conceptual framework

The primary objective of this study is to examine the feasibility and acceptability of a walking intervention. Secondary outcomes include evaluating trends among participants pre-intervention and post-intervention regarding functional mobility, ADL function, and QOL. The conceptual framework used to guide the research study is the International Classification of Functioning, Disability and Health (ICF) (WHO, 2001). The ICF (WHO, 2001) describes the complex phenomena of disability and functioning as a continuum while accounting for the influence of the environment, individual, and disease. It has contributed to a shift in health care from a medical-biological approach to a psychosocial-environmental approach, and is considered the most comprehensive classification system (Cerniauskaite et al., 2011). The ICF has been used extensively to conceptually describe function as well as refocus the design and evaluation of interventions towards QOL especially for populations challenged by multiple co-morbidities (Cerniauskaite et al., 2011; Worrall & Hickson, 2003).

In this study, the ICF will be used to provide a framework to understand how a multifaceted walking intervention (MWI) will be efficacious to maintain nursing home resident outcomes when considering the individual, the continuum of function, and the environment (Figure 1). The ICF accounts for the integration of one’s personal factors (age, sex, health status, co-morbidities, medications) with the individual’s environmental factors (e.g. practice setting, resources) that impact on areas of activity or social participation (Cerniauskaite et al., 2011). Each construct within the ICF influences and is influenced from the interactions between them, for example an individual’s personal factors influences their body structures, activity, and their ability to participate in everyday life.
**Figure 1.** Applying the ICF to this study

**Constructs of the ICF and how they apply to this study**

**Activity:** Described as “the execution of a basic task or action by an individual that allows the person to function” (WHO, 2001), for example the acts of walking, talking, and standing. These activities serve as the link between physical bodily functions and the individual’s capability to participate in society. The MWI intervention enhances the activity level of the resident by implementing a walking regime. The resident’s functional mobility will thus be improved and this construct will be measured by the Timed Up and Go (TUG) measure and the 2-Minute Walk Test (2MWT).

**Body function and structures:** Relates specifically to the physiological function of body systems (including systems of mental function) and the anatomical structure of parts of the body.
such as organs and limbs, and their physical components like nerves, muscles, bones, and connective tissue (WHO, 2001). The MWI enhances the body function and structure of the resident as walking contributes to contracting leg muscles and bending of the knee. The gait speed of the resident will be used to assess this construct.

**Participation:** Refers to one’s capacity and ability to participate in everyday life, which includes being autonomous and participating in societal roles. In this study, the MWI intervention will include a walking regime that aims to influence residents’ autonomy and independence in ADL function. This construct will be measured with the Functional Independence Measure (FIM).

The health condition, personal factors and environmental factors within the ICF model will influence the MWI intervention. Thus, these factors will also be assessed in the study:

**Health condition:** Refers to the diseases, disorders, and injuries that interact with the contextual factors (personal and environment) to determine the level of impairment related to body structures, activity, and participation. Based on a review of the literature, the health condition of the individual will be assessed using the MMSE and the Functional Assessment Staging of Alzheimer’s Disease Test (FAST) (Riesberg, 1988). The MMSE assesses cognitive impairment and was the most frequently used assessment tool in previous PA intervention studies with nursing home residents with dementia. FAST scores are the most validated measure evaluating the progression of AD (Tappen et al., 2008) and provide a specific evaluation of functional changes throughout the trajectory of AD. Moreover, dementia significantly impacts one’s language and communication skills which directly influences how and to what degree one can interact with their surroundings. The resident’s communication skills will be assessed using
the Functional Linguistic Communication Inventory (FLCI) and the results will be used to develop communication strategies to meet the communication needs of the resident.

**Environmental factors:** Refers to all external influences upon the individual. The influences can be in the direct physical environment, like the number of additional physical activity programs and the resources in the environment. The interaction between the older person's capacity and their environment should be considered when assessing mobility since it can greatly influence a person's functional mobility and physical health (Hogue, 1991). In recent work by Slaughter et al., 2011, three specific subscales of the Professional Environmental Assessment Scale (PEAP) (Norris-Baker et al., 1999) were associated with a reduced hazard walking disability: i) support of functional ability, ii) maximizing awareness and orientation, and iii) quality of stimulation (Slaughter et al., 2011). The PEAP will be used to assess the environment of the nursing home.

**Personal factors:** Refers to the internal influences of the individual specifically non-modifiable variables, like gender (Landi et al., 2012), age, impairments in vision and hearing (Allen et al., 2003) and having three co-morbidities or more, are all associated with developing walking disability (Guralnik, Ferrucci, Balfour, Volpato, & Di Iorio, 2001). Specific co-morbidities like heart disease (OR=3.8, 95% CI=1.2, 11.9), osteoporosis, hip fractures (Aguero-Torres, Thomas, Winblad, & Fratiglioni, 2002; Taylor, Schenkman, Zhou, & Sloan, 2001), depression (Espiritu et al., 2001), and functional impairment (Aguero-Torres et al., 1998; Muò et al., 2005) contribute to mobility loss in nursing home residents with dementia. In addition, several medications prescribed to the individual can influence walking ability, such as cognitive enhancers (Slaughter et al., 2011). For this study, the personal factors which will be collected
include: depressive symptoms, medications, age, comorbidities, baseline functional status, vision and hearing challenges.

**Quality of life:** QOL affects, and is affected by all four domains, and for that reason QOL is included in the ICF as an overarching construct to depict how an individual’s QOL is significantly influenced by their personal, environmental, and physical factors (McDougall, Wright, & Rosenbaum, 2010). As previously stated, QOL is defined as “individuals’ perceptions of their position in life in the context of the culture and value system in which they live, and in relationship to their goals, expectations and standard” (WHO, 1994, p. 28). This study will measure QOL with the Alzheimer disease related QOL scale (ADQO) (Rabins et al., 1999) as the MWI intervention is expected to improve functional decline and QOL.

**Summary**

This feasibility study will assess the feasibility of the MWI and the acceptability of the MWI to residents with dementia, and their PSW staff and POAs. The ICF will be used to determine the efficacy of the MWI which is designed to influence the resident’s body function and structure (gait speed), activity (functional mobility measured by the TUG and 2MWT) and participation (ADL function measured by the FIM). This study will consider the influence of dementia as the health condition (MMSE, FAST score), nursing home environment factors (PEAP), as well as personal factors (age, gender, co-morbidities like depression, medications, baseline functional status). Lastly, the QOL of the resident’s will be measured with (ADQRL) a valid and reliable tool appropriate for those with dementia. The research study design and acceptability questionnaire will evaluate the feasibility and acceptability of the MWI which will be described in the next chapter.
Research objectives and questions

Primary research objectives
To determine the feasibility of the Multifaceted Walking Intervention (MWI) over a 4-month intervention phase (compared to the pre-intervention phase) and the acceptability of the MWI to the resident, resident’s POAs and PSW staff.

Research questions
1. What is the feasibility of the MWI over a 4-month intervention phase as indicated by the recruitment rates, retention rates, and level of interventionist adherence?

2. What is the acceptability of the MWI to residents as measured by resident adherence during the intervention phase?

3. What is the acceptability of the MWI to resident’s POAs and PSW staff as measured by the modified-Treatment Evaluation Inventory before and after the intervention phase?

Secondary research objective
To determine the efficacy of the MWI in maintaining the functional mobility, ADL function, and quality of life of nursing home residents with dementia over a 4-month intervention phase (compared to the pre-intervention phase).

Research questions
1. Does participation in the MWI lead to a reduced decline in functional mobility measures (Timed-up-and-go (TUG), 2-Minute Walk Test (2MWT), gait speed) compared to the pre-intervention phase?
2. Does participation in the MWI lead to a reduced decline in ADL function as measured by the FIM compared to the pre-intervention phase?

3. Does participation in the MWI lead to a reduced decline in quality of life as measured by the Alzheimer’s related Quality of Life scale compared to the pre-intervention phase?

**Exploratory questions:**

1. Describe the number and severity of adverse events (e.g. falls) experienced by the residents during the *pre-intervention phase*.

2. Describe the number and severity of adverse events experienced by the residents during the *intervention phase* when measured immediately after the intervention.

3. Describe the nursing home attributes as measured by the Professional Environment Assessment Protocol (PEAP) that influenced feasibility measures (recruitment rates, retention rates, interventionist adherence).

4. Describe the nursing home attributes as measured by the PEAP that influenced residents’ outcomes (functional mobility, ADL function, quality of life scores) pre and post-intervention.
Chapter 3: Methods

This chapter presents an overview of the goals of this feasibility study, followed by a description of the study design, including the sample, recruitment procedures, measures (resident assessment; resident outcomes; PSW staff and family/POAs data; and environment assessment), and data collection procedures. Next, is a brief description of the possible threats to internal and external validity and how the research design mitigated these threats. Then the data management and statistical analysis methods used to analyze the data will be outlined. The chapter concludes with the ethical considerations that were applied to work with this population.

Feasibility study

A feasibility study identifies issues during the intervention to determine the feasibility and acceptability of a proposed intervention in order to answer the question “is it possible to implement this intervention as it is designed?” The goals are to assess adequacy of study instruments, reveal barriers to data collection and intervention implementation, and recognize modifications needed to enhance the intervention and facilitate implementation to the target population in the selected context (Sidani & Braden, 2011). Feasibility studies are meant to uncover hindrances related to crucial aspects of conducting the intervention, like recruitment rate in a context. Unlike a pilot study, randomization is not required for a feasibility study (Hertzog, 2008; Thabane et al., 2010); where a pilot study often adopts the same study design which may include randomization to reflect a larger RCT that will be conducted later (Arain et al., 2010).

Typically a feasibility study precedes a pilot study (Arain et al., 2010) as it is mainly focused on feasibility and acceptability (definitions are listed in Appendix A). Acceptability refers to the views, perceptions, and judgments of those participating in the intervention, like the resident’s POA and PSW staff (Sidani & Braden, 2011). The construct of acceptability is
comprised by several factors: appropriateness of the intervention to address the problem, convenience of the intervention, perception of the effectiveness of the intervention, level of risks involved, and extent to which they are willing to adhere to the intervention (Carter, 2007; Sidani & Braden, 2011, p.167). Participants’ perception about acceptability contributes to the success of significant aspects such as intervention adherence, participant retention and recruitment that are critical to the implementation of a larger future study.

**Study design**

A quasi-experimental one-group time series design was utilized to examine the feasibility, acceptability, and efficacy of a MWI to maintain functional mobility, ADL function, and QOL of nursing home residents with dementia.

After participants were enrolled into the study, baseline data and measurements for resident outcomes (functional mobility, ADL function and QOL) were collected at the beginning of the two month *pre-intervention phase*. During the pre-intervention phase, the participants received usual care according to the nursing homes’ protocols. Following this phase, the *intervention phase* (MWI) was initiated for a four month period and resident outcomes measurements were collected at the beginning, middle, and end of the intervention phase. Figure 2 provides an overview of the study. Data was collected mid-intervention for a few reasons: 1) to identify salient problems with data collection methods or intervention delivery prior to the end of the intervention; 2) detect changes in outcomes compared to the pre-intervention phase; and 3) better understand the trajectory of functional mobility, ADL function and QOL over time in nursing home residents with the MWI.
Figure 2. Study design and timing of measurements

An interrupted time series design is an effective design to investigate the effect of complex interventions and over time with multiple measurements pre-intervention and immediately post-intervention (Cook & Campbell, 1979; Glass, 1997; Sidani & Braden, 2011). This study design compares the resident’s functional mobility, ADL function, and QOL during the pre-intervention phase to the intervention phase to identify trends and evaluate the efficacy of the MWI. Other outcomes such as resident recruitment, retention, and adherence were monitored throughout the six month period to determine intervention feasibility and acceptance. Acceptance of the MWI by the resident’s POA and PSW staff was measured at the beginning and end of the intervention phase using a survey, whereas acceptance of the MWI by the residents was measured by their adherence to the intervention throughout the intervention period.

Quasi-experimental time series

Unlike experimental studies, quasi-experimental studies evaluate interventions/treatments and their effects on outcome measures but do not require randomization to create groups (Cook & Campbell, 1979, p. 6). An interrupted time series design is a type of quasi-experimental design that allows the PI to infer whether the timed intervention had an impact on resident outcomes by
comparing the many observations before to those immediately after exposure to the intervention (Cook & Campbell, 1979). The repeated measures collected in the pre-intervention phase provide the empirical evidence necessary for participants to serve as their own controls (Sidani & Braden 2011, p. 195). Repeated measures on two occasions or more represents the control condition during which the participants received no intervention (Sidani & Braden 2011).

**Setting**

This intervention took place in two nursing homes within the Greater Toronto Area. Home 1 (KG) is a 350 bed non-profit facility and Home 2 (LS) is a 128 bed non-profit nursing home. These sites were selected based on preliminary discussions between the PI and the Directors of Care (DOCs) of these homes where each DOC estimated 1 to 2 admissions every month would meet the inclusion criteria to achieve the required sample size (described below).

**Sampling**

The study used a convenience sample of relatively newly admitted residents to two LTC facilities. This non-probability sampling method introduces some sampling bias but was selected due to its advantages in both cost and practically of recruitment.

**Inclusion and Exclusion Criteria**

The inclusion criteria was: 1) 65 years old or older; 2) a resident in the LTC facility for less than six months; 3) diagnosed with dementia (AD, VaD, mixed); 4) had a MMSE score >10 and <24; 5) English speaking; 6) was able to complete the 2MWT at baseline (with or without gait aids); 7) whose primary physician deemed participation to be safe; 8) was not severely hearing impaired (i.e. can hear voices one meter away), and 9) had a Power of Attorney (POA) (typically a family member or guardian) who consented to the resident’s participation.
The exclusion criteria was: non-ambulatory (i.e. unable to stand, get out of bed, or walk), diagnosed with Parkinson’s disease (due to muscle and motor related impairments), a personality disorder, schizophrenia, focal brain disorder, an unstable cardiac condition that could deteriorate during ambulation, surgery within the last 6 months, a terminal illness with a life expectancy of less than 6 months as indicated in the medical chart or by a physician, considered palliative, or had extreme loss of vision or hearing.

**Sample size**

A sample size calculation used a power level of 0.8 and an $\alpha = <0.1$ was applied to accept a 10% chance of Type I error (two-tailed). A medium effect size of 0.355 was assumed based on Toulette and colleagues’ previous work using the Timed Get Up and Go (TUG) (Toulotte et al., 2003). A P value of 0.1 was used for the purpose of identifying trends in feasibility, acceptability, and efficacy of the intervention. This study required a sample of 23 participants to complete the MWI to provide 0.815 power to correctly reject the null hypothesis. An attrition rate of 30% over the six month study period needed to be accounted for (Christofoletti et al., 2008), so a total of 30 participants was the goal to ensure that the study is adequately powered.

Sample size calculation was performed using the statistical power analysis program G*Power 3.1 which has the capability to perform power analyses for a repeated measures design with a between group variable.

**Usual care**

Usual care refers to the routine day to day care provided to residents at the nursing homes such as daily supportive care, treatments, programs, and activities. Residents typically received one-hour of group sitting exercise six-days a week, if they were able to attend. Physiotherapist assistants (PTAs) visit residents one to four times a week for 10 minute sessions that involved
either walking, balancing or strengthening exercises. Communication strategies PTAs used with residents with dementia were developed over time through trial and error, but specific strategies were not documented or consistently applied by all staff.

**Intervention**

The MWI is a complex intervention that contains two components: 1) an individualized walking regime that gradually increases in intensity over 4 months; and 2) a person-centered care plan outlining communication and interactional strategies individualized to the resident based on resident’s cognitive assessment (Table 3).

**Intervention components**

1) **Individualized walking regime**

The walking regime was developed for each resident and delivered by the PI (interventionist). The PI assessed the residents at baseline with the TUG and the 2MWT and used these results to determine the walking regime. A physiotherapist consultation was available as necessary. The dose of the walking (frequency and duration) offered by the MWI was informed by the duration of PA interventions in previous studies that were effective in either improving or maintaining functional mobility measures, as well as a recommendation of a systematic review (Littbrand et al., 2011). The intensity of the walking (walking speed) was individualized to the resident’s walking ability. The simplified version of the Borg Rating of Perceived Exertion (Borg, Ljunggren, & Ceci, 1985) with a visual analog scale was intended to measure intensity of the activity during the MWI sessions, but residents were able to either verbally communicate if the intensity was too much for them or naturally slowed down to decrease the intensity of the walk, so the Borg visual analog scale was not required. The resident was encouraged to gradually
increase their distance or speed with each week of the MWI. The detailed instructions of how to measure the TUG and 2MWT is in Appendix H and I.

**Table 3: Components and activities in the MWI**

<table>
<thead>
<tr>
<th>Active ingredient</th>
<th>Operationalized ingredient</th>
<th>Specific activity to perform</th>
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</table>
| Physical activity: Walking | Participants participated in walking sessions up to 4 days a week as tolerated, for a 4 month period | 1. Completed the mobility assessments for each resident (TUG, 2MWT, gait speed (m/s)) and develop an individualized walking regime for each resident.  
2. The interventionist delivers the walking regime and documents each session in the interventionist log (distance, notable changes, number of breaks, how the resident tolerated). |
Person-centered care approach  Practice individualized communication and interactional approaches during walking sessions

1. Develop a communication and interactional care plan based on: a communication assessment (FLCI); interviews from the resident’s family/POAs and PSW staff; and a short observation of the resident

2. Document resident’s biographical information, and specific interactional approaches in the care plan. Update the care plan as needed

3. Document resident’s reactions to various strategies or changes to the approach in the interventionist log.

The regime was modified over time based on the tolerance of the resident, for example if the resident wanted to walk for a longer period of time or if the resident’s activity level suddenly changed, the regime was tailored accordingly. All changes were documented in the interventionist log. The interventionist log was also used to document the time and distance of each walking session, describe any issues during the session, any changes in resident health, cognition, mobility, modifications, and broad topics of conversations during the walk. The initiation of each walking session followed the guidelines of the ethical protocol outlined in Appendix K. All the appropriate precautions were taken, such as ensuring the resident had their glasses, hearing aids, appropriate gait aid, and non-slip footwear.
2) Individualized communication and interactional care plan

The care plan is a two to three page document tailored to the resident that provides a detailed and clear description of the person-centered care approaches that can be used to effectively communicate and interact with the resident (McGilton, 2004; McGilton et al., 2007) (care plan example in Appendix U). The purpose of the individualized care plan was to summarize essential information about resident’s communication and interactional abilities (McGilton, 2004; McGilton et al., 2007), as well as their personal information that should be considered when interacting with the resident, for example their history, values, and preferences to facilitate a person-centered approach towards the resident throughout the intervention (Granger, Sandelowski, Tahshjain, Swedberg, & Ekman, 2009). Effective communication between resident and the interventionist is an essential component of person-centered care (Olsson, Jakobsson Ung, Swedberg, & Ekman, 2013).

The PI developed the communication care plan using four different data sources:

i. Functional Linguistic Communication Inventory (FLCI) - a valid and reliable communication assessment tool

ii. A short interview with the POA, who was typically a family member who was very familiar with the resident prior to admission into the nursing home, to collect residents’ biographical information, communication abilities, and interactional behaviours (e.g. level of activity prior to admission to the nursing home). The narratives regarding the resident were integrated into an evidence-based care plan for the resident (Henbest & Stewart, 1990).
iii. Consult with the PSW staff to learn the residents’ ADL function and daily activities (e.g. their daily exposure to PA at the facility, their daily routine), as well as communication abilities and interactional behaviours.

iv. A short observation of the resident interacting with a POA or PSW staff that was documented in detailed notes by the PI.

The communication care plan contained five sections to remind the PI about how to: effectively communicate and be with the resident, how the resident communicates, resident’s communication problems, topics to avoid, and topics of interest for discussion (Katherine S McGilton et al., 2012). Knowing what triggers or calms the resident can help to mitigate the resident’s responsive behaviours (Kovach, Kelber, & Wells, 2006). Additionally, focusing conversations on topics of interest (e.g. hobbies, family members, nature) for the resident increases the likelihood for meaningful interactions that enhance pleasure and motivation.

To supplement the FLCI assessment results, the communication strategies POAs and PSW staff found effective were also documented in the care plan. These included verbal and non-verbal techniques, such as speaking in short simple sentences, rephrasing, using gestures, yes/no questions, or closed ended questions that require a single word for a response. A repository of the most common communication strategies is provided in Appendix D. In order to collect interactional information, a brief interaction between the resident and PSW staff or POA was observed by the PI to identify mannerisms and recognize the remaining capabilities of the resident. Detailed notes about the interaction were taken by the PI describing the resident’s behaving and communication, and what strategies were being used by POA and staff with the resident.
In order to get biographic information and daily activities, interviews with the POA and PSW staff were conducted, respectively. The PI audio-taped the interviews if the POAs and PSW staff were agreeable (see Appendix P for sample questions). Whenever possible the interviews were conducted in person in a quiet area or on the telephone, if the POA did not visit regularly. The information provided was included into the care plan and guided the PI on how to individualize the sessions. Over time, the care plan was continually refined in order to include additional strategies, update the walking regime, and other relevant information.

Data collection

Data collection was organized into eight categories: 1) demographic information from the resident, PSW staff and POAs; 2) environmental assessment of the nursing home; 3) MWI feasibility measures; 4) acceptability of the MWI by the resident; 5) acceptability of the MWI by the resident’s POA and PSW staff; 6) resident specific health information to individualize the MWI; 7) efficacy of the MWI; and 8) the number and severity of adverse events related to the MWI. Table 4 provides an overview of the data collection measures, sources of data, and timing.

1. Demographic information from the resident, PSW staff and POAs

   Resident demographic and baseline data: Information such as demographic data (age, sex, ethnicity), body mass index (BMI) calculated as weight in kilograms divided by height in meters squared), co-morbidities (stroke, diabetes, heart failure, angina, hypertension, osteoporosis, coronary heart disease, asthma, COPD, syncope), number of and types of medications extracted from the medical chart (see Table 5 for list of medications) was collected.
Table 4: Measurement times and measures used for the study

<table>
<thead>
<tr>
<th>Data to be collected</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
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<tbody>
<tr>
<td><strong>Demographic information</strong> from the resident (includes the CSDD), PSW and POA</td>
<td></td>
<td>X</td>
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<tr>
<td><strong>Environmental assessment</strong> (PEAP)</td>
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<tr>
<td><strong>Feasibility measures of the MWI PI</strong></td>
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<tr>
<td>Interventionist adherence</td>
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<tr>
<td>Retention rate</td>
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<tr>
<td>Recruitment rate</td>
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<tr>
<td><strong>Acceptability of MWI by POA and staff</strong></td>
<td></td>
<td>X</td>
<td>X</td>
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<tr>
<td>TEI for POAs</td>
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<td>TEI for PSW staff</td>
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<tr>
<td><strong>Acceptability of MWI by the resident</strong></td>
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<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resident adherence</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Resident specific health information</strong> to individualize the MWI (MMSE, FLCI)</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Efficacy of the MWI over time</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functional mobility (TUG, 2MWT, Gait speed)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>ADL function (FIM)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>QOL (ADRQL)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td><strong>Adverse events</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</table>

→ = indicates continuous and ongoing measurement with each walking sessions with the resident throughout the intervention
Table 5: Medications that may influence walking

<table>
<thead>
<tr>
<th>Medication class (examples)</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive enhancers</td>
<td>Associated with reduced functional decline (Slaughter et al., 2011)</td>
</tr>
<tr>
<td>Insulin (HumR, 30/70, Humulin, Lantus)</td>
<td>Need to be aware of timing of dose to avoid hypoglycemia during exercise</td>
</tr>
<tr>
<td>Oral hypoglycemics (Glyburide)</td>
<td></td>
</tr>
<tr>
<td>Antidepressants (tricyclics)</td>
<td>Can cause orthostatic hypotension in the elderly</td>
</tr>
<tr>
<td>Anti-hypertensives (beta-blocker eg. Metoprolol, ACE inhibitors e.g Ramipril, Perindopril, Angiotensinogen-II receptor blockers e.g. Losartan, Calcium-Channel Blockers e.g. Amlodipine)</td>
<td></td>
</tr>
<tr>
<td>Hypnotics</td>
<td></td>
</tr>
<tr>
<td>Diuretics (e.g. Furosemide, Hydrochlorothiazide, spironolactone)</td>
<td></td>
</tr>
<tr>
<td>Sedatives, anti-psychotic/neuroleptics, psychoactive drugs (Haldol, benzodiazepines e.g. Ativan)</td>
<td>Increases the risk of falls because they can reduce physical performance by reducing activity levels or by inhibiting effects on muscles and nerves.</td>
</tr>
<tr>
<td>Anti-emetics (Gravol, Ondesterone)</td>
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</tbody>
</table>

The PSW most responsible for the resident (i.e. most frequently assigned to the resident) was asked to provide information about the resident’s exposure to physical activity throughout their daily routine, their ADL function, and disabilities (hemiparesis, hearing impairment, visual impairment). Any relevant information was documented in the interventionist log. The PI also checked in with the PSW to get updates on the resident (e.g. recent illness, injuries, appointments). Depressive symptoms (Cornell Scale for Depression in Dementia [CSDD]) was assessed by POAs who regularly visited the resident, but in four cases the POAs preferred the PI ask the PSW most responsible for the resident because they did not have regular visits and did not feel they knew the resident well enough to answer the questions. For all the residents, POAs
provided biographical information about the resident (history, personality, values, etc.). Information regarding communication abilities and interactional skills were collected from both POAs and staff. Lastly, the PI accessed the resident’s electronic chart to collect information about adverse events like falls or musculoskeletal injuries throughout the study.

**Cornell Scale for Depression in Dementia (CSDD):** The CSDD (Alexopoulos, Abrams, Young, & Shamoian, 1988) is a valid and reliable scale to assess depression in persons with dementia based on observation and data from PSW staff. The CSDD is the most valid assessment tool in patients with dementia (Debruyne, 2009; Engedal, Kvaal, Korsnes, Barca, Borza, & Selbaek, 2012; Lichtenberg, Marcopulos, Steiner, & Al., 1992; Müller-Thomsen, Arlt, Mann, Mass, & Ganzer, 2005; Rinaldi et al., 2003), and is considered the gold standard to assess depressive symptoms (Sheehan, 2012). The CSDD is a 19-item scale assessing five areas: mood related (e.g. anxiety), behavioural disturbances (e.g. agitation), physical signs (e.g. weight loss), cyclic functions (e.g. sleep disturbances), and ideational disturbance (e.g. suicidal thought). Items are measured on a 3-point continuum: ‘absent’ (0 points), ‘mild or intermittent’ (1 point) and ‘severe’ (2 points). The scale can be found in Appendix G.

The summative scores on the CSDD range from 0 indicating a lack of depressive symptoms to 38 indicating a severely depressed resident, with a score of 8 or more suggesting significant depressive symptoms. There is sufficient evidence of reliability and validity of the CSDD (Alexopoulos et al., 1988) including high criterion validity with sensitivity and specificity of 93% and 97% (Korner, Lauritzen, & Abelskov, 2006). The CSDD has been widely used in clinical trials in LTC settings (Dal Bello-Haas, Thorpe, Lix, Scudds, & Hadjistavropoulos, 2012; Galik et al., 2008; Hyer, 2005). If any CSDD score was > 8, the PI would immediately inform
the healthcare team who is primarily responsible for the resident participant to ensure their safety.

**PSW staff and POAs’ demographic information:** Basic demographic information was collected for descriptive statistics. PSW demographic information included age, sex, education, employment status and role in the nursing home, and number of months caring for the resident. POA demographic information included age, sex, relationship to the resident, level of education, and how well they know the residents (self-rated on a scale of 1 to 10), and how often they visited the resident.

2. **Environmental assessment of the nursing home**

The Professional Environmental Assessment Protocol (PEAP) (Norris-Baker, Weisman, Lawton, Sloane, & Kaup, 1999) is an evaluation tool that measures the physical and social environment of nursing homes who care for persons with dementia with eight items. The items assess eight therapeutic goals/areas that are important for the care of persons with dementia: maximizing awareness and orientation, maximizing safety and security, providing privacy, regulating stimulation, providing good quality stimulation, supporting functional abilities, providing opportunities for personal control, supporting the continuity of the self, and facilitating social contact. Three areas are linked to walking disability and will be of specific focus in this study: i) support of functional ability, ii) maximizing awareness and orientation, and iii) quality of stimulation (Slaughter et al., 2011). The PEAP assesses the organizational and policy features of the unit as well as three physical environment features that are therapeutic to persons with dementia: 1) fixed structural features like floor plans, 2) semi-fixed features like handrails, and 3) non-fixed features like paintings and décor (Norris-Baker et al., 1999). The PEAP was filled out by an executive team member who was also the study’s contact person in the nursing home.
The ICF (WHO, 2010) considers attributes of the environment as critical to understanding one’s abilities as function is seen as a consequence of individual abilities and environmental resources.

Psychometric properties for the PEAP include kappa results from 0.69 to 0.85 indicating good to very good agreement, and Spearman’s rho from 0.69 to 0.88 (Norris-Baker et al., 1999). Criterion validity with the Therapeutic Environment Screening Scale has also been established (r=0.89) (Lawton et al., 2000). The results of the PEAP addressed the additional questions posited in this study regarding trends between the therapeutic attributes of the home and feasibility of the intervention or efficacy of measures. Examples of each PEAP indicator have been added from the literature (Murray, 2001) to prompt the PI about various aspects of the nursing home environment that are important to note. The adapted PEAP is in Appendix J.

3. MWI feasibility measures

The feasibility of the MWI was measured by recruitment rates, retention rates, and interventionist adherence. Table 5.1 presents each indicator of feasibility. Interventionist adherence to the walking regime and care plan was documented in an interventionist log. The most commonly occurring issues were summarized and described. The adherence to program content is critically important for accurate conclusions of the efficacy of the intervention; low levels of adherence to the manual content would compromise the validity of the intervention (Cross & West, 2011).

The interventionist documented in the interventionist log immediately after each session in order to record the details of each session (e.g. distance and path walked, resident’s behavioural response, explanations for any missed sessions).

Table 5.1: Indictors and measures related to feasibility
### Indicators of feasibility:

<table>
<thead>
<tr>
<th>Indicators of feasibility:</th>
<th>Feasibility will be measured with:</th>
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<tbody>
<tr>
<td>1. Recruitment of residents, resident’s POAs and PSW staff</td>
<td>a) Recruitment rate (percentage of enrolled participants out of the total number of eligible participants); reasons for refusal to participate will be documented; recruitment time (duration required to recruit total number of residents for the study)</td>
</tr>
<tr>
<td>2. Interventionist adherence to the intervention protocol</td>
<td>b) An interventionist log updated by the interventionist/PI throughout intervention to report challenges, barriers to data collection or intervention delivery, and modifications to care plan based on resident’s preferences</td>
</tr>
<tr>
<td>3. Retention rate of participants throughout the study</td>
<td>c) Percentage of residents, POAs, and PSW participants who completed the study</td>
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### 4. Acceptability of the MWI by the resident

Acceptability refers to the degree to which treatments are assessed by individuals (specifically resident’s family/POAs and PSW who is most responsible for the resident) as being appropriate and reasonable to treat the problem (Kazdin, 1980). “Acceptable interventions are agreeable to the clients expected to receive them” (Sidani & Braden, p. 9) which can be quantified by measuring resident adherence to the walking sessions, and identifying the causes for missed sessions to determine if they can be addressed and minimized in a future trial. An interventionist log updated daily by the interventionist/PI documented resident attendance and the walking sessions (number of sessions attended/number of sessions planned) as well as additional information such as the number of breaks, distance, gait aid used, problems during the sessions, or missed sessions due to illness.

### 5. Acceptability of the MWI by the resident’s POA and PSW staff

The acceptability of the POAs and the PSW staff was measured because their acceptability influences recruitment, adherence, attrition, and transferability into clinical
practice. Given the important role of acceptability plays in the success of the intervention, it was measured by the modified-TEI survey before and after the MWI as recommended by Sidani & Braden (2011) to identify changes in MWI acceptability over time.

**Modified-Treatment Evaluation Inventory:** To measure acceptability, a modified form of the Treatment Evaluation Inventory (TEI) was distributed to residents’ POAs and PSWs. The original TEI (Kazdin, 1980) was used to measure the acceptability of behavioral treatments towards children with autism but has since been used in many studies with geriatric populations and their nursing staff and families to assess their acceptability towards treatments (Burgio & Sinnott, 1990; Burgio et al., 1995; Kelley et al., 1989; Landreville et al., 2001). As such, the modified-TEI (Landreville & Guerette, 1998) measures an overall positive or negative reaction to the treatment by asking respondents to rate items measuring treatment acceptability, suitability, how much they like the treatment, perceived effectiveness, risks and side effects, and whether the treatment make sense. Item examples include “How much do you like the procedures and protocols used in this treatment?” and “How consistent is this treatment with common sense or everyday notions about what treatment should be?” The permission from the author to use the TEI via email correspondence can be found in Appendix M.

The modified-TEI is multidimensional with good psychometric properties assessing treatments: the internal consistency was moderate to high as indicated with Chronbach alpha coefficients of .92 for the total score, 0.94 for the general acceptability scale and 0.69 for the negative aspects scale (Landreville & Guerette, 1998). Temporal stability was also moderate to high ranging from 0.60-0.84 (Landreville & Guerette, 1998). Notably, both the global and general acceptability scales interacted with symptom severity (F(1, 92)=16.78 and 25.55, respectively, P < 0.0001). Congruency in the intensity of the intervention and the severity of the
symptoms is important to overall acceptability (Landreville & Guerette, 1998); less intense
treatments were considered more acceptable for residents with less severe symptoms.

To date the modified-TEI has yet to be tested in an intervention with those with AD. The
tool was adapted to specify that the treatment is the MWI and the outcomes are functional
mobility, ADL function, and QOL. The TEI was adapted in previous studies with the elderly to
assess acceptability of a treatment for depression (Landreville, Landry, Baillargeon, Guérette, &
Matteau, 2001).

The modified-TEI consisted of 11 items on a 7-point scale (1=not at all acceptable and
7=very acceptable), one of which is negatively worded (1=no risks at all and 7=many risks are
likely) that load onto two factors; the first factor is ‘general acceptability’ to the entire
intervention which contains 8 items, the second factor consists of 3 items which constructs the
‘negative aspects of the treatment’, for example the risks and side effects. The total score ranges
from 11 to 77 with an ideal score of 71 as one question is negatively scored. A higher score
represented greater acceptability of the treatment while a score of 44 denotes “moderate
acceptability” of the intervention. The survey was distributed to POAs and PSW staff prior to the
delivery of the intervention at the time of decision making to enroll into the study, and again,
after the intervention was delivered.

For this study, open-ended questions were added at the end of the modified-TEI to further
assess the values, judgments and beliefs of the POA and PSW staff to gather data to complement
the survey questions about the acceptability of the intervention (Sidani & Braden, 2011). In the
post intervention TEI, the wording of the questions were changed to the past tense in order to
reflect that the MWI was complete (e.g. ‘Do you think there will be any risks…’ was changed to
“Were there any risks...’). Additional open ended follow-up questions about the process,
procedures and results were included that could not be answered prior to the intervention, such as “what did you dislike about the MWI?” and “did you notice an improvement in the resident?” Appendix N presents the two modified-TEI tools distributed pre-intervention and post-intervention. The PI pilot tested the readability and clarity of the tool with three PSWs and feedback was used to clarify the questions. The main benefits of collecting acceptability after the intervention is that the information provided by participants will be based on the actual intervention, not just the description of the intervention (Sidani & Braden, 2011), and one can compare results to determine if the intervention met participants’ expectations.

6. Resident specific health data to individualize the MWI to the resident

The Mini-Mental State Examination (MMSE) and the Functional Linguistic Communication Inventory (FLCI) (Bayles & Tomoeda, 1994) were used to assess residents’ severity of cognitive impairment and their communication abilities. Clinical assessments are critical to the development of person-centered approaches with residents with dementia as they allow a better understanding of the person and their condition, and the combination of this information results in more meaningful engagement with the resident throughout the intervention (Mast, 2012). The MMSE and the FLCI are described in detail below:

Mini-Mental State Examination (MMSE): The MMSE (Folstein, Folstein, & McHugh, 1975) is a 11 item measure that assessed residents’ orientation, word recall, language abilities, attention and calculation, and visual-spatial ability using verbal, reading and written responses. This objective screening test is widely used to assess cognitive function and is responsive to changes over time (Cockwell & Folstein, 2002; Folstein et al., 1975; Tombaugh & McIntyre, 1992). Previous studies reported reliability coefficients between tests and raters from 0.8-0.95 (Tombaugh & McIntyre, 1992), and correlates with other diagnostic tests like computerized
tomography (Tsai & Tsuang, 1979) and magnetic resonance imaging (Bondareff, Raval, Woo, Hauser, & Colletti, 1990).

The MMSE required only 5-10 minutes to administer and this short duration made it practical to utilize with persons with dementia (Kurlowicz & Wallace, 1999). During the testing, praising success to minimize embarrassment or other negative emotional reactions which could hinder cooperation and performance was acceptable (Cockwell & Folstein, 2002). Scores range from 0 to 30 with a low score indicating more cognitive impairment: scores less than 17 is severe cognitive impairment, 18-23 is mild cognitive impairment, and 24 and above is considered no impairment (Hensel, Angermeyer, & Riedel-Heller, 2007).

**Functional Linguistic Communication Inventory (FLCI):** The FLCI (Bayles & Tomoeda, 1994) was designed to quantify the functional linguistic communication skills of people with moderate and severe dementia. Test scores were used to inform care plans to promote residents’ preserved skills and encourage their highest level of functioning, as well as allow the PI to monitor changes in communication abilities over time.

The FLCI required no special training to administer and took approximately 20-30 minutes to complete. The FLCI consisted of 32 items that evaluated 10 components: greeting and naming, question answering, writing, sign comprehension and object to picture matching, word reading and comprehension, ability to reminisce, following commands, pantomime, gesture, and conversation. This assessment therefore contained a mixture of items from both the Activities and Participation domains from the ICF (Hopper, 2007). The test began as soon as the PI entered the room and approached the resident. The first item instructed the PI to introduce themselves to the resident and extend a hand for a handshake; if the resident appropriately responded to the introduction (e.g. says “hello”) they were given 1 point, if they did not respond they were scored
0 points. After the test was completed, each of the 10 sub-scores were graphed and compared to the normative scores of other patients at different levels of severity to identify the residents’ preserved communication skills. For example, some residents were unable to answer open ended questions but could reliably select between two choices, in this case the care plan indicated to the PI that open ended questions were to be avoided in order to mitigate any resident frustration. The FCLI has high test-retest reliability throughout the 10 subscales ranging from 0.69 to 0.92 (Bayles & Tomoeda, 1994).

FLCI scores were then converted to modified Functional Assessment Stages (FAST) score (Riesberg, Ferris, & Frannsen, 1985) to quantify an overall dementia severity for those with moderate and severe AD and reflects the health condition construct in the ICF. A FAST score is a valid and commonly used to describe dementia severity (Sclan & Reisberg, 1994) that ranges on a scale from 1 (normal adult) to 8 (severe AD) with multiple subscales with each integer (e.g. 7a, 7b, 7c....7f). The FAST score is more specific to AD, and can predict the progressive loss of functional communication skills as AD progresses. According to Boyles and Tomoeda (1994) 42% of residents with severe AD who are still ambulatory should be able to answer at least 70% of the test to provide an accurate score regarding their communication abilities.

**7. Efficacy of the MWI on resident’s outcomes**

Efficacy of the MWI was evaluated based on the changes in the resident outcome measures between the pre-intervention phase and the intervention phase. The outcome measures were: functional mobility (Timed Get up and Go, 2 Minute Walk Test, gait speed), ADL function (Functional Independence Measure), and QOL (Alzheimer’s Related QOL scale). The combined completion time of the functional mobility measures was approximately 10 minutes with the
resident. The ADL measure was collected from nursing staff and observation. Figure 3 illustrates each outcome measure and its alignment with the ICF. This section will describe these outcome measures.

**Figure 3: Resident outcome measures and the constructs they represented in the ICF**

**Timed Get up and Go (TUG):** The TUG is a reliable, valid, and sensitive measure to detect changes in functional mobility in frail elderly patients. The TUG has been used with nursing home residents with dementia to measure the effects of PA programs (Brenner, 2009; Christofoletti et al., 2008; Rolland et al., 2007; Toulotte et al., 2003). The TUG is a reliable outcome; intrarater and interrater reliability have been reported as high in elderly populations ranging between 0.92-0.99 (Steffen, Hacker, & Mollinger, 2002) and higher reliability scores have been reported in older people with AD (ICC = 0.985-0.988) (Ries, Echternach, Nof, & Gagnon Blodgett, 2009). Construct validity has been shown by correlating TUG scores with several tests including gait speed (Pearson r = 0.75) (Steffen et al., 2002).
The full TUG protocol can be found in Appendix H. A trained research assistant (RA), who is a physiotherapist assistant (PTA), assessed the TUG for all the residents. Scores under 10 seconds are associated with individuals who are functionally independent in the frail elderly population (Podsiadlo & Richardson, 1991). A TUG score of $\geq 15$ seconds is indicative of a falls risk for older adults (Canadian Fall Prevention Curriculum, 2007), and a higher cut off score of 32.5 seconds or greater has been reported as a falls indicator for the frail elderly (Thomas & Lane, 2005). There is a lack of consensus about the cut-off value to indicate falls risk in nursing home residents with dementia and the value of such a score has been questioned due to the large variability in the scores of older people in residential care facilities.

The TUG is not susceptible to ceiling effect limitations, is normally distributed (Herman, Giladi, & Hausdorff, 2011) and is related to executive function as cognitive resources are required to complete the transfer and turning components of the TUG (McGough et al., 2011). The TUG is slightly more responsive than the 2MWT in the geriatric population and provides information about a person’s ability to transfer from a chair and walk a short distance (Brooks et al., 2006), which are important abilities for ADL function.

A recent study aimed at nursing home residents with AD indicated that 4.09 seconds was the minimal detectable change score for the TUG (Ries et al., 2009). Minimal detectable change is the magnitude of change that a measurement must demonstrate to exceed the anticipated measurement error and variability in nursing home residents with AD (Haley & Fragala-Pinkham, 2006; Ries et al., 2009). The minimal detectable change at a 90% CI (MDC$_{90}$) findings by Ries et al. (2009) means that if there is more than a 4.09 second different in either direction, one can be 90% confident that the difference was not due to measurement error or patient variability. No MCID has been established for those with AD. A Cochrane Review of eight
studies indicated improvement with a difference of 5 seconds in the TUG pre and post physical rehabilitation in nursing home residents (Crocker et al., 2013).

**2 Minute Walk Test (2MWT):** The 2MWT (Stewart, Burns, Dunn, & Roberts, 1990) is a modified version of the extensively used and established six-minute walk test (Guyatt et al., 1985) to measure endurance and functional mobility. The 2MWT has been validated with older adults, for example one study examined elderly men with COPD and found strong correlations between the 2MWT and the 6 minute walk test ($r=0.95$) as well as the 2MWT and the 12 minute walk test ($r=0.94$) (Bernstein et al., 1994). The 6 and 12 minute walk tests have been difficult to complete for nursing home residents with AD because their cognitive impairments make them easily distracted and unable to follow commands (Tappen, Roach, Buchner, Barry, & Edelstein, 1997). The distance walked also correlated strongly with volume of oxygen consumed ($VO_2$/kg was $r = 0.55$) and moderately with maximal volume of oxygen consumption ($VO_2$max was $r = 0.45$) (Bernstein et al., 1994). Additionally, Brooks, Davis, & Naglie (2006) reported the good construct validity and responsiveness of the 2MWT in a geriatric inpatient setting, and that the assessment had the ability to discriminate if the patient was or was not using a gait aid. Brooks and colleagues (2006) also found moderate to strong correlations with functional status as measured by the FIM. The 2MWT has sound measurement properties in nursing home residents and high test-retest reliability (0.94) (Connelly, Thomas, Cliffe, Perry, & Smith, 2009). The $MDC_{95}$ was determined to be 42.5 meters, the difference required between performances that would be interpreted as true change and not random measurement error (Bohannon, Wang, & Gershon, 2015). A previous study found an MCD of 40 seconds in a sample of female LTC residents who did not use gait aids and who were cognitively intact and medically stable (Connelly et al., 2009). There is no MCID established for this measure (Pin, 2014). The 2MWT
is a simple and suitable measure of everyday exercise tolerance for nursing home residents with AD.

The instructions to administer the 2MWT can be found in Appendix I. The residents could use their usual gait aids if necessary and the corridors were brightly lit and relatively quiet to reduce distractions. A trained RA who was a PTA assessed the 2MWT for all the residents. A digital stopwatch and a calibrated wheel with a counter were used to measure the distance walked in meters. For this study, instructions were repeated to the residents if required due to the cognitive impairment of the residents; however, no feedback or positive encouragement during the test was provided because simple encouragement improves performance (P < 0.02 for the six minute walk), emphasizing the need for careful standardisation of the performance of walking tests (Guyatt et al., 1984).

**Gait speed (meters per second):** Gait speed is a useful clinical indicator for older adults especially those over 85 years (Toots et al., 2013) and has been referred to as the “sixth vital sign” (Fritz & Lusardi, 2009) because it is a predictor of lower extremity function (Guralnik et al., 1994; Studenski et al., 2011). A slowed gait speed is associated with falls (Kearney, Harwood, Gladman, Lincoln, & Masud, 2013a), reduced executive function and processing speed (McGough et al., 2011; Viccaro, Perera, & Studenski, 2011), and increased mortality (Studenski et al., 2011). Gait speed is influenced by muscle, bones, joints, central and peripheral nervous system, and impairments in any of these systems results in slowed walking (Ferrucci et al., 2004; Hicks et al., 2011; Peel, Kuys, & Klein, 2013). Gait speed is a commonly used quick, inexpensive, reliable measure of functional capacity (Cesari et al., 2005) and part of a comprehensive geriatric assessment (Peel et al., 2013).
The MCID of gait speed is 0.05 m/s, and a change of 0.13 m/s is a substantial meaningful change (Perera, Mody, Woodman, & Studenski, 2006). During the 2MWT, the meter distance was divided by 120 seconds to calculate the gait speed formula which was used to calculate the gait speed. The same environmental precautions was taken (brightly lit, uncluttered hallway) as the 2MWT.

**Functional Independence Measure (FIM):** The FIM (Granger, Hamilton, Zielezny, & Sherwin, 1986) measures disability and outcomes of rehabilitation based on the level of assistance required to complete basic ADLs. The FIM contains 18 items including a motor subscale (13 items) and cognitive subscale (5 items) (Granger, Hamilton, Linacre, Heinemann, & Wright, 1993). The motor subscale assesses self-care, sphincter control, transfer, and locomotion, and the cognitive subscale includes items related to communication and social cognition. All items were scored with a 7-point ordinal scale based on the amount of assistance the resident required to perform each ADL (Granger et al., 1993). The FIM is presented in Appendix O. The sum of all 18 items provided the total score, which ranges from 18-126; higher scores on the FIM denote residents that have a greater level of independence and require less assistance (Granger et al., 1993).

No MCID has been established for the FIM in nursing home residents with dementia, but has been established in the older adult stroke population (Beninato et al., 2006). Beninato and colleagues (2006) found an MCID of the total FIM score was 22 points, and the MCID subscale scores to be FIM-Motor score was 17 points, and FIM-Cog was 3 points. The use of the FIM as a functional assessment is congruous with the physical performance measures selected (TUG and 2MWT) and both aspects should be considered in a comprehensive assessment (Brooks et al., 2006).
The FIM was selected for several reasons, including the ability of the 7-point Likert scale (e.g. 7=independent…4=patient can perform 75% of the task, 3=patient can perform 50-74% of the task…0=total assistance) to detect small changes in functionality over time rather than dichotomous measures such as the Katz ADL scale or Barthel Index (e.g. 0=dependent, 1=independent). Due to the small sample size, measures with continuous variables were preferred in this study to dichotomous variables because they usually permit smaller sample sizes (Hulley, Cummings, Browner, Grady, & Newman, 2006). Responsiveness studies have found the physical subscale to be responsive to change (Jones & Feeny, 2006; Rogers, Gwinn, & Holm, 2001). The FIM was completed by the PI observing the resident perform their ADLs or by asking the PSW staff about the resident’s daily functioning. Performance-based ADL scales, like the FIM, can provide a more objective measure of a person’s ADL function (Marshall, Amariglio, Sperling, & Rentz, 2012). The FIM has demonstrated excellent test-retest reliability for both the motor, (ICC = 0.9) and cognitive subscales (ICC = 0.8) in institutionalized adults aged 80 years and older living in a continuing care retirement community (Pollak, Rheault, & Stoecker, 1996). Thirdly, the FIM is conceptually based on the ICF therefore the FIM has construct validity with the notion of ‘Participation’ as described in the ICF (WHO, 2001; Hall, Hamilton, Gordon, & Zasler, 1993). Lastly, although the FIM is frequently used in rehabilitation settings, in recent years it is being used more commonly with nursing homes residents as a measure of their function (Frandin et al., 2009; Johnson et al., 2005).

**Alzheimer Disease-related Quality of Life scale (ADRQL):** The ADRQL is a 40-item disease specific scale that assesses five domains: social interaction, awareness of self, feelings and mood, enjoyment of activities, and response to surroundings (Rabins, Kasper, & Kleinman, 1999). The PI asked the POA to “agree” or “disagree” to each item if it described the subject in
the last two weeks and took approximately 5 to 10 minutes to complete. The overall score was calculated according to the free user manual that accompanies the tool (Black, Rabins, & Kasper, 2009); a higher score indicated a higher QOL of the resident. In four cases, the POAs preferred the PI ask the PSW most responsible because they did not feel like they could answer the ADRQL questions.

Proxy measures like the ADROL are advantageous because collecting QOL data from persons with dementia can be challenging. In one study, Sloan and colleagues (2005) were unable to administer a self-report QOL scale to 75% of their residents with severe cognitive impairment. Using proxies allows assessment of individuals at all stages of disease severity (Kasper, Black, Shore, & Rabins, 2011). The ADRQL has good item–internal consistency, score distribution and scaling success, and exceeds minimum reliability standards for group comparisons (Kasper et al., 2011). Author permission and the ADRQL scale are presented in Appendix L.

8) Data about number and severity of adverse events

An adverse event is defined as “any unfavorable and unintended sign, symptom, or disease temporally associated with the use of the investigational product, whether or not related to the investigational product” (International Conference on Harmonisation [ICH], 2004, p. 9). Data about all adverse events was collected to establish the baseline health of the resident, and to monitor if the MWI appeared to be related to the number or severity of adverse events (Sidani & Braden, 2011). Data about all adverse events (e.g. falls, fractures, responsive behaviours), including the mechanism and severity, were collected regardless if the PI was present throughout
the study to ascertain a reference point of adverse events experienced by the resident participants (Table 5.2 for operational definitions of injury categories).

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<thead>
<tr>
<th>Classification</th>
<th>Operationalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Minor event (no injury)</td>
<td>Mild or temporary; asymptomatic or mild symptoms; no injury; Medical intervention not indicated. e.g. Fear of falling</td>
</tr>
<tr>
<td>(2) Moderate event</td>
<td>A temporary and minor incident that causes injury; minimal, local or noninvasive intervention indicated. e.g. Laceration; moderate pain from arthritis</td>
</tr>
<tr>
<td>(3) Severe event</td>
<td>Severe, medically significant but not immediately life-threatening; hospitalization or prolongation of hospitalization indicated; A manifestation from an injury or disease e.g. Chest pain; pneumonia</td>
</tr>
<tr>
<td>(4) Serious event (life threatening)</td>
<td>Life-threatening consequences; Requires hospitalization; results in persistent or significant disability, incapacity or death (ICH, 2004) e.g. Cardiac arrest; Stroke; fall causing a hip fracture</td>
</tr>
</tbody>
</table>

The PI categorized the adverse events as minor, moderate, severe, and serious and operationalized based on the Common Terminology Criteria for Adverse Events v4.0 (CTCAE) (NIH, 2009) and the ICH (1994), which informed the definition of serious adverse event. To document the attribution of the adverse event, the possible relationship was categorized from 1 to 5 to describe the degree of causality between the adverse event and the MWI as indicated by the CTCAE v4.0 (NIH, 2009): 1 is Unrelated (clearly not related), 2 is Unlikely (doubtfully related), 3 is Possible (may be related), 4 is Probable (likely related), and 5 is Definite (clearly related).

**Respondent burden**
The maximum anticipated questionnaire time burden for POAs or PSW staff at baseline was approximately 40 minutes (10 minutes for the modified TEI and a 30 minute interview). During the intervention, there was minimal respondent burden as only the ADRQL was collected (5 to 10 minutes). At the end of the intervention, participants filled out the final ADRQL and a modified TEI (5 to 10 minutes for the ADRQL and 10 minutes for the modified TEI). To minimize respondent burden for busy POAs, upon request, the blank surveys were e-mailed to them to fill out and were returned electronically or physically. Table 6 lists the total questionnaire and interview burden of POAs and PSW staff, and a more detailed burden for each data source is provided in Appendix E and F.

**Procedures to conduct this study**

The PI was the primary interventionist and responsible for data collection, data management, care plan development and intervention delivery at two nursing homes. The PI is an experienced Registered Nurse who is certified in gerontological nursing (GNC(C)), and who has worked with the geriatric population in the community and acute care settings for 10 years.

**Table 6: Total respondent burden for PSW staff and POAs**

<table>
<thead>
<tr>
<th>Tool (Number of items, completion time)</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDSS (19 items; 10 minutes)</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>ADRQL (40 items; 5-10 minutes; staff)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>FIM (18 items; 10 minutes)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Modified-TEI (15 items; 10 minutes)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modified-TEI (15 items; 10 minutes)</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
The MWI was concurrently implemented by the PI in two nursing homes facilities which was possible due to the time-series research design that allowed the intervention phases to be staggered for individual residents. A trained RA who was a PTA assessed the residents’ mobility outcome measures. The RA was blinded to how long the resident was in the intervention and collected the measures independently, with random checks by the PI to ensure the standardized procedures were being followed.

**Sources of data**

There were three sources for data collection: resident, resident’s POAs and PSW most responsible for the resident. Resident data was collected with multiple methods and sources: a chart review, interview with the POA and PSW staff member, short observation of the resident interacting with their POA or PSW staff member, proxy measures (ADRQL, CSDD) by the POA or PSW staff member depending on the POA’s preference, as well as resident mobility, function, communication, and cognitive assessments conducted by the PI. Residents’ POA and PSW staff member demographic data and acceptability were collected. The environmental data (PEAP) was distributed to an executive staff member familiar with resident care in each nursing home to fill out and identify the attributes of the home environment.

A general procedure presented below (Table 7) was used to guide data collection with residents. The RA was trained to the procedures as well. There was a 10 day period at each of the four target data collection times (i.e. baseline, beginning of intervention, mid intervention, and post intervention) to collect the data.
Table 7: Procedure to collect resident data

**Procedure to collect resident’s data**
- Ensure you have a quiet area to administer the surveys and a clutter free area for physical assessments
- Introduce yourself to the resident, make sure you are wearing a name badge
- During the assessments (e.g. MMSE/FLCI or TUG/2MWT) follow the described protocol, and continuously monitor the resident for any physical/verbal signs of dissent
  - If the resident demonstrates or expresses an unwillingness to participate, attempt to identify the issue and troubleshoot. If the resident continues to dissent, end the session. Attempt to collect information at another time.
  - PI or RA may re-approach after 5 to 10 minutes if appropriate.
    - The RA collected all the physical measure outcome data (TUG, 2MWT, gait speed)
    - The PI completed all the cognitive screening
  - If resident dissents more than three times, consider the participant withdrawn from the study and document this in the logbook.
- If resident is agreeable, continue with data collection.

*For MMSE and FLCI:
- The PI explained to the resident that the instructions and questions will be read slowly, and that responses will be written down
- Inquire if the resident would like to have a copy of the test with him/her to make it easier to follow. Give the resident a blank copy as needed.
- Read the instructions. Make sure the resident understands them. Repeat them as needed.
- Give the resident some time to think, avoid rushing the resident for an answer.
- Write down the response.
- Continue until the tests are completed.
- Thank the resident.
- Exit the room and record on the resident log, that data collection was completed.
- Document in the interventionist log any difficulties the residents encountered in completing the questionnaire.

**Recruitment**

A two wave recruitment strategy was used to optimize the recruitment time for the three categories of participants (i.e. residents, resident’s POA, and PSW staff members). The first
recruitment wave began at the end of September (Sept 29th 2014) and the second recruitment wave began on February 1 2015. The total recruitment time was seven months.

Months before the first recruitment wave, the PI formally met with each of the LTC facilities’ executive leadership and managers to inform them of the study objectives, procedures, and the inclusion criteria. The meetings included the executive director, Directors of Care (DOC), home physiotherapist, social worker, nurse practitioner, VP of quality control and risk, and restorative care coordinator. During this time the restorative care coordinators and social worker were asked to identify potential/eligible participants to generate a list of residents admitted within the last six months, as well as the residents who were eligible and ineligible based on the inclusion criteria. This was completed over several weeks due to their workloads.

After the list of potentially eligible residents was generated, the POA of residents who meet the inclusion criteria were contacted by the restorative care coordinator or social worker from the homes who asked for consent to have the PI contact them directly. If the POA was interested, their name and telephone number was shared with the PI who would connect with the POA and describe the study. Then the PI contacted the POA, described the study to both resident and POA, and asked them both to participate. During the informed consent process, a consent form was provided in person or electronically to the POA to sign and an additional copy was given to them for their own records, and a consent form was provided to the resident as well (see Appendix Q for consent forms). Resident assent and dissent were assessed during the informed consent process. Baseline data collection and assessment with the resident was initiated after consent. If the POA declined, the resident was not entered into the study and no screening tests were conducted. A screening log and master list were kept in an encrypted computer network at Toronto Rehabilitation Institute.
The POAs were also asked to participate in the study themselves. Similarly, the PSW most responsible for the enrolled resident was approached to participate in the study (see Appendix Q for letter to nursing staff). A Tim Horton $5 gift card was provided to the PSW at the beginning and end of the study as a token of appreciation. For both POAs and PSW staff members, the informed consent process was followed according to the Tri-Council Policy Statement (2010) as well as the research ethics board of the University of Toronto and the nursing home. Participants were provided with ample opportunity to ask the PI questions. The PI also ensured the POAs understood that their participation was voluntary and that their participation would not influence the care their loved one received.

Retention

Retention strategies were employed to retain the interest of the POA and PSW staff throughout the study. Strategies such as developing a good rapport and maintaining a pleasant interpersonal relationship with all participants (POAs, PSW staff, and residents) were critical to retention (Nicholson et al., 2011). Participants were more likely to have a positive perception of the intervention if the PI was personable and professional during interactions (Nicholson et al., 2011). For example, the PI ensured that all questions were addressed in a timely manner, and that data collection was scheduled when it was most convenient for the POAs and PSWs.

It was important to have “buy in” from the nursing home management to support the study’s objectives (Nicholson et al., 2011). To maintain visibility on the unit, the PI was frequently on the units to consult with the PSW staff, attended team meetings, and carried a copy of a signed letter with the manager’s approval to provide to participants if requested. The PI was onsite on a daily basis including weekends which guaranteed visibility to the study and gave the researcher a presence in the home.
Lastly, the PI offered the option of reporting resident’s progress to POAs on a regular basis so they felt included and invested in the intervention (Nicholson et al., 2011). Utilizing these strategies facilitated excitement for the intervention among POAs and PSWs and their enthusiasm likely encouraged resident participation.

**Threats to validity**

This section will discuss the main threats to the internal, external, and statistical conclusion validity of this study, and the strategies used to address and minimize these threats.

Internal validity reflects the extent to which the observed effects are a true representation of the relationship between the intervention and the outcomes (Sidani & Braden, 2011), whereas external validity refers to the extent to which the results of the study can be generalized to a wider population (Cook & Campbell, 1979). Statistical conclusion validity (SCV) is the validity of inferences about the mathematical correlation between the treatment and outcome (Shadish, Cook, and Campbell, 2002).

**Threats to internal validity**

**Experimenter bias:** A single researcher (PI) was responsible for designing the study, and delivering the intervention, and collecting the data from POAs and PSW staff (Marczyk, DeMatteo, & Festinger, 2010). Bias can blur the study findings and impact the validity of the study. Strategies to minimize bias were implemented to provide quality control: i) a blinded RA, who was a PTA with experience working with residents with dementia, was trained to collect the physical outcome measures; ii) all procedures related to data collection and data measurement were carefully described to minimize bias; iii) collection of data was standardized with tools that are valid and reliable; iv) documentation of the PI’s thoughts and behaviours (Marczyk et al., 2010) to identify biases that may influence intervention feasibility and interventionist adherence.
**History threat:** This threat to the internal validity was addressed by i) closely monitoring the occurrence of contextual events that could have confounded the effects of the intervention on the outcomes (Shadish, Cook, & Campbell, 2002) by consulting with DOCs and home staff on a regular basis during the intervention phase; and ii) exploring the contribution of the contextual event on the treatment implementation (Sidani & Braden, 2011; Cook & Campbell, 1979), resident adherence, and their behaviour.

**Measurement error:** Several strategies were integrated to reduce random and systematic error during measurement. These strategies increased the accuracy of measurement, which is a function of systematic error (bias) which affects the validity of conclusions (Hulley et al., 2006). First, an operations manual was developed outlining the standardized measurement methods to reduce random and systematic error. Second, ensuring that the environment and surroundings of the participant was appropriate and consistent can decrease variability (Hulley et al., 2006), such as always collecting the measures in the hallway outside the resident’s room by a trained professional. Lastly, repeating the measurement (e.g. TUG and 2MWT) increased the precision and the power of the measurements to detect effects and reduced random error from the observer and participant (Hulley et al., 2006).

**Maturation threat:** The residents may experience natural changes in physical function due to age and as part of the trajectory of dementia (Tappen, 1998). The time-series design of the study allowed an assessment of any maturation trend prior to the implementation of the intervention, so the trajectory of dementia can be identified and considered in the intervention phase (Cook & Campbell, 1979).
Threats to external validity: The lack of a comparison group in the time-series design makes it difficult to know what would have happened had the residents been left untreated (Hulley et al., 2007). For example, even though previous literature indicates a decline in functional mobility and ADL function over time, one cannot be completely certain that a plateau in decline during the intervention phase was due to the intervention or the normal decline of the disease.

Threats to statistical conclusion validity (SCV): SCV is threatened by an increased probability of Type II error from the pre-set value of $P = <0.1$. The $P$ value of 0.1 is appropriate in order to identify trends in the outcome variables associated with the intervention. In order to address SCV, a sample size calculation was determined by a power analysis to detect a significant intervention effect accounting for attrition rates based on previous studies (see sample size calculation). From a methodological perspective, SCV was further addressed by the time-series design which eliminated the error variance in the outcome due to random heterogeneity of residents (Cook & Campbell, 1979). In this one group study, residents serve as their own control which removed baseline between-subject variability of the outcome variables and ensured group equivalence between the pre-intervention and the post-intervention phase (Hulley et al., 2006). Nursing home residents with dementia are a heterogeneous population with multiple comorbidities and medications, as well as differences in personal characteristics; thus minimizing variance between resident-specific confounders is particularly important with this group, and serves to increase the power to detect intervention effects (Sidani & Braden, 2011).

Data management

The PI was responsible for all participant recruitment and the collection of baseline data from electronic medical records and participants, chart review, resident
observation, interviews with POAs and PSW staff, MWI delivery, and recording sessions in the activity logs. Physical outcome measures were collected by the RA. The PI was responsible for entering all the data onto an encrypted and password protected computer in a secure office at the E.W. Bickle Center, Toronto Rehabilitation Institute-UHN. A data entry dictionary that defines each variable label and response option was created. Files were backed up on a bi-weekly basis onto an encrypted drive and stored in a secure location. All hard-copy paper documents were de-identified, and the participants were assigned a number code. A master list was created and kept in an alternate locked and secure place separate from the consent forms to protect participant confidentiality, and was only accessed by the PI.

**Data Analysis**

**Data Entry and Data Accuracy**

Quantitative data was analyzed using SPSS for Windows (SPSS Inc, v. 21, Chicago). Data was entered in SPSS and analyzed for missing information, outliers, and data entry errors. Double entry was completed and cross-matched for 25% of the data to check for data entry errors. Data entry errors were corrected by checking the original paper copy of the assessment data and survey information; descriptive statistics with frequencies were completed before and after recoding to verify corrections. These steps were important to ensure data entry was accurate for data analysis.
Statistical analysis methods

The statistical analysis method to address each research question is outlined in this section. An $\alpha = <0.1$ was applied for all statistical tests to accept a 10% chance of Type I error. This increased P value is appropriate where the study objective is to identify any positive trends that correspond to the feasibility and efficacy of the intervention.

Primary research objective.

To determine the feasibility of the Multifaceted Walking Intervention (MWI) over a 4-month intervention phase (compared to the pre-intervention phase) and the acceptability of the MWI to the resident, resident’s POAs and PSW staff.

Research question 1. What is the feasibility of the MWI over a 4-month intervention phase as indicated by the recruitment rates, retention rates and level of interventionist adherence?

Descriptive statistics were conducted for each univariate (recruitment rate, retention rate, resident adherence). The recruitment rate and retention rate were described as percentages; reasons for ineligibility or withdrawal from the study were summarized.

An in-depth reading of the daily logs tracking the walking sessions and the PI’s field notes was completed. Frequency counts of topics related to interventionist adherence to deliver the MWI as designed (e.g. intervention modifications, enablers and barriers) were completed for conventional content analysis (Hsieh & Shannon, 2005). This inductive method highlights patterns linked to the intervention, residents, environment, or PSW staff.
**Research question 2.** What is the acceptability of the MWI to residents as measured by resident adherence during the intervention phase?

Resident adherence was expressed as a percentage determined by the number of sessions attended by residents divided by the number of sessions outlined in the walking regime. The interventionist log was analyzed to summarize why residents missed sessions, the frequency of each reason, and if these challenges could be mitigated in the future in order to inform modifications to the MWI. An in-depth reading of the daily logs tracking the walking sessions and the PI’s field notes was completed to describe the enablers and barriers related to resident adherence to the protocol for conventional content analysis (Hsieh & Shannon, 2005). This inductive method highlights patterns linked to the intervention, residents, environment, or PSW staff.

**Research question 3.** What is the acceptability of the MWI to POAs and PSW staff as measured by the modified-Treatment Evaluation Inventory before and after the intervention phase?

Descriptive statistics to describe POAs and PSW staff participants in the study were completed. A Cronbach’s alpha was calculated to validate the modified-TEI with the resident’s POAs and PSW staff. The data from the two points were displayed using a histogram to check for a normal distribution of the means for the resident’s POAs and PSW staff. Descriptive statistics for the modified-TEI scores (mean, SD, 95% CI) were calculated for “pre intervention” and “post intervention” periods. If the distribution was normal between subject scores, POAs and the PSW staff were compared using a paired t-test to identify differences between modified-TEI scores from the resident’s POAs and PSW staff over time. If the distribution was not normal,
medians, and inter-quartile ranges were calculated and non-parametric tests were to be used as fewer assumptions are necessary.

**Secondary Research Objective.**

To determine the efficacy of the MWI in maintaining functional mobility, ADL function, and QOL of nursing home residents with dementia over a 4-month intervention phase (compared to the pre-intervention phase).

**Research question 1.** Does participation in the MWI lead to a reduced decline in residents’ functional mobility measures (TUG, 2MWT, gait speed) compared to the pre-intervention period?

Descriptive statistics (mean, SD, SE, 90% CI) of the functional mobility measures were conducted to assess any differences between baseline, pre-intervention, mid-intervention, and post-intervention testing. The scores were checked for a normal distribution in the sample using the Shapiro-Wilks test which is sensitive to check for normality of the data. If data were skewed, the data will be transformed to normalize the data.

A multivariate repeated measures analysis of variance (RM-ANOVA) was used to test the efficacy of the intervention over time (four measurements) on the dependant variables 2MWT, gait speed, and TUG. RM-ANOVA is an appropriate test to use when more than two measurements are taken on the same sample of participants. For the RM-ANOVA, the assumption of sphericity was checked with the Mauchly’s Test which tests for the equivalence of the hypothesized and the observed variance/covariance patterns, although the small sample size will limit the power to detect any violation in sphericity. If the test was not statistically significant, the data had approximately equal variances and equal co-variances. If the test was statistically significant, the assumption of sphericity has been violated which biases the F-
statistic and increases the chance of Type-1 error. In this case, the degrees of freedom were corrected with the Greenhouse-Geisser correction.

Post-hoc pairwise comparisons were examined for overall significant difference within subject effects between the means of the different time points. The null hypothesis ($H_0$) is that there is no difference during the pre-intervention phase compared to the intervention phase. The alternative hypothesis ($H_1$) is that there will be a difference when comparing the pre-intervention phase compared to the intervention phase.

**Research question 2.** Does participation in the MWI lead to reduced declines in residents’ ADL function as measured by the FIM compared to the pre-intervention period?

To address research question 2, the same statistical plan from research question 1 (above) was followed to complete an RM-ANOVA using the FIM score as the dependent variable.

**Research question 3.** Does participation in the MWI lead to a reduced decline in residents’ quality of life as measured by the Alzheimer’s related Quality of Life scale compared to the pre-intervention period?

Likewise, an RM-ANOVA was conducted for research question 3 to examine the efficacy of the MWI on the QOL score.

**Exploratory questions**

1) Describe the number and severity of adverse events (e.g. falls) experienced by the resident during the *pre-intervention phase*.

2) Describe the number and severity of adverse events (e.g. falls) experienced by the resident during the *intervention phase* when measured immediately after the intervention.
The PI regularly checked with nursing staff throughout the study as well as referenced the electronic patient incident reports and nursing notes to access the adverse events (e.g. falls) for all the resident participants. Incidents were inconsistently documented by staff in the incident reports and nursing notes, so both data sources were checked to ensure the number of incidents was accurate. There were over 3000 nursing notes and incident reports. Incidents were categorized according to 1) the severity as classified by the CTCAE guidelines; 2) the degree of causality between the MWI and the adverse event on a scale of 1 to 5; and 3) the nature of the event, such as behavioural (e.g. wandering, increased confusion), aggression (e.g. verbal or physical abuse towards staff or other residents), ADL related (e.g. issues with ADLs), QOL related (e.g. verbalized complaints or concerns to staff, refusing activities), pain (e.g. exhibiting sigs of pain), falls, and notable incidents (e.g. skin tears, clinical issues such as problems breathing, rashes, swelling). Each event was summarized and entered into Excel, regardless of PI presence, as per good clinical practice guidelines (ICH, 2004). The summary of each event also included the category of nursing staff (RN, RPN, PSW) who documented the event.

The number and type of adverse events, the attribution relationship, and the number of events per resident per month during the pre-intervention phase and the intervention phase was compared in a table.

3) Describe the nursing home attributes as measured by the Professional Environment Assessment Protocol (PEAP) that influenced feasibility measures (recruitment rates, retention rates, interventionist adherence).

The descriptions of the nursing home environments, guided by the PEAP, were entered into a table. The PI also referred to the interventionist log to add, modify or corroborate the nursing home descriptions. Attributes in the environment that may have impacted a feasibility
measure (recruitment rates, retention rates, interventionist adherence) were identified and described. The descriptions of the two homes were compared and contrasted to identify commonalities, if any, to inform a future trial. Correlations cannot be calculated with only two sites which is acceptable as this research question is exploratory and hypothesis generating for future research concerning the conduction of a larger future trial in the nursing home environment.

4) Describe the nursing home attributes as measured by the PEAP that influenced residents’ outcomes (functional mobility, ADL function, quality of life scores) pre and post-intervention.

   Same analysis plan as question 3 (above) to explore the potential impact of the therapeutic attributes of the home that could possibly impact resident outcomes. Particular attention was given to the three PEAP subscales that were relevant to functional abilities to describe the environment. The therapeutic attributes of the nursing home environment were contrasted and compared and the interventionist log was referenced as necessary for additional details. Attributes in the environment that may have impacted resident outcomes were identified in order to inform a future trial. As the case in question 3, correlations cannot be made with only two sites. This descriptive research question is exploratory and hypothesis generating for future research concerning the nursing home environment and resident outcomes.

**Handling missing data**

   First, missing data was examined to identify if there is pattern in the type of data that were missing. Missing data and data that were difficult to collect were documented in the interventionist log as a measure of feasibility, for example specific reasons why the data was not
collected. The PI determined if the data is completely missing at random, missing at random, or missing not at random. The findings are included in the results of this study.

A concerted effort by the PI was made to ensure data was not missing from residents during this longitudinal study since RM-ANOVA is unable to handle missing data. Four strategies were incorporated into the intervention to prevent missing data: 1) allowing a 10-day window to collect data at each data collection time period, 2) approaching the residents three times to collect the data before the data is deemed unavailable for that particular time point and variable, 3) collecting information from either POAs or PSW staff for some measures and 4) making it clear to residents that data collection may take several sessions.

**Ethical Considerations**

Ethics approval was obtained from the University of Toronto’s Research Ethics Board and the nursing homes’ research ethics board. A letter of information was also provided to the staff about the feasibility study (See Appendix Q).

Ethical considerations were accounted for in this study aimed at persons with dementia due to their cognitive impairment and communication challenges to protect this vulnerable population. Free and informed consent was required to participate in the study (Tri-Council: Medical Research Council of Canada, 2010), and participants had the right to dissent and withdraw from the study at any given time. For persons with dementia who lacked the ability to provide consent, a legally assigned POA provided consent in order for the nursing home resident to participate in the study. Moreover, for persons experiencing dementia, researchers are required to obtain assent in addition to informed consent.
Assent refers to the ‘the initial and ongoing willingness of the participants themselves to participate’ (Brodaty et al., 1999) whereas dissent refers to the refusal to participate despite informed consent from the POA. Assessing assent and dissent can be complex in persons with dementia because objections may be expressed verbally or indicated by the behaviour of the participant, for example if the resident showed signs of agitation or discomfort (Dresser, 2001; Keyserlingk, Glass, Kogan, & Gauthier, 1995). Therefore, additional measures in the form of project-specific guidelines to obtain informed consent and to assess the assent or dissent of the participants during the study were developed and applied (Slaughter, Cole, Jennings, & Reimer, 2007). Guidelines ensured consistent data collection prior to and throughout the intervention to protect their rights and wishes. For example if the resident consecutively refused sessions for three days, the participant was withdrawn from the study; see Appendix K for the ethical protocol during data collection. Previous studies that have applied similar conservative protocols reported minimal attrition due to the clinical expertise of the interventionists (Slaughter et al., 2007).

The data was kept in a safe secure office and precautions were taken to ensure the protection of participants (See Data Management section for details). The information was anonymous through the assignment of numerical codes for the participating nursing homes, POAs, PSW staff, and residents.
Chapter 4: Results

This chapter will report the findings related to the feasibility, acceptability and efficacy of the Multifaceted Walking Intervention (MWI). First, the results addressing the primary research objectives to investigate the feasibility and acceptability of the MWI will be presented. Next, the findings for the secondary research objective exploring the efficacy of the MWI to maintain functional mobility, ADL function, and QOL will be presented. This chapter will conclude by describing the results for the additional exploratory questions regarding 1) the risk associated with participating in the MWI and 2) the influence of the nursing home environment on the outcomes of the MWI.

Primary Research Objective: Feasibility and Acceptability

To determine the feasibility of the MWI over a 4-month intervention phase (compared to the pre-intervention phase) and the acceptability of the MWI to the residents, residents’ family, and nursing home staff.

Research Question 1: Feasibility of MWI

The first research question evaluated the feasibility of the MWI based on recruitment rate, retention rate, and interventionist adherence.

Recruitment rate

Resident participants. In total, 99 residents were admitted into the two nursing homes during the period six months prior to the start of the study on September 1st 2014. Figure 4 presents the flow diagram for the study and the reasons for participant exclusion. Of these 99
residents, 68 (68.6%) were ineligible to participate in study screening because they violated one or more exclusion criteria. The most common reasons for exclusion were: immobility/inability to walk or stand up from a chair upon admission (n=29), lack of a diagnosis of dementia (n=15), and unable to speak or understand English (n=10). Three residents were excluded because they suffered a serious injury before the PI was able to contact the POA to obtain consent.
Thirty residents were screened. Of the 30, four residents (13%) were deemed ineligible and excluded for the following reasons: obtained MMSE scores below 10 and severely visually impaired (n=2), unable to complete the 2MWT and needed to rest at 1 minute and 40 seconds (n=1), inability to complete the physical and cognitive screening tests and responded with "I'm tired" and “I don’t know” when approached (n=1). After screening, 26 residents were eligible to participate and all 26 residents were enrolled into the study. Therefore based on the number of screened residents (n=30) the recruitment rate for residents was 86.6%.

Table 8 presents the resident demographic information including their comorbidities and medication profiles for the final resident sample (n=26). The average age of enrolled residents was 86.8 (SD = 6.98) years of age, 81% were female, and 15 residents had a high school education or less. The residents had a mean MMSE score of 15 (severely cognitively impaired), mean of 6 comorbidities, and had an average of 10 prescribed medications. There were no significant demographic differences between the residents from Home 1 and Home 2. Five residents had full-time private caregivers; three of these residents were mostly wheelchair or bed bound throughout the day, one resident used a walker, and one resident required no gait aid. There were no significant differences between the residents with private caregivers and the resident participants without private caregivers with respect to baseline characteristics.
Table 8

Baseline Characteristics of Enrolled Residents (N=26)

<table>
<thead>
<tr>
<th>Resident Characteristics</th>
<th>Mean (SD), min-max</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>86.8 (6.98), 76-101</td>
<td></td>
</tr>
<tr>
<td>75-80</td>
<td>6 (23.0)</td>
<td></td>
</tr>
<tr>
<td>81-85</td>
<td>6 (23.0)</td>
<td></td>
</tr>
<tr>
<td>86-90</td>
<td>4 (15.4)</td>
<td></td>
</tr>
<tr>
<td>91-95</td>
<td>8 (30.7)</td>
<td></td>
</tr>
<tr>
<td>&gt;95</td>
<td>2 (7.6)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>21 (80.8)</td>
<td></td>
</tr>
<tr>
<td>Baseline BMI</td>
<td>23.77 (5.8), 16-37.2</td>
<td></td>
</tr>
<tr>
<td>Home 1</td>
<td>15 (57.7)</td>
<td></td>
</tr>
<tr>
<td>Home 2</td>
<td>11 (42.3)</td>
<td></td>
</tr>
<tr>
<td>Number of months in home</td>
<td>2 (1.3), 0.75-5</td>
<td></td>
</tr>
<tr>
<td><strong>Marriage status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>6 (23.0)</td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>2 (7.6)</td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>3</td>
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</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>25 (96.2)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1 (3.8)</td>
<td></td>
</tr>
<tr>
<td><strong>Education level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade school</td>
<td>6 (23.0)</td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>9 (34.6)</td>
<td></td>
</tr>
<tr>
<td>Resident Characteristics</td>
<td>Mean (SD), min-max</td>
<td>n (%)</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>--------------------</td>
<td>---------</td>
</tr>
<tr>
<td>College graduate</td>
<td>4 (15.4)</td>
<td></td>
</tr>
<tr>
<td>University graduate</td>
<td>5 (19.2)</td>
<td></td>
</tr>
<tr>
<td>Graduate school/medical school</td>
<td>2 (7.6)</td>
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</tr>
<tr>
<td><strong>Screening results</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMSE score</td>
<td>15.5 (5.0), 10-24</td>
<td></td>
</tr>
<tr>
<td>FAST score</td>
<td>5.01 (0.8), 4 – 7</td>
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<tr>
<td><strong>Screening results</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression score</td>
<td>8 (6.0), 3-26</td>
<td></td>
</tr>
<tr>
<td><strong>Cognition</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alzheimer’s</td>
<td>6 (23.1)</td>
<td></td>
</tr>
<tr>
<td>Dementia unspecified</td>
<td>20 (76.9)</td>
<td></td>
</tr>
<tr>
<td><strong>Comorbidities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of comorbidities per resident</td>
<td>6.1 (3.0), 3 -11</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>15 (57.7)</td>
<td></td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>9 (11.5)</td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>9 (34.6)</td>
<td></td>
</tr>
<tr>
<td>Arthritis</td>
<td>8 (30.7)</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>5 (19.2)</td>
<td></td>
</tr>
<tr>
<td>Cataracts</td>
<td>5 (19.2)</td>
<td></td>
</tr>
<tr>
<td>COPD</td>
<td>3 (11.5)</td>
<td></td>
</tr>
<tr>
<td>Spinal stenosis</td>
<td>3 (11.5)</td>
<td></td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>3 (11.5)</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>2 (7.7)</td>
<td></td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>2 (7.7)</td>
<td></td>
</tr>
<tr>
<td>Asthma</td>
<td>2 (7.7)</td>
<td></td>
</tr>
<tr>
<td>Medications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Medications prescribed per resident</td>
<td>9.8 (4.4), 117</td>
<td></td>
</tr>
<tr>
<td>Use of antidepressants</td>
<td>16 (61.5)</td>
<td></td>
</tr>
<tr>
<td>Use of analgesics</td>
<td>15 (57.7)</td>
<td></td>
</tr>
<tr>
<td>Use of ACE-I</td>
<td>12 (46.1)</td>
<td></td>
</tr>
<tr>
<td>Use of cognitive enhancers</td>
<td>9 (34.6)</td>
<td></td>
</tr>
<tr>
<td>Use of sedatives, antipsychotics</td>
<td>8 (30.7)</td>
<td></td>
</tr>
<tr>
<td>Use of diuretics</td>
<td>7 (26.9)</td>
<td></td>
</tr>
<tr>
<td>Use of Ca-Channel blocker</td>
<td>4 (15.4)</td>
<td></td>
</tr>
<tr>
<td>Use of Angiotensin Receptor blocker</td>
<td>4 (15.4)</td>
<td></td>
</tr>
<tr>
<td>Use of insulin</td>
<td>4 (15.4)</td>
<td></td>
</tr>
<tr>
<td>Use of narcotics</td>
<td>3 (11.5)</td>
<td></td>
</tr>
<tr>
<td>Use of benzodiazapines</td>
<td>3 (11.5)</td>
<td></td>
</tr>
<tr>
<td>Use of anti-emetics</td>
<td>1 (3.8)</td>
<td></td>
</tr>
<tr>
<td>Use of beta-blockers</td>
<td>2 (7.69)</td>
<td></td>
</tr>
<tr>
<td>Use of hypnotics</td>
<td>1 (3.8)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mobility status and gait aid use</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No gait aid needed</td>
<td>6 (23.0)</td>
</tr>
<tr>
<td>Used a walker to mobilize around the unit</td>
<td>11 (42.3)</td>
</tr>
<tr>
<td>Spent the majority of the day in a wheelchair or bed</td>
<td>9 (34.7)</td>
</tr>
</tbody>
</table>
**POA participants.** Of the 31 eligible resident and their accompanying POAs, 30 POAs were able to be contacted by the PI and enrolled in the study (96.8%) and one POA was unable to be contacted via telephone calls, voice mails, or email despite multiple attempts over a period of three weeks. Upon obtaining consent, the PI began resident screening. Based on screening results, four resident-POA dyads were excluded and not enrolled into the study. The remaining 26 resident and POAs dyads were enrolled into the study. Overall, 26 POAS enrolled out of the 30 POAs who provided consent, thus the POA participant recruitment rate was 86.6%.

The demographics of the POAs are shown in Table 9. The mean age of POAs was 59 years of age (SD=12.3), daughters represented over half of the POAs and three POAs were spouses. The majority of POAs were university educated, visited an average of twice a week, and rated themselves as knowing the resident “the most” compared to others family members or friends.

**PSW participants.** Twenty-one PSW staff were approached by the PI and consented to participate in the study resulting in a PSW recruitment rate of 100%. Five PSWs were identified as the primary PSW (i.e. the PSW most responsible) for two enrolled residents so for this reason 21 PSW staff were enrolled to provide data for the 26 enrolled residents. Table 10 displays the demographics for the enrolled PSW staff (N=21) who were 90% female, their average age was 46 years of age, the majority were working full-time, had been employed at the homes for almost a decade, and had worked with their respective residents for at least two months or from resident admission into the home. Five PSWs were full-time private caregivers hired by the family and were in the home providing one-on-one care for the resident for least six hours a day.
Table 9

Baseline Characteristics of POAs (n=26)

<table>
<thead>
<tr>
<th>POA Characteristics</th>
<th>Mean (SD), min-max</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>59 (12.3), 41-86</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5 (19.2)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>21 (80.8)</td>
<td></td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>25 (96.2)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1 (3.8)</td>
<td></td>
</tr>
<tr>
<td><strong>Education level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade school</td>
<td>1 (3.8)</td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>2 (7.7)</td>
<td></td>
</tr>
<tr>
<td>College graduate</td>
<td>4 (15.4)</td>
<td></td>
</tr>
<tr>
<td>University graduate</td>
<td>13 (50)</td>
<td></td>
</tr>
<tr>
<td>Graduate school (Masters or Doctorate)</td>
<td>6 (23)</td>
<td></td>
</tr>
<tr>
<td><strong>Relationship</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spouse (Wives: Husbands)</td>
<td>2 (7.7) : 1 (3.8)</td>
<td></td>
</tr>
<tr>
<td>Children (Daughters: Sons)</td>
<td>15 (57.8) : 3 (11.5)</td>
<td></td>
</tr>
<tr>
<td>Niece</td>
<td>2 (7.7)</td>
<td></td>
</tr>
<tr>
<td>Other (e.g. God-daughter, Friend, Self)</td>
<td>3 (11.5)</td>
<td></td>
</tr>
<tr>
<td><strong>How often do you visit per week?</strong></td>
<td>2.5 (1.7), 0.025-7</td>
<td></td>
</tr>
<tr>
<td><strong>How well do you know the resident (1 [least] to 10 [most])?</strong></td>
<td>9.4 (1.5), 4-10</td>
<td></td>
</tr>
</tbody>
</table>
Table 10

Baseline Characteristics of PSW Staff (n=21)

<table>
<thead>
<tr>
<th>PSW Characteristics</th>
<th>Mean (SD), min-max</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>46.1 (10.7), 23-65</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2 (9.6)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>19 (90.4)</td>
<td></td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health care aide certificate program</td>
<td>18 (85.8)</td>
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</tr>
<tr>
<td>RPN program</td>
<td>2 (9.5)</td>
<td></td>
</tr>
<tr>
<td>Baccalaureate degree in nursing</td>
<td>1 (4.7)</td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of years in healthcare</td>
<td>14 (7.2), 1-30</td>
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</tr>
<tr>
<td>Years of employment at facility</td>
<td>9 (3.7), 0.25-13</td>
<td></td>
</tr>
<tr>
<td>Job status</td>
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<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>18 (85.7)</td>
<td></td>
</tr>
<tr>
<td>Part-time</td>
<td>3 (14.3)</td>
<td></td>
</tr>
<tr>
<td>Private full-time care giver</td>
<td>5 (23.8)</td>
<td></td>
</tr>
</tbody>
</table>

**Retention rate**

No residents, POAs, or PSW staff withdrew from the study. One resident who was diagnosed with non-Hodgkin’s lymphoma during the intervention was admitted into palliative care during week 10 of the intervention phase. As a result, this one resident was deemed lost to follow-up, so their functional mobility measures were not collected due to palliative treatments but the resident’s POA (spouse) and PSW staff completed the acceptability surveys.

**Interventionist adherence**
The third measure of feasibility was intervention adherence (i.e. the degree to which the interventionist was able to adhere to the intervention as designed). The intended study plan for recruitment, screening, data collection, and walking sessions were followed with no major issues. Only two minor modifications were made to the original study plan to monitor walking intensity during a session. First, the Borg, a visual analog scale to assist residents in expressing their level of exertion was not used during the sessions as all enrolled residents were able to simply verbalize their level of exertion (“I need a break”, “can we slow down?”, “I need to sit down here”) or would just stop walking to stand or sit and take a break to decrease the intensity of the walk. Second, using gait speed to calculate the intensity of each session was not applied because calculating the gait speed (distance walked divided by the time of the walking session) to estimate the intensity of the session would have been inaccurate due to the numerous frequent stops and breaks during sessions. Rather to document the intensity of the sessions, the PI document the number of breaks, if the resident articulated a need to stop, and the distance walked which was a more pragmatic approach. The section that follows will present the enablers and barriers to interventionist adherence.

**Enablers.** There were three main enablers to interventionist adherence to the MWI protocol. First, a working knowledge of each resident’s schedule as well as the activity schedule of the different units in each home was beneficial to strategically plan resident visits during times that were best suited for them. Second, the intervention was designed with a data collection procedure that included a “10 day grace period” which enabled more complete resident data and improved study feasibility. The only missing data was due to the death of one resident prior to mid-intervention that comprised less than 1% (0.79%) of the total resident outcome data collected. Lastly, the ethical guideline of the intervention protocol that permitted the PI to
approach the resident up to three times a day facilitated high interventionist adherence rates to deliver the walking sessions according to residents’ individualized walking regimes. For example, several residents would regularly require a reminder in the morning and/or the afternoon prior to their walk; the ethical provision ascertained that these residents received their walking sessions.

**Barriers.** A major barrier to delivering the walking session as intended was miscommunication between the home staff and the PI about the residents’ schedules. There were nine instances when the PI arrived on the unit and was not informed that the resident was away on a day pass with family members, on a spontaneous family outing, or an outing to attend a medical appointment. These occurrences resulted in missed sessions (n=9).

**Research Question 2: Acceptability of MWI to residents.**

The measure of acceptability of the MWI to residents was measured by resident adherence. This section will report the resident adherence rate and the reasons why sessions were missed. Next, the enablers and barriers to residents adhering to their individualized walking dosage and/or distance for each session will be described in order to gain a more comprehensive understanding of several important factors to consider in a larger future trial.

**Resident adherence rate**

Table 11 in Appendix T presents an overview of the walking regimes, walking milestones, and indicates when a resident missed a session. During the intervention, a cumulative total of 860 walking sessions were intended to be delivered over the four month intervention phase and a total of 57 (6.6%) were missed. Residents who completed the intervention participated in an average of 33 walking sessions over the four month period, and the number of
sessions per resident ranged from 16 to 128 sessions. Variation in the number of sessions per resident walking regime was wide because of the person-centered care approach used to individualize the MWI to the residents’ physical abilities. Resident adherence to their individualized walking regimes ranged from 77% to 100% and on average the MWI had a high resident adherence rate of 93.4%.

There were no noticeable trends related to the missed sessions for individual residents. The reasons why residents missed a walking session were: five residents missed 21 sessions (36.8%) due to a change in health status related to illness (e.g. diarrhea, vomiting) or as a result of outbreak precautions, palliation, or hospitalization, three residents missed 13 sessions (22.8%) due to agitation or uncontrolled responsive behaviors exhibited earlier that day, four residents missed 9 sessions (15.7%) due to outing or doctor/dentist appointment, four residents missed 8 sessions (14%) due to uncontrolled pain, three residents missed 5 sessions (8.8%) due to extreme fatigue or drowsiness, one resident missed a session (1.7%) because their glasses were broken and could not see clearly enough to ambulate safely. Follow-up sessions were provided later in the week to compensate for missed sessions. Overall, 12 (46%) residents who completed the MWI did not miss any of their walking sessions, while another 12 (46%) residents missed between 1 to 5 sessions, and three (11.5%) residents missed 5 to 15 sessions.

**Enablers of resident adherence.** From the interventionist log, four factors were identified as enablers to resident adherence to the intended waking dosage and/or distance for each session: 1) resident motivation; 2) warm weather and other environmental sources of stimuli outside; 3) nursing home environment conducive to PA; and 4) nursing home staff assistance.
1. Resident motivation. All the enrolled residents felt under stimulated and isolated in the nursing home environment to various degrees, and were motivated to have additional company and engage in PA according to residents’. One source of resident’s motivation to partake in a walking session was the presence of family members because residents wanted to show-off and impress their visitors with how well or far they could walk which enabled MWI participation.

2. Warm weather and other environmental sources of stimuli. Residents were encouraged by the environment to walk 25% to 50% farther outside and sustained longer walking sessions outdoors most likely because of the stimuli (e.g. nature, playgrounds and wading pools with children, churches, bakeries, flower shops, restaurants, traffic, houses and other people). Home 1 was in closer proximity to these sources of stimuli compared to the Home 2, as a result Home 1 residents generally had 10 to 15 minute longer sessions. The POAs and residents reported that they found the warm weather, fresh air, sunshine, and passing the local shops enjoyable and brought residents pleasure in a way that the indoors of a nursing home could not provide.

3. Nursing home environment conducive to PA. The exterior design characteristics of the nursing homes, such as locked walking gardens or courtyards, were advantageous because it provided a safe space for residents who were able to enjoy the outdoors but remain in a controlled environment. From an interventionist perspective, these enclosed spaces were beneficial for the PI to during the first outdoor sessions to assess the residents’ level of cooperation prior to exposing them to an environment with a numerous sources of stimulation such as walking on the sidewalk of a busy street. Further, the architectural design of the hallways made a difference to the distance walked per session; Home 2 had large circular hallways that supported longer continuous uninterrupted walking sessions whereas Home 1 had shorter hallways with dead ends that were not conducive to longer walking sessions.
4. Nursing home staff assistance. Assistance from the nursing home staff was important in three ways. First, it was helpful when the PSW staff would prepare the resident to go outside by helping them get dressed or use the bathroom prior to the PI’s arrival. Secondly, nursing staff team members were also critical in mitigating conflicts between residents to facilitate adherence. For example, one resident would frequently harass other residents, including two study participants (R8, R9), by closely following and intimidating them. The harassment deterred the residents from leaving their rooms or walk around the unit. Prior to the sessions, members from the nursing staff would distract these residents so the resident participants felt safe to ambulate in the hallways. In another example, a resident was incredibly protective over an enrolled participant (R14) and angrily shouted in her native language that the resident needed to sit down and not walk. In this case, the nursing home staff were instrumental in separating the resident from the resident participant to ensure the walking session could be delivered by the PI as intended. Based on such events, nursing staff management of resident relationships and dynamics to create safe spaces was a critical factor in resident adherence. Finally, staff also provided encouragement to residents by making positive comments when the PI walked the residents past them in the hallways.

Barriers. There were several barriers to delivering the intended distance of each walking session or number of walking sessions as intended identified in the interventionist log: 1) Changes in residents’ health status; 2) outbreaks and infection control policies; 3) residents’ personal issues; 4) unmanaged chronic pain; 5) responsive behaviours and associated protocols; 6) cold temperatures; 7) wanderguards and other alarms; 8) a lack of assistance from nursing home staff or long wait times for resident care.
1. Changes to residents’ health status. The predominant barrier to resident adherence was unpredictable changes to residents’ health. Six residents missed a total of 16 sessions due to symptoms of illnesses (e.g. diarrhea, vomiting, and extreme fatigue, drowsiness) and hospitalizations (e.g. obstructive jaundice).

2. Outbreaks and infection control policies. Both homes experienced influenza outbreaks at various times throughout the intervention. These outbreaks involved mandatory infection control policies that limited visitors onto the units which prevented the PI from entering the unit and delivering walking sessions to residents nine times.

3. Residents’ personal issues. Five residents struggled with personal issues that preoccupied their attention or demotivated them from engaging in the nursing home’s scheduled programs as well as the MWI. This appeared to be more of a problem specifically for residents who had an ill spouse in the same home (n=2). For example, one participant’s husband fell and was hospitalized for a broken hip for about a week, during which time the participant (R23) refused to get out of bed, leave her room, participate in activities, or eat her meals. She remained reluctant to leave his side once he returned to the home and so the PI included him into the last four sessions in order to provide her comfort. More attempts were required in order to encourage these residents to participate, as such the PI needed to allot extra time to give them repeatedly notify them throughout the day on multiple days to prevent missed sessions; however, the sessions were often 6 to 10 minutes shorter during which the resident was worried about the condition of their spouse.

4. Unmanaged chronic pain. Poorly managed chronic pain reduced resident mobility and tolerance for PA. Despite the PI notifying the nurse or PSW, minimal action was taken to
mitigate pain and the staff comments were frequently dismissive of resident complaints (“he’s always like that” (R5), “she’s on a standing pain medication” (R19), “her legs are just sore all day long” (R9)) which resulted in four residents missing eight sessions.

5. **Responsive behaviours and associated protocols.** Three resident participants’ responsive behaviors prevented 11 sessions from being delivered. Of these, two residents missed sessions due to the resident-on-resident violence protocols that are strictly enforced after any incidences. Residents are unable to leave their room/unit without a PSW continuously observing their actions to ensure they maintain a reasonable distance from other residents and visitors to prevent more violence. One resident (R8) participant physically attacked and threw another resident to the ground, witnessed by the PI who was walking with another participant in the hallway. In another instance, a participant (R4) attempted to stab another resident in the face with a fork during meal time prior to the PI’s afternoon appointment time. During the aftermath of resident-on-resident violence, the resident was unable to participate sessions on these days and the PI needed to return the next day.

6. **Cold temperatures.** Cold temperatures decreased residents’ walking distance by approximately half in two ways. First, the PI was required to devote walking session time to help dress residents in the appropriate outerwear (gloves, scarves, hats, thick socks, boots, and parkas) prior to exiting the nursing home. This task was time consuming because in some instances the PI was not informed that the residents (R6, R25) did not own or had recently lost clothing items. Secondly, once outside obstacles such as snow covered sidewalks, slippery black ice on the sidewalks and walkways, cold winds and icy rains made walking outside treacherous for residents. One resident (R3) became extremely agitated because they did not recognize their own clothing and as a response took out all their clothes from her closet and threw them on the floor.
Accordingly, walking sessions were delivered indoors which decreased resident’s walking time and distance compared to outdoor sessions in warmer weather.

7. Wanderguards and other alarms. Independently mobile residents were required to wear Wanderguard bracelets that activated a loud alarm throughout the entire building when the resident entered or exited the elevator without the disarmament code. These bracelets were only disarmed when the code was entered into a keypad that only occasionally worked, located inside the elevator. Several instances during the beginning of the intervention, the incredibly loud alarm was activated when the PI and resident attempted to leave the unit, which was very stressful and anxiety provoking for the resident (R3, R4, R21, R27). The residents were visibly frightened and distraught by the alarm sounds and would want to return to their rooms to promptly end the walking session. In the same vein, other incredibly loud alarms mandated residents return to their rooms (e.g. the PA system and fire alarms) to prematurely end the walking session. Also, for safety reasons the PI was unable to access any residents during fire alarms, fire or evacuation drills which occurred five times during the intervention between the two nursing homes. These missed sessions were later rescheduled.

8. A lack of assistance from nursing home staff or long wait times for resident care. One barrier related to nursing staff included long wait times for resident care such as assisting residents from the bathroom, and changing the residents’ pants or soiled diapers resulting in upset and agitated residents. As a consequence the PI spent a significant amount of time toileting residents (R4, R14, R17, R28) before and/or after each session because there was no available staff to provide bathroom assistance. Moreover, there were times when staff did not provide the resident with their hearing aids (R5, R27) or glasses in the morning (R26, R28), or who were not supportive in mobilizing the resident (e.g. no assistance was provided to find residents’ shoes or
help residents unfold their walkers) (R27, R29). When the PI would ask a PSW, who was not enrolled in the study, for assistance to prepare a resident for a walking session, various PSWs stated to the PI that the resident should remain in their wheelchairs due to their age (R1, R28, R29) or poor cognitive status (R17). No sessions were missed due to these issues, but regularly dealing with these situations required a great deal of PI’s time which reduced session times and was a barrier to follow a stringent schedule.

Research Question 3: Acceptability of MWI to POA and PSW staff

The third research question aimed to determine the acceptability of the MWI to the PSW (n=21) and POAs (n=26) participants as measured by the pre-intervention and post-intervention modified-TEI survey. The modified-TEI was found to be reliable; the “general acceptability” subscale consisted of 8 items (α= 0.71) and the “risk” subscale consisted of 3 items (α= 0.69). There was no missing data from the quantitative questions. This section first describes the pre and post intervention acceptability of the POAs followed by the PSW staff.

Pre-intervention acceptability of POAs

The average score was 69.2/71 (97.5%) indicating POAs found the MWI “very acceptable”. POAs scored the MWI highly on the “general acceptability” subscale scoring each individual item an average of 6 to 7 (7=very acceptable). For the items “How effective do you think the MWI is likely to be for the resident?” and “How likely is the MWI to result in permanent improvement in the resident?” POAs scored a mean of 6 and 5, respectively. POAs thought the “MWI made logical sense or were consistent with everyday notions of mobility, function and QOL” and scored this item a 6.7 indicating that the intervention was a logical solution to address the problem of functional mobility loss. POAs indicated that they would feel comfortable performing the intervention themselves (6.0) but reported in the qualitative open-
ended responses that not being able to visit as often as they would like (n=5) and their lack of training to handle responsive behaviors (n=3) were the main obstacles to conducting a similar intervention themselves. The POAs perceived the MWI to have almost no risk (6.3) and the POAs liked the procedures used in the study (6.7). Lastly, the question “Overall, what is your general reaction to the MWI?” was scored a high positive score (7).

The four open ended questions asked POAs about their values, judgments and beliefs about the components – person-centered care and PA – and the cumulative effect of the two components, in addition to the mechanism of the intervention to impact resident outcomes. Qualitatively, the majority of POAs expressed that person-centered care was a “very important” (n=21, 80.7%) attribute in resident and dementia care and valued this philosophy in the MWI. The POAs coupled person-centered care with three themes: recognizing the person as an individual (n=22, 88.4%), foundational for a relationship that provides social interaction, respect, and dignity to the resident (n=10, 38.5%), and addresses the symptoms of dementia by meeting the residents’ deficits and needs (n=9, 34.6%). One POA described how person-centered care addresses residents’ short-term memory loss:

You need to know the person because they can’t tell you what happened 24 hours ago; they can’t tell you what they want or what happened. If you know them, you can read them and meet their needs, also their routines and knowing their families. You can talk to them about things no-one here can talk to them about.

(R7 POA)

POAs felt that the MWI would be suitable to maintain ADL function (n=9, 34.6%) primarily due to maintaining the residents’ cognitive abilities to understand commands which may help them
follow instructions better to complete the ADL. Lastly, POAs (n=8, 30.7%) felt that the MWI would be suitable to maintain resident’s QOL by preserving their walking abilities and providing socialization (n=10, 38.5%). For example one POA stated:

[the MWI] can increase their quality of life. She’s not lying down in bed and she’s not walking in circles alone. She won’t engage in other activities that they offer here. It gives her something to do, someone to be with. (R6 POA)

Table 12 in Appendix V provides several exemplars of POAs’ responses to the open ended modified-TEI questions prior to initiating the MWI. The quantitative survey questions and the open-ended questions indicated very high POA acceptance of the MWI prior to the intervention.

**Post-intervention acceptability of POAs**

POAs continued to have a “very high acceptance” post-MWI and scored the MWI a 69.2/71 (97.5%). They continued to feel that the MWI was appropriate (6.7), made logical sense (6.8), was low-risk (6.6) and wanted the resident to continue the intervention (6.9). POAs reported that the resident experienced no undesirable side effects or discomfort (6.5). They thought the MWI was indeed effective and led to improvements (6.3). POAs continued to like the procedures used in the study (7) indicating that they found merit in the procedures used in the intervention. Lastly, participants scored that their general reaction to the MWI as very high (6.8).

The post-intervention modified-TEI survey also had eight open-ended questions asking respondents: what they liked and disliked about the MWI, if they thought it was effective, noticed an improvement, believed the MWI was person-centered, and included room for additional comments about the intervention and study. In the open-ended questions, POAs (n=26, 100%), liked the MWI and valued the social and physical benefits of the MWI on the
residents. Specific attributes of the MWI that were positively received were: additional socialization for the resident (n=13, 50%), individualization of the intervention and a personalized approach (n=11, 42.3%) (e.g. flexibility in scheduling (n=3, 14.4%)), increased PA to maintain mobility (n=11, 42.3%), and going outside (n=6, 28.8%). POAs felt the MWI espoused person-centered care attributes, one POA (R13) wrote:

Totally [the MWI was person-centered]. I was listened to - my father’s history, his other behaviors, his paranoia, etc. - all these were taken into account. Also the time of day [evenings after dinner] to most benefit my father was arranged for the one on one walks that were remarkable.

POAs also described resident changes they ascribed to the participating in the MWI: enhanced social skills, communication skills and memory (n=11, 42.3%), improved resident strength (n=7, 26.9%), “more mobile” (n=7, 23.0%), improved mood/”happier” (n=5, 23.8%), prevented decline in ADLs (n=5, 23.8%), decreased agitation (n=3, 11.5%), and more confidence when walking (n=3, 11.5%). Overall, POAs enjoyed and appreciated the MWI. The most common complaint about the intervention was that the intervention had to end (n=3, 11.5%), and that more residents could not participate (n=2, 7.6%).

All the POAs felt that the MWI maintained mobility and ADL function (n=26, 100%). One POA stated that:

The MWI kept him up and going to the dining room when no-one else could… He got up and moved; he was stimulated. The [physiotherapy] here is so boring, all he does is stand there and raise his legs up and down 5 times and that’s it. Those activities were not tailored to his level…That’s why this walking program was so
special – it’s focused on what a person wants and their current abilities so that it can be tailored to what they need and maintain their abilities. (R5 POA)

POAs also felt that the MWI was suitable to maintain QOL namely due to maintaining the residents’ ability to physically ambulate where they want (n=9, 34.6%) and the socialization aspect of the intervention (n=12, 46.1%). A few POAs felt that more individualization in PA should be the standard of care and were disappointed that this type of intervention was not included in the usual care of their loved one (n=3, 11.5%). MWI acceptability of the POAs was high before the intervention and remained high post-intervention, indicating that the intervention met their expectations, was appropriate and effective, achieved satisfactory results, and aligned with their general impression of the intervention.

**Pre-intervention acceptability of PSW staff**

The PSW staff average score was 67.3/71 (95%) and indicated that the MWI was associated with very little risk (6.3) meaning that the PSW staff found the intervention “very acceptable”. For the questions “How effective do you think the MWI is likely to be for the resident?” and “How likely is the MWI to result in permanent improvement in the resident?” PSW staff scored a mean of 6.5 and 5.5, respectively. The PSW staff liked the procedures used in the study (6.7), and thought that the MWI made sense and was a logical solution to address the problem of functional mobility loss (6.9). PSW staff indicated that they would feel comfortable performing the intervention themselves (6.8), but in the qualitative responses four PSW staff (19.0%) mentioned a lack of time to walk the residents during their day. No other reasons that prevent PSWs from delivering the MWI were provided. The question “Overall, what is your general reaction to the MWI?” was scored a 7 out of 7 indicating the PSW staff found the MWI to be very highly acceptable.
The four open-ended questions indicated that all PSW staff found PCC to be important and favorable for three main reasons: person-centered care facilitated the “individualization” of care and strategies (n=11, 52.3%), helped them “meet their residents’ needs” (n=8, 38.1%), and required “getting to know the person” (n=7, 33.3%).

POAs felt that the MWI would maintain ADL function by means of providing increased cognitive stimulation to reduce confusion and improve verbal communication during ADLs (n=8, 38.1%), “getting more walking” to maintain physical abilities (n=7, 33.3%), and reduce agitation during ADLs (n=3, 14.3%). All the PSW staff felt that the MWI would directly improve mobility and QOL (n=21, 100%) due to the additional PA and socialization. One PSW responded:

Walking outside will be good to get her up, especially in the summer, and this will help increase the quality of life. It’s good, because everybody needs company and social interaction and attention. She won’t feel so useless. (R27 PSW)

Table 12 in Appendix V provides exemplars of PSW staff responses to the open-ended TEI questions prior to initiating the MWI. The quantitative survey questions and the open-ended questions indicate that the PSW staff had very high acceptance of the MWI prior to intervention delivery.

**Post-intervention acceptability of PSW staff**

PSW staff continued to have a “very high acceptance” post-MWI and gave an average score of 65.5/71 (92.3%). All the PSW staff wanted the resident to continue participating in the MWI (6.9), continued to feel that the MWI was appropriate (6.9), made logical sense (7), was low-risk (6.8), and the resident experienced no undesirable side effects or discomfort (6.8). PSW
staff thought the intervention was effective or led to improvement and scored this item 6.6. With respect to the study procedures, the nursing staff continued to like the procedures (surveys and interviews) used in the study (6.3). Lastly, the PSW staff scored a 7 on the item asking “overall, reflecting back on the intervention, what is your general reaction to the MWI?”

In the open-ended questions, all the PSWs liked the intervention and no one reported anything that they disliked about the intervention. The specific aspects they liked about the intervention were: the increased personalized socialization/company for the resident (n=15, 71.4%), regular additional PA (n=12, 57.1%), residents went outside and off the unit (n=8, 38.1%), residents were “happier” and “more confident” when walking (n=8, 38.1%), someone paying “attention” to the resident (n=7, 33.3%), and that the resident was with a RN who would ensure the “resident would be safe” (n=3, 14.2%). PSW staff acknowledged the benefits of the intervention in filling an important need for individualized resident time – a need that staff could not meet due to time constraints and limited human resources (n=6, 26.5%). Respondents felt that the MWI was person-centered due to its consideration for the residents’ preferences, communication deficits and dementia-related behaviors, as well as its inclusion of the POA in planning (n=16, 76.1%). One PSW stated:

It was good that you learned about her before you started to work with her because she has dementia so she can’t express herself and tell you much about who she is, so that was good that you learned about her first. The intervention kept her walking to that was good too, which keeps her from being bedridden. It also gives her cognitive and social skills practice because she doesn’t talk to anyone on the floor (PSW R6)
PSWs continued to feel that MWI was suitable to maintain mobility, ADLs and QOL (n=21, 100%). PSWs noted improved muscle strength (n=9, 42.8%), decreased agitation (n=8, 38.1%), improved confidence (n=4, 19.0%), and no decline in mobility or ADL function (n=7, 33.3%). One participant reported that their resident (R27) who was not eating during meals ate more now because of the increased regular PA. PSW staff acceptability of the MWI was high prior to the intervention and remained high after the intervention to indicate that the MWI met their expectations, was appropriate and effective, achieved satisfactory results, and aligned with their general impression of a PA intervention designed for residents with dementia.

**Secondary Research Objective: Efficacy**

The secondary research objective was to explore the efficacy of the MWI in maintaining the functional mobility, ADL function, and QOL of nursing home residents with dementia over a four month intervention phase compared to the pre-intervention phase. This study was sufficiently powered to detect significant difference in the TUG, and significant results were found in all three measures of functional mobility outcome, as well as the measures for ADL function and QOL. The results of each outcome during the intervention phase are described in more detail below as well as comparing the results to the pre-intervention phase.

**Functional Mobility**

Three valid measures of functional mobility, the TUG, 2MWT, and gait speed, were used to explore the efficacy of the MWI for the 25 residents who completed the study. Table 13 presents the descriptive statistics of these outcomes at each time point. The mean differences between each time period of each outcome can be found in Table 14 in Appendix W.
TUG. The assumptions for the RM-ANOVA were tested. According to the Shapiro-Wilk test, the distribution of TUG scores was positively skewed so TUG scores were log transformed using base 10. Descriptive statistics for TUG scores, log transformed TUG scores, and back-transformed values of parameter estimates are presented in Table 15 in Appendix X. The trajectory over time of the log transformed data is depicted in Figure 5 and can also be found in the Appendix X. Results of the analysis were similar to the raw data, and for the purposes of a feasibility study the RM-ANOVA results from the raw data are presented. Mauchly’s test indicated that the assumption of sphericity was not violated \( (X^2(5) = 6.74, P = 0.241) \).
### Table 13

*Descriptive data of functional mobility measures throughout the study (N=25)*

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Mean (SD)</th>
<th>SE</th>
<th>90% CI</th>
<th>Range</th>
<th>Median (Q1-Q3)</th>
<th>IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(min-max)</td>
<td></td>
<td>(Q1-Q3)</td>
<td></td>
</tr>
<tr>
<td>TUG T1</td>
<td>22.56 (9.46)</td>
<td>1.89</td>
<td>19.33 - 25.80</td>
<td>11 - 49</td>
<td>20.00 (16.00 - 25.70)</td>
<td>11</td>
</tr>
<tr>
<td>TUG T2</td>
<td>26.71 (9.38)</td>
<td>1.87</td>
<td>23.50 - 29.92</td>
<td>11 - 45</td>
<td>24.30 (20.18 -32.00)</td>
<td>13</td>
</tr>
<tr>
<td>TUG T3</td>
<td>20.69 (9.28)</td>
<td>1.856</td>
<td>17.51 - 23.86</td>
<td>8 - 41</td>
<td>18.10 (13.70 - 28.90)</td>
<td>16</td>
</tr>
<tr>
<td>TUG T4</td>
<td>18.13 (10.18)</td>
<td>2.03</td>
<td>14.64 - 21.61</td>
<td>8 -58</td>
<td>15.60 (12.10 -19.60)</td>
<td>8</td>
</tr>
<tr>
<td>2MW T1</td>
<td>59.38 (26.86)</td>
<td>5.37</td>
<td>50.19 - 68.57</td>
<td>20.12 - 117.04</td>
<td>58.82 (39.01 - 73.15)</td>
<td>40.45</td>
</tr>
<tr>
<td>2MW T2</td>
<td>53.60 (26.79)</td>
<td>5.36</td>
<td>44.43 - 62.76</td>
<td>10.61 - 106.38</td>
<td>56.38 (34.74 - 74.67)</td>
<td>41.30</td>
</tr>
<tr>
<td>2MW T3</td>
<td>75.91 (30.74)</td>
<td>6.148</td>
<td>65.39 - 86.43</td>
<td>30.11 - 132.44</td>
<td>67.81 (49.37 - 101.49)</td>
<td>56.39</td>
</tr>
<tr>
<td>2MW T4</td>
<td>81.07 (34.31)</td>
<td>6.86</td>
<td>69.33 - 92.81</td>
<td>29.87 - 140.21</td>
<td>75.89 (54.55 - 108.05)</td>
<td>55.70</td>
</tr>
<tr>
<td>Gait T1</td>
<td>0.49 (0.22)</td>
<td>0.04</td>
<td>0.42 - 0.57</td>
<td>0.17 - 0.97</td>
<td>0.49 (0.32 - 0.61)</td>
<td>0.34</td>
</tr>
<tr>
<td>Gait T2</td>
<td>0.43 (0.22)</td>
<td>0.044</td>
<td>0.36 - 0.51</td>
<td>0.08 - 0.88</td>
<td>0.43 (0.28 - 0.62)</td>
<td>0.34</td>
</tr>
<tr>
<td>Gait T3</td>
<td>0.64 (0.26)</td>
<td>0.05</td>
<td>0.55 - 0.73</td>
<td>0.25 - 1.12</td>
<td>0.57 (0.42 - 0.86)</td>
<td>0.47</td>
</tr>
<tr>
<td>Gait T4</td>
<td>0.67 (0.29)</td>
<td>0.06</td>
<td>0.58 - 0.77</td>
<td>0.25 - 1.17</td>
<td>0.63 (0.45 - 0.90)</td>
<td>0.46</td>
</tr>
</tbody>
</table>
The RM-ANOVA showed there was a significant change over time. Post-hoc pairwise comparisons revealed there was a significant increase in the TUG of 4.15 seconds (90% CI = 1.61, 6.68, P = 0.010) during the pre-intervention phase, which indicates a 4.43% decline in functional mobility. Residents’ TUG scores improved significantly (mean difference = 6.02 seconds, 90% CI = -8.24, -3.80, P = 0.000) within the first half of the MWI and continued to significantly improve in the third and fourth month (mean difference = -2.56 seconds, 90% CI = -4.96, -0.15, P = 0.081). Overall, the MWI resulted in 32.14% improvement in resident TUG scores (mean difference between T₄ - T₂ = -8.58 seconds, 90% CI = -11.57, -5.59, P = 0.000), and residents were able to recover the decline in functional mobility they experienced during the pre-intervention phase (depicted in Figure 6). Based on these results, the H₁ is accepted suggesting that the MWI leads to improvement in the TUG compared to the pre-intervention period.

*Figure 6: Mean differences and standard deviations of the TUG from baseline to immediately after the MWI*
2MWT. The assumptions for the RM-ANOVA were tested. Mauchly’s test indicated that the assumption of sphericity had been violated. $X^2(5) = 27.0, P = 0.000$, therefore the number of degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($e = 0.58$). The Shapiro-Wilk test was not significant at all four time points (P values ranged from 0.292 to 0.558) indicating that the data was normally distributed. The RM-ANOVA was conducted and the results showed significant changes to 2MWT over time (Table 14 in Appendix W).

The post-hoc pairwise comparisons show significant decline in the 2MWT of -5.78 meters (90% CI = -10.19, -1.37, $P = 0.034$) in the pre-intervention phase indicating a 9.73% decline in resident functional mobility during this phase. There was a significant improvement in the 2MWT in the first half of the MWI (mean difference = 22.31 meters, 90% CI = 15.27, 29.35, $P = 0.000$), as well as the second half (mean difference = 5.16 meters, 90% CI = 0.33, 9.99, $P = 0.080$). Cumulatively, residents experienced a significant improvement in 2MWT from 53.60 to 81.07 meters (mean difference of 27.47 meters between $T_4 - T_2$, 90% CI = 19.97, 34.98, $P = 0.000$) representing a 51.25% improvement from pre to post-MWI. Moreover, residents showed a significant improvement from their baseline 2MWT measure compared to $T_4$ (mean difference = 21.69 meters, 90% CI = 12.66, 30.72, $P= 0.000$). Figure 7 displays the measurements throughout the study. Based on these results, $H_1$ is accepted to suggest that the MWI leads to improvement in the 2MWT compared to the pre-intervention period.

Gait speed. The assumptions of RM-ANOVA were tested. Mauchly’s test indicated that the assumption of sphericity had been violated. $X^2(5) = 24.04, P = 0.000$, therefore the number of degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($e = 0.604$). The Shapiro-Wilk test was not significant at all four time points (P values ranged from 0.252 to 0.752) indicating that the data was normally distributed.
Figure 7: Mean differences and standard deviations of the 2-Minute Walk Test measurements from baseline to immediately after the MWI.

The RM-ANOVA showed significant changes over time. Results from the post-hoc pairwise comparisons (Table 14 in Appendix W) indicate a significant decline in gait speed of 11.31% (mean difference = 0.05 meters/second, 90% CI = -0.09, -0.01, P=0.022) during the pre-intervention phase. Residents experienced a significant improvement in their gait speed the first two months of the intervention (mean difference = 0.20 meters/second, 90% CI = 0.14, 0.26, P = 0.000) and continued to improve, although not to a significant degree (mean difference=0.03 meters/second, 90% CI = -0.007, 0.07, P=0.169). On the whole, the MWI improved the gait speed of residents by 55.11% (mean difference = 0.23 meters/second, 90% CI=0.18, 0.31, P=0.000). Figure 8 depicts that residents were able to regain their decline in gait speed from the
Figure 8: Mean differences and standard deviations of gait speed measurements from baseline to immediately after the MWI

pre-intervention phase and experienced a significant increase in gait speed by the end of the intervention (mean difference = 0.18 meters/second, 90% CI= 0.11, 0.26, P=0.000); therefore, the H₁ is accepted and the MWI appears to increase residents’ gait speed compared to the pre-intervention period.

ADL function

The assumptions for the RM-ANOVA were tested. Mauchly’s test indicated that the assumption of sphericity was not violated ($X^2(5) = 5.748, P = 0.332$). The descriptive statistics for the FIM total score, FIM-motor and FIM-cognitive subscales are presented in Table 16. The RM-ANOVA was conducted and the mean differences are displayed in Tables 17 (Appendix W).

The RM-ANOVA showed significant changes over time. The post-hoc pairwise comparisons showed a significant decline in the total FIM score of 22.28% during the pre-intervention phase (mean difference = -17.88, 90% CI = -21.75, -14.00, P = 0.000). During the
intervention, there was a significant improvement of 18.72% in the total FIM score in the first half of the MWI (mean difference = 11.68, 90% CI = 8.67, 14.68, 0.000) and the total FIM score continued to improve by 5.29% in the second half of the MWI but not to a significant degree (mean difference = 3.92, 90% CI = -0.131, 7.97, P = 0.111). Figure 9 illustrates the trajectory of the total FIM scores over the study period. Residents improved 25% during the intervention phase (mean difference of 15.60 between T4 – T2, 90% CI = 11.15, 20.05, P = 0.000).

Figure 10 shows the FIM cognitive and motor subscales. The FIM-motor subscale mirrors the trajectory of the total FIM; whereas the FIM-cognition subscale shows significant improvement in the first and second half of the MWI. FIM-cognition scores increase 33.7% over the course of the intervention phase (P=0.000). MWI significantly improved the FIM-total score and both FIM subscales compared to the pre-intervention phase; therefore, the H1 hypothesis is accepted.

![FIM Total Score](image)

**Figure 9:** Mean differences and standard deviations of FIM total score from baseline to immediately after the MWI
Figure 10: Mean differences and standard deviations of FIM-motor and FIM-cognition subscale scores from baseline to immediately after the MWI

Quality of Life

Table 16 shows the descriptive data of the ADQRL throughout the four time points. The assumptions of an RM-ANOVA were tested. Mauchly’s test indicated that the assumption of sphericity had been violated. $X^2(5) = 13.89$, $P = 0.016$, therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($e = 0.694$) $(2.38, 2.083)$ $P = 0.10$.

A RM-ANOVA was conducted and results show significant changes over time. There was a significant 5.56% decline of the QOL score during the two month pre-intervention phase (mean difference = -1.84, 90% CI= -3.20, -0.48, $P= 0.030$), and a significant improvement during the intervention phase (Figure 11). The ADQRL score significantly increased by 7.17% in the first half of the intervention (mean difference = 2.24, 90% CI = 0.324, 4.15, $P = 0.057$) and
continued to improve by 0.59% but not to a significant degree (mean difference = 0.20, 90% CI = -1.05, 1.45, P = 0.787). Overall the trajectory of the ADQRL continued to improve throughout the MWI to a significant degree (P = 0.063), the $H_1$ was accepted.

*Figure 11:* Mean differences and standard deviations of ADRQL scores from baseline to immediately after the MWI
<table>
<thead>
<tr>
<th>Outcome</th>
<th>Mean (SD)</th>
<th>SE</th>
<th>90% CI</th>
<th>Range (min-max)</th>
<th>Median (Q1-Q3)</th>
<th>IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIM Total T1</td>
<td>80.24 (13.53)</td>
<td>2.70</td>
<td>75.61 - 84.87</td>
<td>44 - 110</td>
<td>81(73 -87)</td>
<td>14.5</td>
</tr>
<tr>
<td>FIM Total T2</td>
<td>62.36 (14.21)</td>
<td>2.82</td>
<td>57.49 - 67.22</td>
<td>37 - 90</td>
<td>61 (50 -75)</td>
<td>25</td>
</tr>
<tr>
<td>FIM Total T3</td>
<td>74.04 (15.58)</td>
<td>3.11</td>
<td>68.70 - 79.37</td>
<td>40 - 110</td>
<td>73 (67 -83)</td>
<td>17.5</td>
</tr>
<tr>
<td>FIM Total T4</td>
<td>77.96 (18.58)</td>
<td>3.77</td>
<td>71.50 - 84.41</td>
<td>45 - 108</td>
<td>81(65 -91)</td>
<td>32.50</td>
</tr>
<tr>
<td>FIM-Mot T1</td>
<td>57.44 (13.79)</td>
<td>2.76</td>
<td>52.72 - 62.16</td>
<td>21- 84</td>
<td>57(53 -63)</td>
<td>12.5</td>
</tr>
<tr>
<td>FIM-Mot T2</td>
<td>44.92 (14.58)</td>
<td>2.92</td>
<td>39.93 - 49.91</td>
<td>14 - 72</td>
<td>47 (36 -56)</td>
<td>20</td>
</tr>
<tr>
<td>FIM-Mot T3</td>
<td>52.88 (15.09)</td>
<td>3.01</td>
<td>47.71 -58.05</td>
<td>15 - 83</td>
<td>55 (41 -64)</td>
<td>25.5</td>
</tr>
<tr>
<td>FIM-Mot T4</td>
<td>54.64 (17.25)</td>
<td>3.45</td>
<td>48.74- 60.54</td>
<td>17 - 82</td>
<td>55 (40 -67)</td>
<td>29</td>
</tr>
<tr>
<td>FIM-Cog T1</td>
<td>22.80 (7.47)</td>
<td>1.49</td>
<td>20.243 - 25.357</td>
<td>6.0 - 35.0</td>
<td>24 (21 -27)</td>
<td>6.5</td>
</tr>
<tr>
<td>FIM-Cog T2</td>
<td>17.44 (6.72)</td>
<td>1.34</td>
<td>15.138 -19.742</td>
<td>6 - 31</td>
<td>18 (12 -21)</td>
<td>10.5</td>
</tr>
<tr>
<td>FIM-Cog T3</td>
<td>21.16 (4.82)</td>
<td>.96</td>
<td>19.508 - 22.812</td>
<td>14.0 - 30.0</td>
<td>20 (18 -25)</td>
<td>8</td>
</tr>
<tr>
<td>FIM-Cog T4</td>
<td>23.32 (6.32)</td>
<td>1.26</td>
<td>21.16 -25.48</td>
<td>8 - 32</td>
<td>23 (18 -28)</td>
<td>10</td>
</tr>
<tr>
<td>ADQRL T1</td>
<td>33.08 (6.11)</td>
<td>1.22</td>
<td>30.987 - 35.173</td>
<td>16 - 40</td>
<td>35 (29 –38)</td>
<td>9.5</td>
</tr>
<tr>
<td>ADQRL T2</td>
<td>31.24 (6.60)</td>
<td>1.32</td>
<td>28.98 - 33.50</td>
<td>14 - 39</td>
<td>33 (30 -38)</td>
<td>11</td>
</tr>
<tr>
<td>ADQRL T3</td>
<td>33.48 (4.07)</td>
<td>.81</td>
<td>32.08 -34.87</td>
<td>26 - 40</td>
<td>33 (30 -38)</td>
<td>8</td>
</tr>
<tr>
<td>ADQRL T4</td>
<td>33.68 (5.22)</td>
<td>1.04</td>
<td>31.89 -35.47</td>
<td>22 - 40</td>
<td>35 (27 -37)</td>
<td>9</td>
</tr>
</tbody>
</table>
Additional exploratory research questions

Research questions 1 and 2: Describe the number and severity of adverse events during the pre-intervention and intervention phase

This section will describe trends in the number and severity of adverse events experienced by residents during the pre-intervention phase to determine the baseline number of incidents each resident participant. Next, the number and severity of adverse events that occurred during the intervention phase will be summarized and compared to the pre-intervention phase to assess if there was an increased risk to participate in the intervention.

Adverse events during the pre-intervention phase

Table 18 shows there were 194 adverse events during the pre-intervention phase among 25 residents who completed the study. As shown in the table, the mean number of events per resident per month during the pre-intervention phase was 3.88 adverse events. Of these 194 events, 167 (88.3%) were categorized as minor events (no injury included) and 22 (11.7%) were moderate events (resulted in small local or temporary injury). There was minimal difference in the number of events per resident from each home; Home 1 had 106 events related to 14 residents (7.57 events per resident) and Home 2 had 83 events related to 11 residents (7.54 events per resident). In the 2 month pre-intervention period, five residents had 0 documented events and the highest number of events involving one resident was 37.
Table 18

*Events per month per resident during the pre-intervention phase and the intervention phase (N=25)*

<table>
<thead>
<tr>
<th></th>
<th>Total number of events</th>
<th>Events per month per resident</th>
<th>SD</th>
<th>Events per resident (Min- Max)</th>
<th>Mean difference (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-intervention phase (2 months)</td>
<td>194</td>
<td>3.88</td>
<td>4.58</td>
<td>0-37</td>
<td></td>
</tr>
<tr>
<td>Intervention phase (4 months)</td>
<td>331</td>
<td>3.71</td>
<td>5.02</td>
<td>0-76</td>
<td>-0.17 (2.03)</td>
</tr>
</tbody>
</table>

Table 19 presents the classifications of events, the number of events, the number of affected residents, and the ratio between minor and moderate events. The events were classified by type, presence and severity of injury, and relation to the intervention. The most common type of documented event were behavioral events that did not result in any injury (n=118, 60.8%), such as the resident requiring redirection, confusion, wondering the halls naked, screaming or shouting, delusions, agitation, and responsive behaviors during care from staff, and attempting to enter another resident’s room. Aggressive actions (n=28, 14.4%) were the second most common type of incident with the majority resulting in no injury (e.g. shouting at another resident) while one quarter (n=7) of the aggressive actions resulted in a small localized injury; five of these violent incidents were residents attacking, scratching, and punching staff and two were isolated attacks on other residents. The third most common events were notable incidents (n=22, 11.3%) pertaining to reports of spontaneous rashes or vomiting involving no injury or treatment, four incidents had a documented treatment, and only one event was categorized as severe (life threatening) when one resident experienced a facial droop and had a low oxygen saturation.
Table 19

Adverse event data during the pre-intervention phase compared to the intervention phase

<table>
<thead>
<tr>
<th>Type of event</th>
<th>Pre-intervention phase</th>
<th>Intervention Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of residents</td>
<td>Number of events</td>
</tr>
<tr>
<td>Falls</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Behavioural</td>
<td>14</td>
<td>118</td>
</tr>
<tr>
<td>Aggressive</td>
<td>8</td>
<td>28</td>
</tr>
<tr>
<td>Notable</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>QOL complaints</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>ADL related</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Five residents experienced 11 documented falls (5.7%) making it the fourth most common incident in the pre-intervention phase. Eight falls did not result in injury whereas three falls resulted in either bruising or a skin tear. QOL related incidents (n=3) comprised of negative events that documented resident concerns or expressed sadness about being in outbreak precautions to staff members, or when staff observed decreased participation in activities. ADL related events (n=2) were staff documenting the current level of assistance the resident needed to complete ADLs. Both QOL and ADL related incidents were minor and comprised of 2.6% of the events.

**During the intervention phase**

Table 18 shows that residents experienced 331 events during the four month intervention phase. All the events were unrelated to the MWI and occurred during times that the PI was not walking a resident. For example, events typically transpired in the evening when the resident was experiencing “sun downing” responsive behaviors. There was an absolute increase in the total number of events which is not surprising since the intervention phase was twice as long as the pre-intervention phase resulting in twice as many events. However, the mean number of events per resident during the intervention phase was 3.71, a decrease of -0.17 events per resident per month compared to the pre-intervention phase.

Three residents experienced no events and the highest number of documented events for a resident was 76. Residents were consistent in their number of documented events from the pre-intervention phase – the same residents who had no documented events during the pre-intervention phase continued to have no events in the intervention phase and the same resident exhibited the highest number of events in both phases. Two residents who had 0 documented events in the pre-intervention phase became ill during the intervention phase and acquired more
“notable incidents” such as illnesses/outbreaks, hospitalizations, and personal events causing distress (from 18 (9.2%) to 66 (19.9%)). There were more QOL related events in the pre-intervention phase to the intervention phase from 3 (1.5%) to 24 (7.2%), for example one resident stopped getting bi-monthly visits from their POA and exhibited more depressive and responsive behaviors.

Table 19 indicates that the most common type of event were behavioral resulting in no injury (n=138, 41.6%), followed by clinically related notable incidents related to no injury or treatments (n=66, 19.9%), and then the third most common category was aggressive actions related to no injury (n= 52, 15.7%). Notably, the proportion of behavioral events decreased by 20% from the pre-intervention phase (n=118, 60.8%) compared to the intervention phase (n=138, 40.7%) as well as a slight decrease in the number of moderate events from the pre-intervention phase (11.3%) compared to the intervention phase (9.3%). This result corroborates with POAs and PSW staff reports of a reduction in residents’ agitation and responsive behaviors on the post-intervention modified-TEI survey. In conclusion, no events were related to the intervention, there was a small decrease in the number of events per resident per month, and there was a decrease in the proportion of behavioral events in the intervention phase compared to the pre-intervention phase.

**Research question 3: Describe nursing home attributes that influenced feasibility measures**

The aim of this question was to describe the attributes of the nursing home environment that may have influenced measures of intervention feasibility to inform a future trial; however, there were few differences in recruitment rates, retention rates, and interventionist adherence in both homes so trends were minimal. For example, both homes had very supportive staff to facilitate recruitment, and were easily accessible by local transit with locked outdoor spaces to
support interventionist adherence. This following section will present three nursing home attributes that may impact the ability to successfully conduct a PA study for residents with dementia in a future study: the extent that nursing staff can dedicate time to assist in recruitment, resources in the home for the researcher to conduct the study, and the size of the home/staff roster.

Recruitment time at each site was influenced by the degree to which a staff member could provide the PI data about the sample pool, eligible residents, as well as make first contact with the POAs. In Home 1, the main contact had a narrow scope of responsibilities within the home and thus was able to promptly determine the sample pool, produce a spreadsheet of all the eligible residents for screening, and contacted the POAs of residents who met the inclusion criteria; the recruitment process was smooth and streamlined. Whereas in Home 2, the main contact had less time to dedicate to the study and took a longer time to contact the POAs for consent; recruitment was one month longer in Home 2.

An aspect of the nursing home environment that impacted the logistics and practicality of conducting the screening, managing documentation, and delivering the intervention was the number of available resources provided to the PI in the home. Common conveniences (e.g. company laptop with an internet connection, telephone line) and a locked office space where the PI could store securely equipment, paperwork and documents in an accessible location near the residents’ units, made conducting the study and delivering the intervention more efficient in Home 1. The office space also provided a quiet place to conduct POA interviews and document in the intervention diaries to ensure high interventionist adherence, and POAs and staff knew where to locate the PI if they had questions. From a pragmatic perspective, these resources were incredibly helpful throughout the screening process and intervention implementation. Compared
to Home 2 where there was no work space provided, the PI was required to transport consent forms, screening tools, documentation, the equipment to deliver the intervention, and a laptop to document resident sessions each day. This inconvenience increased the risk of data theft, and the time burden could impact interventionist adherence in future trials. The lack of material resources to support researchers on site may contribute to the difficulties of conducting future longitudinal PA studies in nursing homes.

Lastly, Home 1 was larger and appeared to have more casual float staff and turnover of employees. Despite spending time promoting the intervention in the beginning of the study, the PI needed to re-introduce the study and explain the intervention multiple times throughout the home in order to ensure staff were aware of the study purpose. In contrast, Home 2 was a smaller home and had more regular staff who all knew about the study. The staff kept documents filled out by POAs at the nursing station in the locked medication room whereas casual staff from Home 1 misplaced a POA’s survey intended for the PI, which underlines the importance of having knowledgeable staff with buy-in to combat the realities of intervention research in clinical settings. Understanding and accounting for these environmental characteristics can influence the feasibility of conducting a PA trial in nursing homes.

**Research question 4: Describe nursing home attributes that may have influenced resident outcomes**

The purpose of this question was to describe nursing home attributes, as measured by the three PEAP subscales linked to walking disability (support of functional ability; maximizing awareness and orientation; and, quality of stimulation), that may have influenced residents’ outcomes. Despite a greater decline in the 2MWT (-29.3 feet) during the pre-intervention phase at Home 2 compared to the decline at Home 1 (-10.4 feet), this decline was not significant. There
were no significant site differences associated to resident outcomes. Table 20 in Appendix Y provides a brief description of the two nursing home sites and a comparison of the therapeutic home features related to the three PEAP subscales that may affect residents with dementia in different ways.

Similar physical features to “support functional ability” in each home were described in the PEAP survey. For example functional hardware that modify the environment, such as wall grab bars and flip-down bars in the bathrooms, as well as handrails along both sides of the hallways, support residents’ functional abilities and accessibility. In the same way, both homes identified similar challenges to support functional abilities of residents, primarily that their nursing staff were unable to dedicate the time to encourage and supervise residents to complete their ADLs. Nursing staff end up “doing the task for” the resident rather than the resident completing the task themselves which contributes to deconditioning. Both homes attributed this challenge to inadequate funding to increase staffing levels to meet residents’ care needs as well as the abilities to appropriately outfit the units and resident rooms with support devices, such as ceiling lifts and height-adjustable beds that would encourage functional abilities.

Home 1 offered consistently more daily activities compared to Home 2 to “support functional ability”. Home 1 consisted of two four-floor buildings that offered: a life enhancement coordinator on each floor (eight in total) who provided programs seven days a week throughout the day, a restorative care program directed by a RPN and activationist staff providing group sitting activities six days of the week, a full-time physiotherapist, and four physiotherapy assistants in each building. Home 2 was made up of a single four-story building and offers fewer programs than Home 1. Home 2’s programs included daily life enhancement group exercise
programing in the afternoons, restorative care with two staff members three times a week, a part-time physiotherapist, and two PTAs who delivered PA interventions.

Both homes had environments that were conducive to “maximizing awareness” in different ways. Home 1 had more consistent and regular social programs offered to the residents in areas with doors that could be shut to create a distinct space for different activities, as well as reduce distractions/noise from the unit that could cause over-stimulation and confusion, whereas Home 2 had an open concept floor plan with minimal closed off spaces. Another aspect of maximizing awareness is the presence of signs in the environment, Home 2 had more signs in different languages posted in the hallways to help direct residents and reduce confusion whereas Home 1 only had one sign in front of the elevator to direct visitors.

The last subscale on the PEAP survey identified areas of improvement in both homes regarding the “quality of stimulation” subscale, specifically identifying the environmental disruption caused by vocal residents with responsive behaviors as a challenge. Both homes have residents who are often seated by the nursing station who constantly vocalize (e.g. scream, shout, sob) throughout the day. The DOCs in both homes acknowledge this as a “nuisance for residents” but have limited options to reduce the disruption. Home 2’s open concept floor plan amplifies the noise related to the severe responsive behaviors. As a response, Home 2 reported to have a consult plan in conjunction with specialized geriatric healthcare institutions in Toronto to address residents who exhibit responsive behaviors, as well as an additional PSW in their locked dementia unit to provide activities for the residents. Specifically, the PSW organized specific Montessori and Sensory Stimulation activities every day between 10am-12 pm and then again at 4pm-5pm and 6pm-8pm to distract residents and reduce responsive behaviors
Chapter 5: Discussion

This chapter begins with a discussion related to the primary research questions regarding feasibility of to the MWI, followed by a discussion of its acceptability to the POAs, PSW staff, and residents. Next, the efficacy of the MWI in maintaining functional mobility, ADL function, and QOL outcomes will be compared to existing research. The number and severity of adverse events and the influence of the environmental attributes of the home will then be discussed. The chapter concludes with a discussion of the strengths and limitations of this study.

Primary Research Objective: Feasibility and Acceptability

The MWI was feasible based on the three key foundational aspects of an intervention study. The high recruitment rate indicates that the recruitment plan was appropriate for the sample, and that there was considerable participant interest in the MWI from both sites. The high retention rate suggests that the intervention as designed was well tailored to this population. The interventionist was able to adhere to the MWI protocol as intended. Further, POAs and PSW staff acceptability was high pre and post the MWI and resident adherence and acceptability was similarly high. These results indicate that the intervention met participant expectations aligned with their beliefs about the benefits of combining person-centered care and PA for this population.

Feasibility of MWI

The translation of intervention research to clinical practice depends on the conduct of well-designed and efficient clinical studies, which involves the examination of measures related to feasibility, such as participant recruitment and enrollment, as well as participant and
stakeholder acceptability (Atassi et al., 2013). The results from this study provide crucial information about participant retention and interventionist adherence that would improve trial validity and timelines for a future trial (Atassi et al., 2013). A discussion of the feasibility measures is presented below.

**Recruitment rate**

*Reasons for exclusion.* The majority of the residents with dementia who were admitted in the last six months (68 out of 99, 68.6%) did not meet the study inclusion criteria (reasons discussed below). This exclusion rate of 68.6% was similar to a previous PA study with the same population that had an exclusion rate of 61% (Littbrand et al., 2009), and is within the range of 43% (Bosser et al., 2014) and 79% (Boström et al., 2015) reported rates of other studies. Previous studies typically did not describe their sampling pools (Christofoletti et al., 2008; Eggermont et al., 2009; Francese et al., 1997; Kemoun et al., 2010; Tappen et al., 2000) or only reported the initial sampling pool but failed to report the reasons for exclusion (Cott et al., 2002). Only one recent RCT of a PA intervention in this population specified that 42% of residents (n=486) were excluded because they were “not interested” (Cancela, Ayán, Varela, & Seijo, 2015).

The primary reason for resident exclusion in this study was *immobility* upon admission into the nursing homes (29 out of 68, 42.3%). From the sampling pool, approximately 30% (29 out of 99) were immobile, meaning completely wheelchair dependent or bedbound and unable to stand up or ambulate. This proportion is reflective of the national nursing home statistics by CIHI (2013) that report 35% of admitted residents in Ontario and across Canada are highly or totally dependent. Given this provincial and national context, it is not surprising that this
proportion of immobile residents was reflected in this study and that immobility was the most common reason for exclusion. Immobility was likewise the primary reason for exclusion in other studies as well. For example in Littbrand et al (2009) 31% (69 out of 216) of those who did not meet inclusion criteria were unable to stand up from a chair/immobile. Even higher rates of exclusion based on immobility were reported by Bossers and colleagues (2014) who indicated that 80% of ineligible participants were immobile, and in a study by Bostrom et al (2015) in which 45% (243 out of 532) of excluded residents were unable to stand from a chair.

The second most common reason for exclusion was the absence of a documented *diagnosis of dementia* (15 out of 68, 23.5%). This reason was consistent with other PA studies in which a dementia diagnosis was an inclusion criteria (Tappen et al., 2007; Telenius, Engedal, & Bergland, 2015; Venturelli et al., 2011a). Although a high percentage of residents exhibit symptoms of dementia in LTC, the disease is underdiagnosed due to many reasons, such as severe hearing or vision deficits, and language barriers (Littbrand et al., 2006). In this study, the social worker and care coordinator from the sites identified accessibility issues as an additional barrier to diagnosis, as residents often cannot attend specialty neurology clinics for comprehensive dementia screening. This clinical reality may suggest difficulties accruing the large sample size required for a future effectiveness trial, which could be addressed by revising the inclusion criteria (Sidani & Braden, 2011) to account for the fact that many residents have symptoms of dementia but are undiagnosed, like using MMSE scores to determine eligibility.

The most concerning reason for exclusion was major traumatic injury prior to being approached by the PI. Three residents fell and sustained fractures (hip, clavicle, humerus) that disqualified them for screening to determine eligibility. Previous literature did not report
“major injuries” as an reason for disqualification/exclusion, although it is possible that one previous study categorized this phenomenon as “clinical instability” (Christofoletti et al., 2008). This trend may be a reflection of the additional risk of injury experienced by newly admitted residents who are unfamiliar to the environment and are not well known to the staff, which makes the identification and management of fall risk more challenging in this population compared to long-residing residents (Leland, Gozalo, Teno, & Mor, 2012). New residents are also at an increased risk of falls due to poor functional status and cognition (Leland et al., 2012).

**Enrollment rate.** One hundred percent of eligible participants consented to enroll into the study; no one refused to participate in the study. This favourable enrollment rate was considerably higher than in previous similar studies: 15% (n=71) (Littbrand et al., 2006), 18.5% (n=26) (Cott et al., 2002), 26.8% (n=85) (Rolland et al., 2007) and 80% (n=10) (Aman & Thomas, 2009). The high enrollment rate may be due to the novel approach used in the MWI in which individualized PA was provided one-on-one with an academic RN unlike other studies that primarily provided group based PA. Qualitative feedback provided by the POAs and PSW staff corroborated this hypothesis and emphasized the value of one-on-one time in facilitating person-centered care. All participants (residents, POAs, and PSW staff) recognized the potential benefits of regular individualized PA and found the person-centered care approaches appealing. They were receptive to study aims and procedures and this enthusiasm contributed to the 100% enrollment rate.

**Enrolled residents.** The residents in this study were more physically and cognitively compromised compared to other studies. The mean MMSE score of participants in this study was 15 (“severe cognitive impairment”), which is lower than other PA studies in the same population.
(Eggermont et al., 2009; Littbrand et al., 2006; Santana-Sosa et al., 2008) but comparable to studies with smaller samples such as Toulotte et al. (2003) (n=20). The average age of enrolled residents was 87 years, which is older than the average Ontario nursing home resident age of 82 years old (CIHI, 2013). As previously reported, greater dementia severity and older age predicted lower physical function (Payette et al., 2011). Given that the enrolled sample consisted of vulnerable residents who were at higher risk of decline, it would be reasonable to expect recruitment challenges. This was not the case, suggesting that recruitment for a similar larger trial to determine the effects of the MWI may also be feasible.

With respect to enrolling residents with dementia into research studies, dementia clinical trials typically face a number of unique recruitment challenges and often find it problematic to enroll both a collateral/POA as well as the resident with dementia (Grill, Raman, Ernstrom, Aisen, & Karlawish, 2013). As a result, studies often struggle to achieve enrollment goals, and previous researchers conducting PA interventions have reported recruitment to be “difficult and time consuming” (Killey & Watt, 2006, p. 7) requiring persistence and skill. Comparatively, in this study the time period to recruit and screen the resident participants was approximately two to three weeks which was reasonable given that only the PI was responsible for these tasks. The POAs were contacted by the home and returned signed consent forms within two weeks from first contact, and resident screening was subsequently completed within a week. The screening process for eligibility was facilitated by the presence of the POA during cognitive and physical screening tests, allowing for completion in fewer sessions. The presence of a trusted third party likely decreased resident apprehension during the consent and screening process (Killey & Watt, 2006). These data suggest that the enrollment and screening of nursing home residents with dementia and POAs for a larger trial in the future would likewise be feasible.
Enrolled POAs. The majority of POAs were daughters of participants, had a mean age 59 years old, and had university degrees. This was consistent with the national profile of informal caregivers in Canada, who are likely to be predominantly women aged 45 to 64 years with postsecondary education (Statistics Canada, 2012), as well as those informal caregivers in Europe (Pickard, 2011). This findings was inconsistent however, with a secondary analysis of studies targeting older adults with dementia that reported more POAs to be spouses of the resident (Grill et al., 2013).

Participant retention rate

The loss to follow-up in this study (n=1, 3.9%) was much lower than other PA interventions in LTC. One such study had a loss to follow-up of 10% (n=29) due to death, another reported a 14% (n=12) loss due to death or surgery (Cott et al., 2002), while a third study reported 20% (n=4) loss due to a loss of resident motivation and death (Kemoun et al., 2010). Other documented reasons for loss to follow-up were clinical instability (24%, n=13) (Christofoletti et al., 2008), and transfer to another LTCH (4%, n=9) (Cancela et al., 2015), although some studies gave no reasons and did not explore reasons for withdrawal of consent (Eggermont et al., 2009; Tappen et al., 2000). A more recent PA study reported a loss to follow-up of one resident (5.5%) due to “unwillingness to participate” but provided no further information (Bossers et al., 2014). Increasing intensity of PA and poor motivation may have contributed to high dropout rates the intervention groups compared to the control group (Christofoletti et al., 2008; Eggermont et al., 2009). Similarly, when comparing a “walking and conversation” group to a “walking only” group, more participants dropped out of the “walking only” group (Tappen et al., 2000). Whereas the retention rate of this study was high, no residents withdrew from the study even as the PA intensity increased over time. Previous studies suggest
that the high retention rate could be related to the notion that all PA was coupled with an individualized social aspect that maintained resident engagement and motivation throughout the study and thereby prevented attrition (Kalinowski et al., 2012; Phillips & Flesner, 2013).

Likewise, no POAs or PSW staff participants withdrew from the study. Strategies such as the PI maintaining visibility, providing a personal contact number and e-mail address, and offering brief updates and pictures from the sessions to the POAs upon request, as well as verbal updates to the PSW staff may have assisted in avoiding attrition. These strategies were determined a priori and provide additional evidence that the intervention as designed is feasible for a larger future trial. In contrast, a high attrition rate would have indicated the need for a larger sample size to maintain statistical power and internal validity, subsequently inflating trial duration and costs (Atassi et al., 2013; Cooley et al., 2003).

**Interventionist adherence**

Interventionist adherence and protocol deviations are crucial to consider in the translation of intervention research to clinical practice because they may lead to bias (systematic errors), random errors, and design errors into a future larger clinical trial that will ultimately result in flawed conclusions (DiFrancesco, Rosenkranz, Craft, & Morse; Sweetman & Doig, 2011). Although there is no broad consensus on what constitutes excessive protocol deviation rates in clinical trials, it has been suggested that more than 10% protocol deviation rate reflects poor adherence and needs to be addressed (Pocock, 1983). The interventionist adherence in this study was high with little deviation and was well below the 10% threshold. While this study deviated from original protocol by not using the BORG visual analog scale to assess perceived intensity of the PA as a safety provision, residents were able to either verbally or physically communicate
that they needed a rest. The original inclusion of the BORG was due to an underestimation of residents’ cognitive functioning. In a larger future trial, the protocol should be modified such that the BORG is only used for those residents who are severely cognitively impaired rather than applying to all participants. The identification of preventable protocol deviations in this feasibility trial might allow errors or missing data to be avoided in a future, larger trial (Sweetman & Doig, 2011; Wolf & Makuch, 1980).

Overall, the PI was successful in delivering the four month MWI to residents as outlined in the protocol. The duration of the MWI was based on geriatric and functional mobility literature. One Canadian study found that 40.8% of nursing home residents with dementia experienced some loss in functional mobility within the first year at the home, and that 61% of this decline was in excess of what would be expected from dementia alone (Slaughter, Eliasziw, Morgan, & Drummond, 2011). A comparable finding from another study found that 27% of residents lost some ability to walk within six months (Carpenter et al., 2006). Within this context, a four month intervention that can be initiated soon after admission would be valuable in mitigating functional decline. In order to achieve a high intervention adherence rate, a generous time commitment from the PI was required in order to stay in the nursing home throughout the day and evening as well as travel back and forth between the sites on a daily basis. The intervention protocol, whereby residents could be approached several times throughout the day was helpful in maximizing participation, but required that the PI follow up with the same resident throughout the day and/or evening to attempt the intervention, rather than by making rounds on a once-daily basis. Other trials fail to report deviations from protocol or intervention adherence in similar PA trials, which is consistent with an overall lack of attention to protocol adherence in clinical trials in general (Sweetman & Doig, 2011).
Acceptability

Acceptability of POAs and PSW staff. There was a high acceptance rate among POAs and PSW staff and they held positive opinions of the MWI. Previous studies did not report the perceptions and input of stakeholders, such as POAs (who are often family members) (Forbes et al., 2008) and nursing staff (who are typically PSWs). Despite this, acceptability of POAs and PSW staff members is important to establish for a future trial, and aligns with the recommendations of a Cochrane review (Forbes et al., 2008) that future PA studies in this area should include the perspectives and outcomes of family/POAs. To date, this is the first PA intervention to include the perspectives of both the POAs and PSW staff about their reactions to a PA intervention, and how it contributed to the QOL of residents.

The POAs found the MWI to be highly acceptable, and specifically appreciated the additional socialization for the resident, individualization of the intervention and a personalized approach, and increased PA throughout the week to maintain mobility. PSW staff liked similar aspects of the MWI, felt that residents seemed “happier” and appreciated that the MWI provided someone to pay “attention” to the resident. These perspectives are consistent with the findings of a literature review that found that staffing limitations constituted a major barrier to providing individualized and meaningful PA to older adults in LTC (Benjamin et al., 2014). Within this context, POAs and PSW staff appreciated that the MWI was able to overcome these recognized barriers to PA. The acceptability related findings helped identify well-received features of the intervention, which should be incorporated into a future large scale trial (Lees et al., 2005).

Resident adherence. Resident adherence was higher than in most other PA studies in this population. Previous PA interventions reported resident adherence rates of 84% over six weeks
(Bossers et al., 2014), 76% over 13 weeks (Littbrand et al., 2006), 73% (Boström et al., 2015) and 75% over 16 weeks (Tappen et al., 2000), 80% (Aman & Thomas, 2009), or 33.2% over one year (Rolland et al., 2007). Only two small pilot studies reported higher or comparable resident adherence rates: one study (n=16) had a 98.8% resident adherence rate to a 12 week PA program that the authors attributed to its relatively short exercise regime, while another study (n=11) reported a 93.4% resident adherence rate to their 24 week walking program in which family members were the interventionists (Venturelli et al., 2011a).

To encourage resident participation and adherence, the PI addressed the reluctance to walk in the cold weather by walking residents out of their unit and around the entire floor, lobby, or onto other floors to give them a change in the environment and maximize the distance walked. Although this approach had limited effectiveness; the units were monotonous and only minimally stimulating, but the act of walking around each unit with the PI provided more PA than they would have otherwise received. Non-stimulating environments while walking indoors has been reported to hamper efforts to keep residents active (Phillips & Flesner, 2013).

There were a small number of missed sessions in this study, many of which were due to non-modifiable reasons (e.g. doctor’s appointments, outbreaks) and prevented the resident from engaging in most physical activities that day. Illness was the most common reason to miss a session, similar to previous PA studies that reported outbreaks contributing to decreased missed sessions (Brenner, 2009; Littbrand et al., 2006). Another common reason for missed sessions was unmanaged resident pain requiring additional nursing staff attention, and which is outside the scope of this study. The proportion of sessions missed due to pain was much lower compared to other PA studies that reported 53% of missed sessions were due to pain and researchers were
unable to increase the intensity of the PA as they originally intended (Littbrand et al., 2006). Unmanaged pain in LTC is prevalent and affects 50% (Corbett et al., 2012) to 80% of residents with dementia (Achterberg et al., 2013). The most common causes of pain in nursing home residents with dementia include musculoskeletal conditions, recent or previous injuries, and chronic pain related to a co-morbidity (Hoffmann, van den Bussche, Wiese, Glaeske, & Kaduszkiewicz, 2014) and results in functional impairment (Ahn & Horgas, 2013; Kolanowski et al., 2015). For example, residents in this study suffered from unmanaged chronic pain due to cancer or severe edema secondary to congestive heart failure. Consistent with the literature, residents with more severe pain are less likely to be mobile (Ahn & Horgas, 2013). Further, nursing home staff may have had a poor knowledge of pain management principles such as analgesic choice, safety of opioid use in dementia, and the use of dementia-specific pain assessment tools for residents (Burns & McIlfatrick, 2015) resulting in residents experiencing unnecessary pain (Care Quality Commission UK, 2014). Poor pain assessment and management can be attributed to a lack of clear dementia-specific practice guidelines for health care providers (Corbett et al., 2012), and other barriers such as workload pressures (Burns & McIlfatrick, 2015) and poor staffing (Burns & McIlfatrick, 2015).

Several aspects of the intervention design were intended to facilitate person-centered care and contribute to resident adherence. First, application of the communication care plan during the walking sessions enabled effective communication and social interaction between the PI and the resident by identifying topics of interest and relevance to the resident. The care plan also served as an in-depth summary of the residents’ personal histories that were used to guide conversations. These conversations were specific to the resident and served as meaningful opportunities for residents to reminisce and recall forgotten facets of their lives during the
walking sessions. The development of the care plan also provided a foundation for the PI to build rapport with the POA participants.

A second aspect of intervention based on person-centered care was the creation of relevant and personalized goals that accounted for resident preferences and schedules and which likely attributed to maintain resident adherence. For example, one resident identified that participating in more social programs would increase his QOL, but he was often excluded from social programs held in the lobby due to a lack of staff to assist him in his wheelchair to the event. In his case, his individualized goal was to walk the distance from his room to the elevator, then standing for a few moments prior to sitting, to account for the time he would need to stand in the elevator, with the goal of enabling him to reach the lobby by the end of the MWI.

Third, the residents’ physical abilities determined their walking regime. Individualization of the regime to correspond with the resident’s physical capabilities was important because of the wide variance in physical abilities among the residents, and tailoring the regime prevented the PI from overexerting and overworking the residents to avoid injury. All residents began with sessions once a week, and then the dose steadily increased (either in the number of sessions and/or the distance walked per session) in subsequent weeks according to the residents’ tolerance (i.e. experienced greater endurance and motivation). In several cases (n=6), residents had extensively limited physical abilities (e.g. were unable to walk 30 feet without taking a break or becoming short of breath) at the beginning of the intervention. To work alongside residents who could not tolerate PA for various reasons, the dosage of the regime was either incrementally increased in distance per session, in the number of sessions per week to not exhaust the resident, or reducing the number of breaks taken per session. Lastly, the perspectives of the POAs and
PSW staff were accounted for, for example by scheduling sessions to avoid shower days for residents who reportedly had increased agitation on those days. This high level of individualization of each session contributed to the 93.4% adherence rate and minimal loss to follow up.

**Secondary Research Objective**

**Efficacy**

The secondary research questions explored the efficacy of the MWI on functional mobility, ADL function, and QOL outcomes. This study was powered to find efficacy trends in functional mobility, and significant differences were found between the pre-intervention and intervention phase that favored the intervention were found.

**Efficacy of MWI on Functional Mobility**

The intervention resulted in significant effect (p < 0.10) in the TUG, 2MWT, and gait speed over time favoring the intervention. Residents experienced a decline in all three functional mobility measures in the pre-intervention phase, and then marked improvements throughout the intervention phase that not only reversed their decline but exceeded their baseline functional mobility.

**TUG.** The differences in the TUG in the pre-intervention phase (4.15 seconds, 4.43% decline) and the intervention phase (8.58 seconds, improvement of 32.14%) overall was greater than the MDC90 established by Ries et al (2009) to suggest that these changes are not due to measurement error and correspond to a meaningful change in functional mobility. No MCID has been reported for nursing home residents with dementia; however, the decline experienced by
residents during the pre-intervention phase was similar to the MCID reported in another study involving persons with Parkinson’s disease (Crocker et al., 2013) suggesting the improvement during the intervention phase has clinical significance. The ability to walk 8 seconds longer could be the difference that allows a resident to walk from the bed to their chair or the bathroom. A recent 16 months longitudinal RCT reported similar baseline TUG results, and also found statistically significant improvements in TUG scores (Cancela et al., 2015). Another recent PA study reported similar improvements in TUG following PA in nursing home residents with dementia (Varela, Ayán, Cancela, & Martín, 2012).

2MWT. There was a significant decline in the 2MWT of 5.78 meters (9.73% decline) during the pre-intervention phase and a significant improvement of 27.47 meters (51.25% improvement) during the intervention. The gains made in the first half of the intervention and the intervention overall, 22.31 and 27.47 meters respectively, are almost twice the reported MDC of 12.2 to 14.7 meters (Connelly et al., 2009) suggesting that the MWI had a beneficial influence on the 2MWT. Resident performance continued to trend non-significantly higher in the second half of the intervention, suggesting that the MWI may have contributed to an important functional stabilization in this frail and dependent population.

The encouraging 2MWT finding from this study was in contrast with a similar study that considered, but found no significant changes (Cott et al., 2002). Cott and colleagues’ findings may have been due to a unpowered sample size and intervention contamination. A MCID is not yet established in literature to compare mean differences; however, the preliminary evidence from this study supports future research into the intervention effectiveness using the 2MWT in a larger trial.
Gait speed. Like the other measures of functional mobility, there was a significant decline during the pre-intervention phase and a significant improvement during the intervention. Residents regained their pre-intervention decline in gait speed (11.31% decline) and experienced a significant increase in gait speed (55.11% improvement) compared to baseline by the end of the intervention. This favourable finding is consistent with other PA intervention studies that have reported significant improvement in gait speed of nursing home residents with dementia (Ahn & Kim, 2015; Perrochon, Tchalla, Bonis, Perucaud, & Mandigout; Schwenk et al., 2014; Tay, Lim, Chan, Ali, & Chong, 2016). The results of this study report greater gains than some previous studies, including Perrochon et al (2016) an increase in mean gait speed of 0.12 m/s after the PA intervention. This could be due to Perrochon and colleague’s underpowered sample (n= 16) and short intervention (eight weeks). As motor and cognitive functions share neuroanatomical structures and psychological processes, there is an association between poor executive function, cognitive functioning, and declines in gait speed (Atkinson et al., 2007; Soumaré, Tavernier, Alpérovitch, Tzourio, & Elbaz, 2009; Watson et al., 2010) and more serious falling patterns in older adults (Kearney, Harwood, Gladman, Lincoln, & Masud, 2013b). Gait speed correlates with many age-related adverse outcomes, and therefore efforts to maintain or increase walking speed in nursing home residents should be considered (Keogh, Senior, Beller, & Henwood, 2015).

Given the lack of rehabilitation services provided to nursing home residents, the positive impact of regularly delivered supplemental PA may be unsurprising. Regular PA is an effective prevention against sarcopenia in nursing home residents with dementia (Landi et al., 2012; Morley, Anker, & von Haehling, 2014; Morley, 2016a). Yet, recent evidence from a survey of Canadian LTC facilities indicates that between 63.7% and 88.6% of residents do not receive any
physiotherapy (PT) or occupational therapy (OT) whatsoever, and that older residents with cognitive impairment or mood disorders are less likely to receive rehabilitation services (McArthur, Hirdes, Berg, & Giangregorio, 2015). This study provides preliminary evidence that an individualized PA regime can have an important impact on functional mobility in nursing home residents with dementia within this context of minimal PT, OT, and restorative care.

**Efficacy of MWI on ADL function**

The positive effect of the MWI on ADL function is consistent with other PA interventions (Kwak, Um, Son, & Kim, 2008; Luttenberger, 2012; Rolland et al., 2007; Santana-Sosa et al., 2008; Venturelli et al., 2011a) and align with the results of a systematic review (Forbes, Forbes, Blake, Thiessen, & Forbes, 2015) and meta-analysis on the topic (Crocker et al., 2013). Although the improvements in the FIM total score were significant, there is no MCID for nursing home residents with dementia to determine whether the change was clinically significant. However, a positive effect of the MWI on ADL function can be hypothesized using the ICF framework (WHO, 2001). An improvement in functional mobility, gait speed, and FIM-motor scores can lead to an improvement in resident’s daily ADLs performance which in turn minimizes dependency on staff members and affects their QOL (Andersen et al., 2004). This agrees with qualitative responses by the POAs and PSW staff who stated that independence and mobility to perform ADLs contributed to resident autonomy and QOL. Possible explanations as to why residents did not totally regain function (difference of 3 FIM points) could be due to measurement error, or the idea that ADLs are complex (i.e. they require recognition, sequencing of tasks, initiation of fine motor skills, etc.) and required more executive functioning than the MWI could provide.
Efficacy of MWI on Quality of Life

The positive effects on QOL measures were consistent with previous PA studies that demonstrated significant improvements in QOL (Cichocki et al., 2015; Serrani Azcura, 2012). Increased QOL is parsimonious with improvements in functional mobility and ADL function according to the ICF (WHO, 2001). This study considered the relationships between QOL, functional mobility and participation in daily activities, like ADLs, while including multiple stakeholders which is an important and fulsome adaptation of the ICF (McDougall et al., 2010). Based on the qualitative data, the POAs and PSW staff perceived improved QOL in residents participating in the MWI. The residents and PSW staff felt that the MWI regularly provided residents with valuable attention, company, and encouragement, and that the person-centered care approach aided in socialization. In particular, POAs valued that the resident spent time with a registered healthcare provider who was well-versed in dementia care and could pay attention to the resident’s individual needs. POAs could also request weekly email updates with photos of the residents enjoying their walks, and these were well received, particular by POAs who were unable to visit regularly. In several instances, family members printed and framed the photos in the resident’s room or in their home. The POAs and PSW staff also agreed that more services that consider the individualized needs of residents would have a beneficial effect on QOL. The MWI protocol provides preliminary evidence to demonstrate the positive effect of person-centered PA interventions in this population.

Exploratory research questions

Adverse events

Before interventions can be applied in clinical practice, an estimate must be made as to whether the benefits outweigh the risk and burden of the intervention. Examining the degree of
risk of injury associated with participating in the intervention by comparing the adverse events in pre-intervention and intervention phase contributes to this important assessment of intervention applicability. Further, to gain a greater sense of the resident profile in this feasibility study, all the adverse events were counted to understand the complex behavioral issues and high level of care required for the enrolled residents.

It is unclear if more risk is involved with participating in PA interventions, as several studies do not failed to report the incidence of adverse events related to the intervention (Eggermont et al., 2009; Littbrand et al., 2006; Tappen et al., 2000) which is a significant measure of intervention applicability (Littbrand et al., 2011). Rolland et al (2007) describe a higher average number of falls, falls related to injury, and hospitalizations per patient in the intervention, but no significant differences between the groups regarding number of fractures or deaths during the one year intervention (Rolland et al., 2007). Other reported adverse events include “serious symptoms” such as chest pain and falls (Littbrand et al., 2006), and strokes during the intervention (Kemoun et al., 2010). In comparison, only one study specifically reported that “no adverse events occurred” during their 12-week PA intervention (Santana-Sosa et al., 2008).

In this study, adverse events were documented throughout the entire study period not just limited to the intervention sessions regardless of the presence of the PI in order to establish a baseline for each resident (ICH, 2004). When comparing the number of events per resident per month, there was a small decrease in the proportion of behavioral events during the intervention phase compared to the pre-intervention phase. Although not significantly different, it could be argued that the small decrease in adverse events and responsive behaviors may be clinically
significant. This presumption is supported by evidence that PA can reduce the frequency of neuropsychiatric disturbances and responsive behaviors (Cancela et al., 2015; Christofoletti et al., 2011). With respect to the total number of adverse events, two variables may have contributed to the number of recorded in this study. First, the enrolled participants were older and more severely impaired than those in other studies meaning that they were more likely to exhibit responsive behaviors in clusters, such as agitation (Morley, 2008), more likely to require physical assistance, and more likely to experience variability in cognitive functioning (Payette et al., 2011). Second, several of the residents had unmanaged pain which may be communicated through disruptive behaviors in cases where it cannot be appropriately verbalized (Ahn & Horgas, 2013). Each responsive behavior would have been documented by a nursing home staff member and tallied into the total number of adverse events. Overall, there was no increased risk of falls despite the presence of several risk factors, such as the use of a walking aid (Deandrea et al., 2013), increased age, and poor cognitive functioning (Kearney et al., 2013b). Given that no injuries or risks were directly or clearly related to the intervention as per the CTCAE classification system (NIH, 2009) it appears the safety of participants was not compromised. The proportion of behavioral events decreased, which suggests that participation in the MWI popes no greater risk of injury than usual care and may positively influence behavioral events, although more research is needed to support this hypothesis.

Environmental trends

Feasibility studies are useful to understand the specific contextual factors that might influence important parameters of an intervention study, such as determining the number of eligible participants available the sample pool and the willingness of clinicians to participate in the intervention (Arain et al., 2010). There were no significant trends between the two homes
regarding intervention feasibility measures despite differences in home size and resources. Both homes provided the PI with one staff member who assisted in recruitment. The staff member from Home 1 was able to dedicate more time to contacting POAs and quickly completing recruitment, an important aspect of a well-designed and efficient clinical trial (Atassi et al., 2013). Home 1 was frequently a research site due to the high volume of residents, and staff members were knowledgeable about obtaining consent. Site selection for future research should consider recruiting homes that conduct more research, since they are more likely to have streamlined processes that can contribute to faster study start-up (Atassi et al., 2013), however researchers should be cautious to not overburden staff.

As more older adults enter nursing homes, increased attention should be given to the nursing home environment and its effect on physical, cognitive, and social outcomes in residents (Slaughter & Morgan, 2012; Wahl & Gitlin, 2003). Residents from the Home 2 with fewer programs experienced greater decline in the pre-intervention phase, although this difference was not significant. The smaller home may have been able to compensate for less programming to ensure the quality of stimulation by having efficient processes in place to maintain awareness and orientation. Both homes had similar physical structures to help support functional abilities that were identified by the PEAP. The environment would be an important consideration when planning a future multisite trial. Studies indicate that the nursing home environment does influence the functional outcomes of residents (Reimer et al., 2004; Kane et al., 2007; Benjamin et al., 2014), to the extent that less supportive and therapeutic nursing home environment could double the risk of walking disability as measured by the PEAP (Slaughter et al., 2011).
Further, the ICF (WHO, 2001) suggests that understanding the physical, social, and organizational aspects of the environment that surrounds residents is useful in identifying aspects that might be amendable to change. The functioning and well-being of nursing home residents with dementia are particularly vulnerable to their physical environment, and outcomes can be improved by modifying the environment to optimize care or intervention uptake (Gitlin, 2006) as well as by taking inventory of existing resources using a tool like the PEAP.

**Study Strengths and Limitations**

This study has limitations. The first limitation is that the sample size of this study may be considered small, however this was a feasibility study with a sample adequate for the primary research questions posed. There was no control group, which limits what can be extrapolated from the data; however, there was a control condition in which the habitual PA in the resident sample was documented. As there was no change in their exposure to PA, except for the MWI, it can be inferred that the level of PA provided by the MWI contributed to the results (Cook & Campbell, 1979). The study was conducted in only two nursing homes meaning that results may not be generalizable to other homes. To further validate the results from this study, a larger multicenter study with a control group is required.

Another limitation of the study was that the inclusion criteria restricted our findings to nursing home residents with the ability to rise from chair and walk for two minutes with or without a gait aid. This means that the frailest residents in the home may not have been included. Furthermore, requiring that residents have a diagnosis of dementia may have excluded many residents who present with behavioral and cognitive signs of dementia but undiagnosed. In order
to include more residents in a larger future trial the MMSE score may be used to determine the severity of CI as in previous studies (Littbrand et al., 2006).

One can question whether 16 weeks of intervention was sufficient time to observe the maximum benefit in the intervention. It is unclear whether the intervention ended before they had reached their full potential. Literature supports a minimum of 16 weeks is required to benefit residents (Littbrand et al., 2010), and the results of this study support this assertion. A future trial should include longitudinal follow up after the intervention to investigate maintenance post-intervention and the long term effects of the individualized PA. For this study, the use of RM-ANOVA was appropriate to explore the efficacy of the MWI in influencing outcome measures over time; however, a future trial with a larger sample size can examine the effect of mediating factors and should use a more robust statistical analysis like generalized estimated equation. Finally, integrating such a person-centered intervention into the current delivery structures of most nursing homes might be problematic given the time and attention needed to deliver the intervention. Consideration of efficient, cost effective implementation in this environment would be required prior to conducting a larger trial.

While the study had limitations, it also had a number of strengths. A sample size calculation was used to ensure that the results would address efficacy of the intervention on the primary functional mobility outcome. Secondly, the participating residents were recruited from more two nursing homes with dissimilar qualities such as size, resources, location, and resident socioeconomic status of, in order to examine the influence of the environment. Thirdly, only the PI delivered the intervention, which ensured consistent delivery of the intervention protocol to the residents and a blinded and trained RA collected all the outcome measures to minimize
experimenter bias. Fourth, a theoretical foundation was used to design the study and identified the relationships between outcome measurements. Fifth, the selected measures were standardized, validated, and responsive, and had been previously used with nursing home residents with dementia. Sixth, although history threats were anticipated in this study, no causes of this threat occurred. For example, there were no changes in the nursing home policies, regulations, executive management or home employees to interrupt current care processes or changes the resident profile of admissions. Accordingly, there would be no reason why residents enrolled earlier on in the study might be different then residents being enrolled later on in the study. Seventh, as this is the first study to combine person-centered care and PA it was important to include multiple perspectives of POAs and PSW staff. Lastly, there was minimal attrition and missing data throughout the study.
Chapter 6: Summary, Study Implications, and Conclusion

Summary

This study determined the feasibility, acceptability, and efficacy of the MWI, a PA intervention that provided an individualized walking regime combined with a person-centered communication care plan, to maintain the functional mobility, ADL function, and QOL of nursing home residents with dementia. The 16 week intervention provided one-on-one walking supervised by an RN between one and four times per week. The exercise prescriptions were individualized to the physical abilities of each resident based on their 2MWT, TUG, and gait speed. The communication care plan outlined interaction and communication strategies that were based on the FLCI, structured interviews with the residents’ POAs and PSW staff, and an observation of the resident which informed the person-centered approach to deliver the intervention. A time-series design was used to identify trends in MWI efficacy related to functional mobility, ADL function, and QOL.

Results of the study indicate that the MWI was feasible and acceptable. Participant recruitment was completed in a timely manner with all eligible residents enrolling into the study and the retention rate was high. The interventionist was able to adhere to the intervention protocol indicating that the intervention could be delivered as designed. Intervention acceptability from the perspectives of the POAs and PSW staff was rated high before the intervention and remained high after the MWI was delivered. Additionally resident adherence was high throughout the intervention to indicate high resident acceptability.

A RM-ANOVA was used to identify trends in MWI efficacy related to functional mobility, ADL function, and QOL by comparing resident data from the two month pre-
intervention phase to the four month intervention phase. In the pre-intervention phase, all the resident outcomes significantly declined; the TUG increased by 4.15 seconds \((P =0.01)\), 2MWT decreased by -5.78 meters \((P = 0.034)\), gait speed decreased by -0.05 meters/second \((P = 0.022)\), ADL function declined \((P = 0.03)\), and QOL was reduced \((P = 0.030)\). During the intervention residents significantly improved in the TUG by 8.58 seconds \((P = 0.000)\), 2MWT increased by 27.47 meters \((P = 0.000)\), gait speed over time increased 0.23 meters/second \((P = 0.000)\), ADL function increased \((P = 0.000)\) and QOL also showed significant improvement \((P = 0.063)\) favouring the intervention. The efficacy findings suggest that walking combined with a person-centered approach may result in improvements in functional mobility measures, ADL function, and QOL of nursing home residents with dementia however a larger trial should be conducted to support this hypothesis.

An examination of the number and severity of adverse events experienced by the residents throughout the study showed that no adverse events were related to the intervention and there was no increased risk to participating in the MWI. There was a slight decrease in the number of events per resident per month during the intervention. Further research should be done to investigate the effects of the MWI on the frequency of responsive behaviors. Lastly, the influence of the environment was assessed as it related to measures of feasibility and outcome measures, and no significant findings were identified.

**Study Implications**

**Research Implications and Areas for Future Research**

The results of this study indicate that the MWI is feasible and acceptable to multiple stakeholder groups related to nursing home residents with dementia. The efficacy results are
promising and suggest that a person-centered approach to deliver PA that is individually tailored to each resident can maintain the functional mobility, ADL function and QOL of this vulnerable population. More research to determine the effectiveness of the MWI in a larger clinical trial is required to further test this hypothesis.

This intervention was delivered solely by the PI, a subsequent study to investigate effectiveness would require training a group of interventionists to deliver the intervention on a larger scale. A future larger trial would not only investigate the effectiveness of the intervention but also determine if it is possible to disseminate the training protocol from this study and scale it for a large sample size with other types of interventionists (e.g. RNs, PSWs, volunteers). The use of individualized dementia specific communication strategies and PA regimes on a larger scale require further investigation. In order to do this, the training of interventionists or the PSW staff to deliver the intervention at different sites is required. Preparing a group of interventionists involves in-depth training about the processes (e.g. screening, assessments, data collection, creating a care plan, applying communication strategies) and rationale of the intervention to ensure that the intervention can be consistently delivered with minimal variation between interventionists (Sidani & Braden, 2011). Research into how the tailoring of a communication plan can be completed in a timely manner on a larger scale is an important consideration to translate this intervention and encourage uptake into practice. To ensure treatment fidelity, the PI can conduct random checks on the interventionists using a checklist to monitor if the intervention protocol is being followed (Sidani & Braden, 2011). Incorrect intervention delivery can dilute true treatment benefits thus reducing overall statistical power leading to a false negative result (DiFrancesco et al.; Sweetman & Doig, 2011). An understanding of protocol deviations rates and identifying any relationships between deviations and study characteristics may enhance the
interpretation of a clinical trial’s results and assist in clarifying issues surrounding feasibility of conducting PA interventions with nursing home residents (de Souto Barreto et al., 2016). Further, it would be important to determine sustainability of the intervention if PSWs on the unit delivered this intervention in every day practice with guidance from a healthcare professional or coordinator who would assist in conducting the assessments, developing the communication plans, and PA regimes. In addition future research could involve determining if volunteers, university students, or family members could assist with outlined PA regimes as it is not known how PSWs could add this activity to their already heavy workloads (Morley, 2014). Volunteer-led exercise interventions (Chen, Li, Chang, Huang, & Cheng, 2015) and interventions that used family members as interventionists have already been conducted and had good adherence.

More research can also be conducted regarding the efficacy of specific dementia care communication strategies. For example, a closer examination of how residents react to various communication strategies (e.g. open ended, close ended or close ended questions), and if certain strategies are more effective with residents who have a specific type of dementia. Being able to compare the resident responses and interactions within the larger sample provides a greater understanding of how to operationalize person-centered care and increases our knowledge of how to effectively communicate with nursing home residents with dementia. Without the ability to effectively communicate and personalize care, performing a regular PA regime with this population may be difficult to actualize.

Another area for future research should explore the influence of the intervention with other subgroups of nursing home residents with dementia. For example applying the MWI to those with vascular dementia whom are likely to decline faster than those with AD (Tolea,
Morris, & Galvin, 2015) or to residents with very low MMSE scores. Two studies indicated that the practicality of implementing interventions for nursing home residents with severe cognitive impairment (e.g. MMSE scores are lower than 10) is challenging with respect to lower resident adherence rates (Cott et al., 2002; Littbrand et al., 2006). Similarly, resident’s physical function or immobility was a main reason why residents were excluded from PA studies. Perhaps a person-centered PA intervention focused on upper-extremity training to maintain or improve handgrip and arm strength which contributes to ADL function (Rogers & Jarrot, 2008) could be piloted. Another area is to investigate the integration of cultural sensitivity to include residents who speak other languages other than English and have multilingual interventionists deliver the intervention. The increasing diversity and acuity of residents who are admitted into LTC requires different PA interventions and strategies to meet the needs of this heterogeneous population especially for residents who are often excluded from PA studies. Research in this area would contribute valuable information on how to tailor PA interventions to meet the cognitive, social and physical needs of these resident profiles.

Lastly, this study did not take other possible mediating factors, like cognition, and moderating factors, like depression, into account. Incorporating mediators and moderators is necessary to get more insight into the mechanism by which PA works to improve outcomes in nursing home residents with dementia (Blankevoort et al., 2010). A future opportunity for research is to investigate if there is a relationship between the applicability of the intervention and the degree of cognitive impairment measured by MMSE scores, and the resident outcomes achieved (Littbrand et al., 2006).
Practice Implications and Recommendations

The results of the pre-intervention phase show significant trends of declining functional mobility, ADL function and QOL during the two month period when residents were receiving usual care. This concerning result emphasizes a clear opportunity to improve the status quo of care in nursing homes and prevent this functional decline and excess disability. Residents spend approximately 75% of their waking time in sedentary activities, more specifically 57% of their time is spent sitting (Ikezoe et al., 2013). The time spent sitting was found to be inversely associated with muscle strength, balance and physical performance of residents whereas weight-bearing activities (e.g. standing, walking) were associated with improved physical fitness (Ikezoe et al., 2013). In a PA study, individuals with dementia who did not perform PA worsened in almost all the variables assessed compared to those in the intervention group (Cancela et al., 2015). Applying a concerted effort to decreasing the level of inactivity throughout the day appears to be an appropriate starting point for practice implications and may pave the way to prevent decline.

One recommendation is for nursing staff to use simple strategies to stimulate residents to move (de Souto Barreto et al., 2016), such as walking ambulatory residents to the dining hall rather than using a wheelchair, in order to integrate more PA into residents’ daily routines. Walking as a PA is inexpensive, readily available, requires no equipment, and utilizes procedural memory so even residents who are severely cognitively impaired are able to participate. In this study, the PI would incorporate walks to the dining hall into the walking sessions for those residents who were physically incapable of walking far distances. This strategy was effective to build a rapport with the resident as well as gradually introduce PA into their routine before slowly increasing the dosage of PA. Another quasi-experimental study by Slaughter and
Estabrooks (2013) showed that having residents stand up and sit down as many times as possible twice a day improved residents' functional fitness. This practice recommendation to use simple strategies to increase PA is consistent with the IAGG (2016) who suggest that nursing home staff should aim to provide short (2–5 minutes) periods of PA two to three times a day to break up the sedentary time spent sitting or lying down. Attention to newly admitted residents is of particular concern as they are at higher risk of falls and injury. To mitigate this risk, PA should be encouraged early after admission into the home.

Another recommendation is to increase funding for PT, restorative care, and activationists who are primarily responsible for promoting PA in nursing homes so routine care includes more of these services. Between 63.7% and 88.6% of residents do not receive PT or OT in the nursing home (McArthur et al., 2015), and those with cognitive impairment are less likely to be seen by PT due to a decreased potential of physical improvement (McArthur et al., 2015). Another recent study showed that only 10% of residents participate in exercise twice a week (De Souto Barreto, Demougeot, Vellas, & Rolland, 2015). The study by McArthur and colleagues used data prior to July 2013; however, in August 2013 there was a reduction to the funding package allocated to physiotherapy in Ontario nursing homes so the percentage of residents who do not receive PT or OT is likely to have increased. Practice implications should include decision makers and policymakers examining what is driving these patterns of services to determine whether the resources available are appropriate, and address the most appropriate goals for residents in LTC (McArthur et al., 2015). Besides funding these healthcare providers, funding for new clinical positions like physical health nurse consultants (Happell, Wilson, Platania-Phung, & Stanton, 2016) or volunteer coordinators are required to provide the human resources to change practice and increase PA for nursing home residents. Nursing home staff often depend
on visitors or the POAs to provide leisure activities to the resident, however, staff should consider the experiences of overburden in adult children who may be unable to visit three times a week to walk the resident to the dining hall. The POAs enrolled in this study were mostly the daughters of the residents and are quickly becoming the main collateral to many nursing home residents (Lopez Hartmann et al., 2016). They make up the bulk of the “sandwich generation”, informal caregivers who are responsible for their ageing parents as well as their own children, and have considerable and demanding stressors (Barker, Minns Lowe, & Toye, 2016; O’Sullivan, 2015).

Evidence surrounding the characteristics of effective physical exercise interventions in terms of exercise type, intensity, duration, and frequency remains limited (Cai & Abrahamson, 2016). The results of this study begin to address this knowledge gap by demonstrating that the process of providing individualized PA that is person-centered to residents is feasible and acceptable. The person-centered aspect of the MWI highlighted the importance of promoting residents' personhood and effective communication, factors that are increased when taking into account residents' list history, motivation, goals, preferences, beliefs, and attitudes. The IAGG (de Souto Barreto et al., 2016) also identify resident’s motivation and pleasure must be taken into consideration for the successful implementation of daily PA for nursing home residents with dementia. Applying a person-centered approach is a reasonable solution because nursing home residents with dementia are a heterogeneous group and a single PA prescription is unlikely to fit the desires and needs of all nursing home residents given their different levels of cognitive impairment, multi-morbidities, and physical abilities (de Souto Barreto et al., 2016). There is no “one size fits all” regime for this complex population, but rather a spectrum of exercise types, intensities, durations, and frequencies based on the individuals’ needs and capabilities. The
translation of this knowledge into practice is facilitated by the application of standardized, reliable and validated clinical assessments and performance measures that are practical and relevant to inform the PA regime and evaluation of the regime.

Another recommendation based on this study’s findings is that nursing home residents with dementia can be adherent to a PA intervention and that shorter PA programs are not necessary. Often, nursing homes provide PA programs with a reduced duration for those with dementia because of challenges with responsive behaviors and adherence rates, however this reduces the amount of PA they receive. There’s no evidence to support that shorter PA interventions should be used for residents with dementia as the likelihood that an improvement in agitation, ADL function, and functional mobility would be seen diminishes with the shortening of the program length (Aman & Thomas, 2009). Increasing the amount of PA being delivered in usual care is especially important for older adults with dementia because they experience a steeper decline in ADL function (Rajan et al., 2012), physical, mobility, and cognitive functions as the dementia advances (Tolea et al., 2015). Exposure to regular PA can counteract this decline and is important to maintain independence in ADLs and mobility. The findings of this study show that a tailored and individualized walking intervention PA intervention may benefit nursing home residents with dementia.

Because excess disability of nursing home residents with dementia places a heavy burden on the Canadian health care system (Alzheimer Society of Canada, 2010), there are significant benefits to increasing the amount of PA, decreasing sedentary activities, improving access to physiotherapy, and applying person-centered care to improve functional mobility, ADL function and ultimately QOL.
Conclusion

This study determined the feasibility, acceptability and efficacy of a multifaceted walking intervention to maintain the functional mobility, ADL function, and QOL of nursing homes residents with dementia. The results of this study suggest that the MWI is feasible, acceptable, and may have a therapeutic benefit to maintain functional mobility, ADL function and QOL of nursing home residents with dementia. Findings from this study will inform the conduction of a larger trial to determine the effectiveness of the MWI. As the first study to apply the ICF to combine person-centered approaches and PA, the results of this study contribute new knowledge about how the operationalization and application of person-centered care can optimize the delivery of PA for nursing homes residents with dementia in order to maintain functional mobility, ADL function, and QOL. Understanding how to effectively deliver PA to nursing home residents with dementia can have beneficial effects to improve the functional capacity of residents and plays a crucial role in the therapeutic management of dementia by delaying the loss of functional independence. Maintenance of functional abilities is the key to preserving QOL in this vulnerable population.
References


McGilton, K. S., Davis, A., Mahomed, N., Flannery, J., Jaglal, S., Cott, C., … Rochon, E.


Murray, A. (2001). Environmental characteristics and staff ratings of newer and older special care units for dementia in British Columbia. SIMON FRASER UNIVERSITY.


Pollak, N., Rheault, W., & Stoecker, J. L. (1996). Reliability and validity of the FIM for persons...


### Appendix A

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Relevance to project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptability</td>
<td>Refers to the views, perceptions, and judgments of those participating in the intervention to address the problem, like the residents, families, staff (Sidani &amp; Braden, 2011). Assessed at time of consent to study, prior to exposure to intervention, and again at the end of the intervention. Acceptability is based on several factors: appropriateness to address problem, convenience of the intervention, perception of effectiveness of the intervention, level of risk involved and extent to which they are willing to adhere (Carter, 2007; Sidani &amp; Braden, 2011, p.167).</td>
<td>Acceptability is important to the uptake, application, adherence and fidelity of the intervention (Sidani &amp; Braden, 2011). Most appropriate evaluation method is to assess acceptability towards the intervention with a self-report questionnaire (Sidani &amp; Braden, 2011, p. 176). The Treatment Evaluation Inventory survey will be provided to nursing staff and families. Resident adherence to the intervention will be used to measure resident acceptability.</td>
</tr>
<tr>
<td>Activities of daily living</td>
<td>These ability to perform the everyday personal care activities that are fundamental to caring for oneself and maintaining independence, toileting, bathing, dressing, mobility/transferring, and eating.</td>
<td>This is a resident outcome measure for the study. It will be measured using the Functional Independence Measure. Conceptually, an increase in functional mobility should increase one’s ability to perform ADLs.</td>
</tr>
<tr>
<td>ADL function loss</td>
<td>Described as a loss of independence in ADLs or as a deterioration in self-care skills (toileting, bathing, transferring, dressing, eating, continence) (Hoogerduijn, 2007). In the literature, a range of terms is used to describe ADL function loss: ADL functional decline, functional decline, loss of function, ADL decline, declining function, status decline, ADL status decline, functional impairment, functional disability and functional limitations.</td>
<td>ADL function loss is a consequence of immobility/impaired mobility, and increases resident dependency on others because they are unable to perform ADLs independently. Thus ADL function loss directly reduces resident QOL.</td>
</tr>
<tr>
<td>Adherence</td>
<td>Adherence refers to the extent to which the interventions and participants follow the intervention as designed (Sidani &amp; Braden, 2011).</td>
<td>Maintaining intervention adherence is important in producing the intended outcomes.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
<td>Relevance to project</td>
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<tr>
<td>Efficacy</td>
<td>Efficacy refers to demonstrating the causal relationships between the intervention and the hypothesized outcomes (Sidani &amp; Braden, 2011). Efficacy is different from effectiveness. Effectiveness refers to the replication of the causal effects in “the real world” (clinical practice contexts) that would implement the intervention, notably these contexts include the variability of interventionists/healthcare practitioners.</td>
<td>A causal relationship implies that the intervention’s components are responsible in producing improvement (Sidani &amp; Braden, 2011). Efficacy should be determined prior to conducting larger trials to determine effectiveness.</td>
</tr>
<tr>
<td>Exercise</td>
<td>A subset of physical activity defined as planned, structured, and repetitive bodily movement (e.g. weight lifting) done to improve or maintain one or more components of physical fitness (e.g. flexibility, endurance) (Pate et al., 1995).</td>
<td>The term “exercise” is not used as the intervention term in this study because it is too specific as per the definition, and does not include the concept of function in daily life.</td>
</tr>
<tr>
<td>Feasibility</td>
<td>Refers to the logistics and practicality of applying the intervention in the setting. This refers to the adequacy of logistics, resources, and procedures required to deliver the intervention (Sidani &amp; Braden, 2011). The feasibility of an intervention is intertwined with the adherence of the intervention.</td>
<td>Challenges in implementing the intervention negatively affect the overall fidelity of the intervention, and consequently reduces the effect on outcome measures (Sidani &amp; Braden, 2011). In this study feasibility was measured by 1) recruitment of residents, 2) retention of residents throughout the study, and 3) interventionist adherence to the</td>
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<td>Term</td>
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<td>Relevance to project</td>
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<tr>
<td>Functional ambulation</td>
<td>Refers to the ability to execute safe, efficient walking (with or without a gait aid) within the environmental constraints encountered in everyday life (Nelson, Certo, Lembo, &amp; Lopez, 1999). This term is most frequently used in stroke rehabilitation literature.</td>
<td>This term will not be used because it appears primarily in the stroke literature (Stroke Engine, 2000), and does not explicitly encapsulate the idea of function/ADLs.</td>
</tr>
<tr>
<td>Functional mobility</td>
<td><em>Functional mobility</em> refers to ambulation (e.g. walking from one place to another), and transferring (e.g. from bed or chair to toilet, bath bench, shower chair, sitting position to standing position) (DeLisa, 2004). Functional mobility refers to the mobility required to perform ADLs. There are various degrees of functional mobility based on the individual’s level of independence with each. This term is from physiotherapy and rehabilitation literature.</td>
<td>This is a resident outcome in the study. It will be measured by valid and reliable performance measures that are responsive to change and have a clinical mean difference: the 2 Minute Walk Test and the Timed-Get-Up-and-Go.</td>
</tr>
<tr>
<td>Gait aid</td>
<td>An assistive device intended to support the ambulation (cane) or mobility (wheelchair) of an individual in daily life. This excludes rehabilitation devices like high-top standing walkers.</td>
<td>The explicit definition will ensure that participants with the appropriate level of functional mobility are included. The care plan will identify the participant’s gait aid, and participants will be using the same level of gait aid equipment to reduce the baseline variance of physical ability (e.g. cane, walker, 2 wheel walker, 4 wheel walker).</td>
</tr>
<tr>
<td>Interventionist adherence</td>
<td>Adherence and competent delivery of the intervention as set forth in the research plan/ intervention protocol (Santacroce, Maccarelli, &amp; Grey, 2004). Also referred to as Treatment fidelity in other texts</td>
<td>Monitoring intervention adherence is important to ensure that the intervention is delivered as intended by the interventionist in order to reach valid conclusions about the intervention (Sidani &amp; Braden, 2011). This is best done by providing a clear manual, random observation by the Principal Investigator</td>
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<td>Term</td>
<td>Definition</td>
<td>Relevance to project</td>
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<tr>
<td>Mobility</td>
<td>“Moving by changing body position or location or by transferring from one place to another, by carrying, moving or manipulating objects, by walking, running or climbing, and by using various forms of transportation” (WHO, 2010).</td>
<td>Mobility is a broad and general term as defined. Functional mobility is distinct from this because it refers specifically to the ability to walk within a particular context or environment (e.g. transferring, within the room to the bathroom, or to the dining room in the nursing home).</td>
</tr>
<tr>
<td>Neuropsychology</td>
<td>Refers to a clinical field that studies the structure and function of the brain as they relate to psychological processes and behaviours.</td>
<td>Important for caregivers to know how the etiology and pathology of the disease influences psychological processes and behaviours in order to address and compensate for deficits</td>
</tr>
<tr>
<td>Nursing home</td>
<td>In the province of Ontario nursing homes can be referred to as Nursing Homes, Long-term Care Homes, or Homes for the Aged. The Ministry of Health and Long-term Care, defines a nursing home as “a home-like facility that provides care and services for people who no longer are able to live independently or who require onsite nursing care, 24 hour supervision, or personal support.” Nursing home residents have higher care needs compared to retirement home residents.</td>
<td>The setting of this study.</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Any bodily movement produced by contraction of skeletal muscles that result in energy expenditure (Pate et al., 1995). Physical activity in daily life can be categorized into occupational, sports, conditioning, household, or other leisure activities.</td>
<td>A broader term that encompasses exercise.</td>
</tr>
<tr>
<td>Quality of Life (QOL)</td>
<td>QOL is defined as “individuals’ perceptions of their position in life in the...”</td>
<td>This is the definition of QOL that will be used in this study.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
<td>Relevance to project</td>
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<tr>
<td></td>
<td>context of the culture and value system in which they live, and in relationship to their goals, expectations and standard” (WHO, 1994, p. 28).</td>
<td></td>
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<tr>
<td>QOL</td>
<td>QOL can be broken down into four core life domains which are identified in the ICF: physical, psychological, social relationships, and environmental (McDougall et al., 2010).</td>
<td></td>
</tr>
<tr>
<td>Responsive behaviours</td>
<td>Conventionally referred to in the medical literature as Behavioural and Psychosocial Symptoms of dementia (BPSD) which includes disruptive behaviours such as agitation, aggression, yelling, hitting, and moaning. Traditional approaches to BPSD target the symptoms, for example, with restraints or sedatives to controlling and containing behaviours (Edvardsson, Winblad, &amp; Sandman, 2008), which not only prevents the person from expressing themselves, but also does not focus on the underlying cause. These behaviours are also difficult to manage for caregivers and cause stress and burnout. BPSD are reframed with person-centered care as responsive behaviours (PCC). In PCC there is active exploration, usually through observation of the person as they interact in the social world, in order to ascertain triggers for agitation, aggression and signs of unmet needs. These observations are informed both by the immediate circumstances, including how care staff are responding, and by the personhood and biography of the person with dementia (Stein-Parbury et al., 2012).</td>
<td>PCC operates from a perspective that such behaviours are a result of interaction with the world and indicates unmet needs, like thirst, hunger, or distress, such as feelings of frustration or anxiety. Responsive behaviours are managed by having an understanding of who the person is, collaborating with their family/POAs or nursing staff who work with them the most, and understanding the resident’s biography. The care plan will outline these aspects and ways to manage or interpret the responsive behaviours.</td>
</tr>
<tr>
<td>Risk</td>
<td>The risks, adverse effects or events that are related to the intervention exposure</td>
<td>Risks of the intervention (such as adverse events) should be</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
<td>Relevance to project</td>
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<tr>
<td>Term</td>
<td>Definition</td>
<td>Relevance to project</td>
</tr>
<tr>
<td>variable that may cause harm to the participant (Sidani &amp; Braden, 2011; Guyatt et al., 2008).</td>
<td>considered when examining efficacy of an intervention (Sidani &amp; Braden, 2011; Guyatt et al., 2008).</td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Broadly conceptualized as the reaction of the client/interventionist, families, and staff to the intervention procedures, research process, and outcomes (Sidani &amp; Braden, 2011). Satisfaction is assessed after receiving the intervention to reflect the experience of the intervention, and continuation of the intervention is considered a behavioural consequence of satisfaction (Sidani &amp; Braden, 2011, p. 166).</td>
<td>Often referred to or used to replace the concept of acceptability in literature. Despite the overlap with acceptability, Sidani and Braden (2011) consider it a distinct concept.</td>
</tr>
</tbody>
</table>
Appendix B

Organization and definitions of memory systems

Long term memory

Explicit memory
  - Episodic memory
  - Semantic memory

Implicit memory
  - Procedural memory

Short term memory
  - Working memory
### Memory systems and the affected brain regions.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Types of memory</th>
<th>Brain regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explicit memory:</td>
<td>Episodic memory: involves remembering specific information like events or episodes in one’s life. These memories are linked to a particular context, such as a time and place. Episodic memory is used for more personal memories, such as the sensations, emotions, and personal associations of a particular place or time.</td>
<td>frontal cortex</td>
</tr>
<tr>
<td></td>
<td>Semantic memory: involves remembering facts, knowledge that is independent of context and unrelated to a specific time or place. Includes the encoding of abstract knowledge about the world (e.g. &quot;Ottawa is the capital of Canada&quot;).</td>
<td>parietal cortex</td>
</tr>
<tr>
<td></td>
<td>Short-term memory: the memory system that holds a small amount of information for a short period of time (seconds). Does not involve manipulation or organization of material. Supports the ability to work with information for a short time period, as when between tasks.</td>
<td>anterior cingulated</td>
</tr>
<tr>
<td></td>
<td>Working memory: the memory system that actively holds information in the mind “online” to be used so it is readily available for information processing/manipulation or to complete a task (e.g. doing mental math)</td>
<td>parts of the basal ganglia</td>
</tr>
<tr>
<td>Implicit memory:</td>
<td>Procedural memory: involves motor memory that is not based on the conscious recall of information, but on motor skills; used to execute integrated procedures that involves cognitive and motor skills (e.g. walking, riding a bike, reading). Procedural memory is a type of long-term memory</td>
<td>cerebellum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>basal ganglia</td>
</tr>
</tbody>
</table>
the task without explicitly recalling the previous experience (Schacter, 1987). Implicit memory is also often developed for life-long entrenched habits or after the action has been repeated over a long period of time. Also described as “Knowing how” (Shepard, 1988. p. 610).
## Appendix C

### Person-centered care definitions

<table>
<thead>
<tr>
<th>Author</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institute of Medicine (2001)</td>
<td>“Care that is respectful and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions” (p. 49).</td>
</tr>
<tr>
<td>Suhonen, Välimäki, &amp; Leino-Kilpi (2002)</td>
<td>“Comprehensive care that meets each patient’s physical, psychological, and social needs” (p. 646).</td>
</tr>
<tr>
<td>McCormack (2004)</td>
<td>“The formation of a therapeutic narrative between professional and patient that is built on mutual trust, understanding and a sharing of collective knowledge” (p. 203).</td>
</tr>
<tr>
<td>Health Information and Quality Authority [HIQA] (2009)</td>
<td>“A term applied to the ethos adopted by facilities which seek to tailor their services to the particular needs of individual residents. It also describes an open, listening and empathetic communication approach which fosters wellbeing, rehabilitation and healing” (p. 76).</td>
</tr>
<tr>
<td>Morgan &amp; Yoder (2012)</td>
<td>“A holistic (bio-psychosocial-spiritual) approach to delivering care that is respectful and individualized, allowing negotiation of care, and offering choice through a therapeutic relationship where persons are empowered to be involved in health decisions at whatever level is desired by that individual who is receiving the care” (p.8).</td>
</tr>
</tbody>
</table>
Appendix D

Verbal communication strategies

A variety of clinically recommended verbal communication strategies for individuals with AD:

- verbatim repetition - syntax need not always be overly simplified and that repetition should not be limited to only verbatim repetition. (Small, Kemper et al., 1997)
- closed-ended questions (yes/no response to question)
- simple sentences/ reduced syntactic complexity - sentence comprehension by individuals with AD was related to the number of propositions in the sentence (i.e., better comprehension associated with fewer propositions) (Rochon, Waters, & Caplan, 1994, 2000)
- asking one question or giving one direction at a time
- minimal use of pronouns
- Verifying
- Reformulating
- Giving a choice of responses
- Speaking very loudly
- Use the person’s name when addressing them to help them retain a sense of identity.

Note:

- Keep in mind para-verbally, the tone, pacing, and volume of voice (“as much about how you say it, as what you say”). Remain calm and still and speak in a relaxed tone of voice to put them at ease.
- Avoid phrases that can be interpreted literally, such as “up to my eyeballs” which might be confusing.
- Avoid using childish or “elder” talk or any demeaning language.
- Try not to interrupt the person even if you think you know what they are saying. If the person is having difficulty finding the right words, you can offer a guess as long as they appear to want some help.
- If they are having trouble communicating, tell them that it's fine and encourage them to keep trying to put their thoughts into words (ASC, 2010)
- slowed speech rate - slowing of speech fail to improve comprehension of sentences, it was counterproductive given that individuals with AD have deficits in working memory (Tomoeda, Bayles, Boone, & Kaszniak, 1990).
References:

Alzheimer Society of Canada, 2010. [http://www.alzheimer.ca/~media/Files/national/Tipsheets/tipsheet_communication_caregivers_2010_e.ashx](http://www.alzheimer.ca/~media/Files/national/Tipsheets/tipsheet_communication_caregivers_2010_e.ashx)


Appendix D (cont)

Non-verbal communication strategies

- Make sure that the person is wearing a working hearing aid and/or glasses
- Establishing eye contact
- Sitting face-to-face
- Sit or stand close enough that they can see your facial expressions
- Using gestures to help explain commands
- Using a calm tone of voice, using instrumental touch to guide a person through tasks
- Using overemphasis and exaggerated facial expression
- Reduce distractions in the environment
- Giving the resident time to respond as they may need more time to process the information
- Approaching the person slowly and from the front showed the strongest correlations.
- Gentle touch
- Demonstrating (for example, demonstrating an action to help the person understand what you are saying)
- Pointing (Use actions as well as words. For example, if it is time to go for a walk, point to the door or bring the person's coat or sweater to illustrate what you mean)
- Using writing or drawing
- Calming the resident
- Being very attentive

Note:

Avoid brisk or hurried movement, as well as a sharp tone or raised voice as they may cause distress.
References:


Appendix E
Summary of Study Measures

<table>
<thead>
<tr>
<th>FEASIBILITY</th>
<th>DATA SOURCE</th>
<th>MEASUREMENT</th>
<th># ITEMS RESIDENT (OR POA PROXY)</th>
<th># ITEMS RESIDENT'S POA</th>
<th># ITEMS STAFF</th>
<th># ITEMS INTERVENTIONISTS</th>
<th>Measurement times</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Baseline</td>
<td>End of control/beginning of intervention</td>
<td>Mid-intervention</td>
<td>Post-intervention</td>
<td></td>
</tr>
<tr>
<td>Interventionist adherence to the intervention protocol</td>
<td>PI evaluation</td>
<td>Interventionist log: Documentation or Direct observation by PI</td>
<td>64 (4X 16wks)</td>
<td>x*</td>
<td>x*</td>
<td>x*</td>
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</tr>
<tr>
<td>Resident adherence to the intervention</td>
<td>PI evaluation</td>
<td>Interventionist log</td>
<td>64</td>
<td>x*</td>
<td>x*</td>
<td>x*</td>
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<tr>
<td>Environmental evaluation</td>
<td>PI evaluation</td>
<td>PEAP</td>
<td>9</td>
<td>x*</td>
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<tr>
<td>Recruitment of residents and their POAs</td>
<td>PI evaluation</td>
<td>Documentation</td>
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<tr>
<td>Retention rate of residents, POAs, and PSWs throughout the study</td>
<td>PI evaluation</td>
<td>Documentation</td>
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<td>x*</td>
<td>x*</td>
<td>x*</td>
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</table>

<table>
<thead>
<tr>
<th>ACCEPTABILITY</th>
<th>DATA SOURCE</th>
<th>MEASUREMENT</th>
<th># ITEMS RESIDENT (OR POA PROXY)</th>
<th># ITEMS RESIDENT'S POA</th>
<th># ITEMS STAFF</th>
<th># ITEMS INTERVENTIONISTS</th>
<th>Measurement times</th>
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<td>Baseline</td>
<td>End of control/beginning of intervention</td>
<td>Mid-intervention</td>
<td>Post-intervention</td>
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</tr>
<tr>
<td>Acceptability of the resident</td>
<td>Resident</td>
<td>Adherence to intervention from the Interventionist</td>
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<tr>
<td><strong>Acceptability of the residents’ POAs</strong></td>
<td><strong>Acceptability of the PSW staff</strong></td>
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<tr>
<td>Resident’s POA</td>
<td>PSW staff</td>
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### INTERNATIONAL CLASSIFICATION OF FUNCTION

<table>
<thead>
<tr>
<th><strong>CONSTRUCT</strong></th>
<th><strong>DATA SOURCE</strong></th>
<th><strong>MEASUREMENT</strong></th>
<th># ITEMS RESIDENT (OR POA PROXY)</th>
<th># ITEMS RESIDENT’S FAMILY</th>
<th># ITEMS STAFF</th>
<th># ITEMS INTERVENTIONISTS</th>
<th>Baseline</th>
<th>End of control/beginning of intervention</th>
<th>Mid-intervention</th>
<th>Post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Person - Resident</strong></td>
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<tr>
<td>Demographic information and other covariates</td>
<td>Resident’s chart</td>
<td>As per protocol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personhood (who they are, communication strategies that are effective)</td>
<td>interview with POA or PSW staff</td>
<td>Interview Developed by PI</td>
<td>20 (30 minutes)</td>
<td>20 (30 minutes)</td>
<td></td>
<td></td>
<td></td>
<td>x*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication abilities</td>
<td>Resident + Resident observation</td>
<td>FLCI</td>
<td>32 (20-30 minutes)</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Disease</strong></td>
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<td></td>
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</tr>
<tr>
<td>Severity of dementia</td>
<td>Resident</td>
<td>MMSE</td>
<td>11 (5-10 minutes)</td>
<td></td>
<td>x*</td>
<td>x*</td>
<td></td>
<td></td>
<td>x*</td>
<td></td>
</tr>
<tr>
<td><strong>Activity: physical Mobility</strong></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Resident’s functional mobility</td>
<td>Resident</td>
<td>Timed up and go</td>
<td>5mins</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Resident’s functional mobility</td>
<td>Resident</td>
<td>2 minute walk test</td>
<td>2mins</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Resident’s physical mobility</td>
<td>Resident</td>
<td>Gait speed</td>
<td>2mins</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td><strong>Participation –</strong></td>
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</tr>
<tr>
<td>Resident’s participation in</td>
<td>Resident (if not possible OR staff proxy)</td>
<td>FIM</td>
<td>observatio n</td>
<td>18 (10 minutes)</td>
<td>18 (10 minutes)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>ADL function</td>
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<tr>
<td><strong>Environment</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapeutic environment</td>
<td>PI evaluation (executive staff input)</td>
<td>PEAP</td>
<td></td>
<td>9 (10 minutes)</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Quality of life</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resident’s Quality of Life</td>
<td>PSW staff input</td>
<td>ADRQL</td>
<td></td>
<td>30 (10-15 minutes)</td>
<td>30 (10-15 minutes)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>
| Depression                  | PSW staff | CSDD       | 19 (10-15 minutes) | 19 (10-15 minutes) | x* |   |   | x
| **Total # of questions asked** | 58 | 53 | 111 | 143 |
| **Total respondent time burden** | 40 min for the resident (MMSE, FLCI); 10 min physical tests and FIM observatio n | 50 mins for POAs (plus an additional 30 min interview) | 50-60 mins for staff | 143 min for the interventionist |

*= update as necessary throughout the baseline and intervention period
* This total represents the maximum number of items asked, e.g. accounts for all the items even though many tools can be asked of either POAs or staff. Note: the response time burden is the maximum time required (e.g. answering questions will take staff no more than 52 minutes
## Appendix F

**Total burden on data source at each data collection time**

<table>
<thead>
<tr>
<th>Information source</th>
<th>Total burden at Baseline (T1)</th>
<th>Total burden at end of baseline/start of intervention (T2)</th>
<th>Total burden at mid-intervention (T3)</th>
<th>Total burden at post-intervention (T4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resident</td>
<td>• 10 minutes of physical tests</td>
<td>• 10 minutes of physical tests</td>
<td>• 10 minutes of physical tests</td>
<td>• 10 minutes of physical tests</td>
</tr>
<tr>
<td></td>
<td>• 43 questions (MMSE (11),</td>
<td>• 43 questions (MMSE (11), FICL (32))</td>
<td></td>
<td>• 11 questions (MMSE(11) )</td>
</tr>
<tr>
<td></td>
<td>FICL (32))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POAs</td>
<td>• 102 questions (questionnaire</td>
<td>• 48 questions (FIM (18); ADRQL(30))</td>
<td>• 48 questions (FIM (18); ADRQL(30))</td>
<td>• 82 questions (TEI (15), FIM (18),</td>
</tr>
<tr>
<td></td>
<td>(20), TEI (15), FIM (18), CSDD</td>
<td></td>
<td></td>
<td>CSDD (19), ADRQL(30) )</td>
</tr>
<tr>
<td></td>
<td>(19), ADRQL(30))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Reporting about adverse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>events (as necessary)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSW Staff</td>
<td>• 102 questions (questionnaire</td>
<td>• 82 questions (TEI (15), FIM (18), CSDD (19), ADRQL(30)</td>
<td>• 82 questions (TEI (15), FIM (18),</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(20), TEI (15), FIM (18), CSDD</td>
<td></td>
<td>CSDD (19), ADRQL(30) )</td>
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</tr>
<tr>
<td></td>
<td>(19), ADRQL(30))</td>
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<tr>
<td></td>
<td>• Reporting about adverse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>events (as necessary)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PI/interventionist</td>
<td>• Chart review</td>
<td>• Complete care plan</td>
<td>• Continually updating care plan</td>
<td>• Retention rates</td>
</tr>
<tr>
<td></td>
<td>• PEAP (9)</td>
<td>• Interventionist log</td>
<td>• Interventionist log</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Recruitment rate and time</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Numbers in parenthesis indicate the number of items in the tool*
Appendix G

Cornell Scale for Depression in Dementia

Participant ID: __________________________ Date: _____________

| Scoring System:                                                                 |
| A = unable to evaluate | 0 = absent | 1 = mild or intermittent | 2 = severe |

Ratings should be based on symptoms and signs occurring during the week prior to interview. No score should be given in symptoms result from physical disability or illness.

A. Mood-Related Signs

1. Anxiety: anxious expression, ruminations, worrying a 0 1 2

2. Sadness: sad expression, sad voice, tearfulness a 0 1 2

3. Lack of reactivity to pleasant events a 0 1 2

4. Irritability: easily annoyed, short-tempered a 0 1 2

   Score = /8

B. Behavioural Disturbance

5. Agitation: restlessness, handwringing, hair-pulling a 0 1 2

6. Retardation: slow movement, slow speech, slow reactions a 0 1 2

7. Multiple physical complaints (score 0 if GI symptoms only) a 0 1 2

   Score = /8
8. Loss of interest: less involved in usual activities (score only if change occurred acutely, i.e. in less than 1 month) a 0 1 2

C. Physical Signs

9. Appetite loss: eating less than usual a 0 1 2

10. Weight loss (score 2 if greater than 5 lb. in 1 month) a 0 1 2

11. Lack of energy: fatigues easily, unable to sustain activities (score only if change occurred acutely, i.e., in less than 1 month) a 0 1 2

Score = /6

D. Cyclic Functions

12. Diurnal variation of mood: symptoms worse in the morning a 0 1 2

13. Difficulty falling asleep: later than usual for this individual a 0 1 2

14. Multiple awakenings during sleep a 0 1 2

15. Early morning awakening: earlier than usual for this individual a 0 1 2

Score = /8

E. Ideational Disturbance

16. Suicide: feels life is not worth living, has suicidal wishes/suicide attempt a 0 1 2

17. Poor self-esteem: self-blame, self-deprecation, feelings of failure a 0 1 2

18. Pessimism: anticipation of the worst a 0 1 2

Score = /8

19. Mood congruent delusions: delusions of poverty, illness, or loss a 0 1 2

TOTAL SCORE = /38
Appendix H

Timed Up and Go (TUG) Test

**Equipment needed:** arm chair, tape measure, tape, stop watch.

1. Begin the test with the subject sitting correctly in a chair with arms (48 cm height, horizontal flat seat with stationary armrests), the subject’s back should resting on the back of the chair. The chair should be stable and positioned such that it will not move when the subject moves from sitting to standing.

2. Place a piece of tape or other marker on the floor 3 meters away from the chair so that it is easily seen by the subject.

3. Verbal instructions: “On the word **GO** you will stand up, walk to the line on the floor, turn around and walk back to the chair and sit down. Walk at your regular pace.” Demonstrate the TUG to the participant during the instructions to compensate for their cognitive impairment.

4. Once the participant is sitting, start timing on the word “**GO**” and stop timing when the subject is seated again correctly in the chair with their back resting on the back of the chair.

5. Record information on the TUG record

**NOTE:**

- The subject wears their regular nonslip footwear, may use any gait aid that they normally use during ambulation, but may not be assisted by another person. There is no time limit. They may stop and rest (but not sit down) if they need to.

- The subject should be given a practice trial that is not timed before testing.

**SCORING** (Podsiadlo & Richardson, 1991; Shumway-Cook, Brauer, & Woollacott, 2000):

Results correlate with gait speed, balance, functional level, the ability to go out, and can follow change over time.

Normal healthy elderly usually complete the task in ten seconds or less. Very frail or weak elderly with poor mobility may take 2 minutes or more. A score of more than or equal to fourteen seconds has been shown to indicate high risk of falls.

**Interpretation:**

- < 10 seconds = normal
- < 20 seconds = good mobility, can go out alone, mobile without a gait aid.
- < 30 seconds = problems, cannot go outside alone, requires a gait aid.
Appendix H (cont)

Timed Up and Go Record

<table>
<thead>
<tr>
<th>Time to Complete TUG Test</th>
<th>Gait Aid Used</th>
<th>Difficulties Identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 (practice):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>_____ seconds</td>
<td>Cane</td>
<td>Getting out of the chair:</td>
</tr>
<tr>
<td></td>
<td>Two canes</td>
<td>Walking:</td>
</tr>
<tr>
<td></td>
<td>4-Wheeled walker</td>
<td>Turning:</td>
</tr>
<tr>
<td></td>
<td>2-Wheeled walker</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solid walker</td>
<td>Sitting down:</td>
</tr>
<tr>
<td></td>
<td>No mobility aid</td>
<td></td>
</tr>
</tbody>
</table>

Note: Observe the patient’s postural stability, gait, short stride length, and sway, slow tentative pace, loss of balance, little to no arm swing, improper use of the gait aid, shuffling.
Appendix I

2 Minute Walk Test Protocol

**Purpose:** To find out how far the participant can walk in two minutes

**Environment:** A quite well lit hallway with minimal distractions. Place a piece of tape on the ground at the start of the hallway, and another at the end of the hallway. Document the distance between the two points.

**Equipment:** digital stop watch, calibrated wheel measure

**Instructions:**

1. Ensure the participant is wearing proper footwear, glasses and/or hearing aids, and has their gait aid.

2. If patient has lung disease - Record patient’s HR and oxygen saturation with a pulse oximeter prior to the start of the test.

3. Read the instructions to the client

   “I want to see how far you can walk in 2 minutes. Start here and walk until I say “stop”. Walk at your own pace and I will follow you. Try not to talk, unless you have to. If you get tired and want to rest during the test, you can stop. Ready? Start walking.”

4. Have the patient walk down the hallway and make a U-turn when they reach the end of the hallway, continue to walk until 2-minutes is over. Do NOT provide verbal encouragement during the two minutes. Instructions may be repeated in an objective
manner. If the patient has lung disease - record patient’s HR and oxygen saturation with a pulse oximeter and BORG RPE immediately after the test.

5. Have the resident first complete a practice trial, and then repeat the test. Only use the second measure.
Appendix I (cont)

2 Minute Walk Test Documentation

Participant code: ___________________ Date: ___________________

☐ Baseline (T1)  ☐ Pre-MWI (T2)  ☐ mid-MWI (T3)  ☐ Post-MWI (T4)

Prior to 2MW test (if lung disease present):

Resting heart rate: ________________  Resting O2 sat.: ________________

After 2MW test or at stop

1. Distance walked in practice trial: ________________ (m)

   Borg: _______________ (0 to 10)

   Gait speed: _____________ (m/s)  Number of rests: ________________

   Additional notes:

2. Distance walked in second trial: ________________ (m)

   Borg: _______________ (0 to 10)

   Gait speed: _____________ (m/s)  Number of rests: ________________

   If lung disease present: Heart rate: _______  O2 sat.: ________________

   Additional notes:
Appendix J

The Professional Environmental Assessment Protocol

OVERVIEW
The goal of the Professional Environmental Assessment Protocol is the focused evaluation of specialized dementia care facilities (Special Care Units) with respect to eight dimensions of the environment as experienced (e.g., Environmental Awareness & Orientation) judged to be therapeutic with respect to the care of persons with Alzheimer’s disease or related dementias.

What is Professional Environmental Assessment?
This approach differs from other commonly employed approaches to environmental description and assessment. It goes beyond the simple documentation of objective properties of a setting (e.g., enumeration of all spaces comprising an SCU, calculation of square footage of each, etc.). Thus indicators included in discussion of each of the 9 attributes of the PEAP are just that -- indicators -- and are not meant to constitute a checklist.

What aspects of the environment are being evaluated?
The primary focus of the PEAP is the physical setting and the extent to which it supports the needs of people with dementia. At the same time it is recognized that the physical world does not exist in isolation. It must be understood and evaluated within the larger context of Unit philosophy of care and program, level of resident capability, constraints of budget and regulations, etc.
One can usefully differentiate 3 levels of the physical setting, all of which are potentially important in completing a PEAP:

1. **Fixed or Structural Features**: Such features include overall unit area and floor plan, presence or absence of windows, etc.
2. **Semi-Fixed Features**: These include less permanent architectural elements – e.g., presence or absence of handrails, wall and floor surfaces.
3. **Non-Fixed Features**: The presence of wall hanging, activity supplies and endless other ‘props’ can play a critical role in the life of a setting.

RATINGS/RANKING OF THERAPEUTIC GOALS
The 9 goals often characterized as therapeutic with respect to dementia care are rated on a 13 point scale:

1-2 = unusually low support
3-5 = low support
6-8 = moderate support
9-11 = high support
12-13 = exceptionally high support.
Appendix J (cont.)

THE PROFESSIONAL ENVIRONMENTAL ASSESSMENT PROTOCOL (PEAP)
Scoring page

Unit I.D. ___________________

[1] Maximize Awareness and Orientation

(HIGH) 13 12 11 10 9 8 7 6 5 4 3 2 1 (LOW)

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

E.g: What specific design features does your hospital/unit employ to facilitate way finding and orientation? To what extent do you try to have a consistent daily program every day? Do similar types of activities occur at roughly the same time every day? How many of the social spaces have a clear identity for specific types of activities -- vs. rooms that are used for multiple purposes, and it’s hard to tell what’s going to take place?


(HIGH) 13 12 11 10 9 8 7 6 5 4 3 2 1 (LOW)

________________________________________________________________________
________________________________________________________________________

E.g. reducing elopement risks, control of unauthorized exits (e.g., locked/coded doors, coded elevators), reducing risk of injury to resident (falls) (e.g., flooring, storage of equipment), safety/security of Head Nurses (e.g., use of portable phones, call bells), support of functional abilities/use of specialized equipment (e.g., railings, bed rails, special equipment), monitoring of residents (e.g., use of cameras), challenges to safety and security (e.g., hard to monitor residents because of layout of unit)

[3] Provision of Privacy

(HIGH) 13 12 11 10 9 8 7 6 5 4 3 2 1 (LOW)

________________________________________________________________________
________________________________________________________________________

E.g. characteristics of private spaces (e.g., spaces used for solitude, away from stimulation), characteristics of public spaces (e.g., stimulating areas, activity rooms), privacy policies (e.g., closing doors during care), boundaries of public/private spaces (e.g., use of privacy curtains), challenges to privacy (e.g., small unit with no space alternatives)
[4] Regulation of Stimulation

(HIGH) 13  12  11  10  9  8  7  6  5  4  3  2  1 (LOW)

e.g. Over the course of the day, would you say there’s a lot of noise from TVs, radios, PA systems, etc.? Includes both level and frequency. control of stimulation (e.g., stimulation without stress, no TVs or PAs), challenges in regulating stimulation (e.g., annoying PA system present, glare present), types of stimulation (e.g., soft music played on unit, bread maker used on unit)

[5] Quality of Stimulation

(HIGH) 13  12  11  10  9  8  7  6  5  4  3  2  1 (LOW)


(HIGH) 13  12  11  10  9  8  7  6  5  4  3  2  1 (LOW)

e.g. To what extent do you encourage residents to do things on their own (like dressing and grooming) even when it takes substantially longer? physical environment maximizes remaining abilities (e.g., grab bars on unit), unit supports wandering behaviours (e.g., wandering paths), Head Nurses philosophy on functional abilities (e.g., resident encouraged to do for themselves even if it takes longer), programming on unit (e.g., flexible eating, sleeping and activity schedule), challenges to supporting functional abilities (e.g., functional abilities of residents on unit is low)

[7] Opportunity for Personal Control

(HIGH) 13  12  11  10  9  8  7  6  5  4  3  2  1 (LOW)

e.g. philosophy regarding personal control (within control of unit) (e.g., Gentle Care, resident-focused care), can resident’s express control over self (e.g., control over sleep, eat, activity schedule), resident’s control over space use (e.g., choice in décor of resident room, and
where to spend day on unit), are there challenges to personal control (e.g., very demented resident population is challenging)

[8] Continuity of the Self

(HIGH) 13 12 11 10 9 8 7 6 5 4 3 2 1 (LOW)

________________________________________________________________________

________________________________________________________________________

e.g. the extent to which items can be brought from home to link to their past, family involvement

[9] Facilitation of Social Contact

(HIGH) 13 12 11 10 9 8 7 6 5 4 3 2 1 (LOW)

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

e.g. social contact through programming (e.g., bus trips, social functions), rooms dedicated to social contact (e.g., courtyards, alcoves), presence/placement of furniture (e.g., lounge chairs in living room area are placed together), social contact with people, families, volunteers (e.g., residents sit near nurses station for social contact with Head Nurses), challenges to social contact (e.g., lack of social spaces on unit)

Other notes:
## Professional Environmental Assessment Protocol (PEAP) criteria and their definitions

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Definition (Norris-Baker <em>et al.</em>, 1999)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Maximize Safety And Security</td>
<td>The extent to which the environment both minimizes threats to residents’ safety and maximizes sense of security of residents, staff, and family members.</td>
</tr>
<tr>
<td>2. Maximize Awareness And Orientation</td>
<td>The extent to which users (often staff and visitors as well as residents) can effectively orient themselves to physical, social, and temporal dimensions of the environment.</td>
</tr>
<tr>
<td>3. Support Functional Abilities</td>
<td>The extent to which the environment and the rules regarding the use of the environment support the practice or continued use of everyday skills. These skills can be divided into both activities of daily living (ambulation, grooming, bathing &amp; toileting, eating) and independent activities of daily living, which will vary with stage of the disease.</td>
</tr>
<tr>
<td>4. Facilitation Of Social Contact</td>
<td>The extent to which the physical environment and rules governing its use support social contact and interaction among residents.</td>
</tr>
<tr>
<td>5. Provision Of Privacy</td>
<td>The extent to which input from (e.g., noise) and output to (e.g., confidential conversations) the larger environment are regulated.</td>
</tr>
<tr>
<td>6. Opportunities For Personal Control</td>
<td>The extent to which the physical environment and the rules governing the use of the environment provide residents with opportunities, consistent with level of acuity, for exercise of personal preference, choice, and independent initiative to determine what they will do and when it is done.</td>
</tr>
<tr>
<td>7. Regulation And Quality Of Stimulation</td>
<td>People with dementia have decreased ability to deal with potentially conflicting stimuli, and have greater difficulty distinguishing between foreground and background stimulation. Therefore the environment must be sensitive to both the “qualify” of stimulation, and its effective regulation. The goal, in Mace’s term, is “stimulation but not stress.”</td>
</tr>
<tr>
<td>8. Continuity Of The Self</td>
<td>This scale focuses on attempts to preserve continuity between present and past environments and the self of past and present. This can be expressed in two different ways: through presence of personal items belonging to the individual, and creation of a non-institutional ambiance.</td>
</tr>
</tbody>
</table>

References:


Appendix K

Ethic protocol and algorithm for data collection and walking session

**Intervention:** Multifaceted Walking Intervention

**Aims:** To determine the feasibility of using personalized communication strategies during walking sessions to maintain mobility, function, and well-being.

**Duration:** Ongoing sessions 3-4x week x 4 months

**Key principles:** creating a sense of comfort for the enrolled participant, active and ongoing monitoring of willingness to participate, and attending to verbal or non-verbal dissent/distress.

**Data collection and walking session:**

1) On arrival, the RA introduces herself to the long-term care facility staff and asks a staff member to provide an introduction to the resident.

2) The RA to spend a few moments visiting the resident, introducing herself, and developing rapport.

3) Before commencing data collection, the RA asks permission from the resident to ask a few questions/begin the session.

If the resident says **NO**, please see step 4); if the resident says **YES**, please see step 5).

4) **If the resident says NO,** then the RA can spend a few more minutes visiting and trying to create a comfortable environment. Then the RA can:

   A. Ask the resident to walk again (the RA should use their clinical judgment as to when it would be appropriate to ask).

      i. **If the resident declines a second time,** the RA is to terminate the conversation.

   B. Troubleshoot to make the resident more comfortable (e.g. speak to the long-term care facility staff to assist the resident) and then approach the resident shortly after troubleshooting.
C. Approach the resident later on in the day (for a total maximum of three attempts)

   i. If the resident declines a third time in the same day; do not approach the resident again and document refusal for the day. The resident should only be asked to participate a maximum of three times throughout the day to participate in the session or for data collection.

   The resident is considered to dissent to the research if he or she refuses to agree when approached on a different day.

   5) If the resident says YES to data collection, then the resident is considered to have assented to the research study. RA to proceed with the data collection.

   6) Continue to evaluate assent throughout the session. During the session if the resident is showing signs of agitation or restlessness attempt communication strategies outlined in the care plan or offer a rest period as per the resident’s wishes.

      i. If the strategies are ineffective within 5 minutes, begin to walk resident to their room and terminate data collection.

      ii. If the strategies are effective, continue session or data collection.

   7) Return client back to room, make sure the resident is comfortable and has a call ball within reach.
Appendix K (cont.)

Dissent and Assent Algorithm

Approach and attempt walking session (steps 1 to 3)

Resident says NO

Intervention can:
- Try to identify the problem, resolve the problem, and ask again.
- Trouble shoot the issue with staff, then ask again.
- Terminate the conversation.

Re-approach and check for assent

Resident says NO

If the resident says NO, terminate the conversation and try again later in the day.

Resident says YES and provides assent.

Begin session. Follow steps 6 and 7.

Resident says YES and provides assent.

If the resident declines a third time in the same day; do not approach the resident again and document refusal for the day.
Appendix L

Date: Thursday, April 11, 2013 10:01 AM
From: Charlene.Chu@mail.utoronto.ca
To: Sunita SHETTY [sshetty@mapigroup.com]

Hello Sunita,

Thank you very much for these documents and permission to use the scale. Kindest regards, Charlene Chu

Date: Wednesday, April 10, 2013 10:01 AM
From: Sunita SHETTY [sshetty@mapigroup.com]

Dear Charlene,

Thank you for your message and for your interest in the ADRQL. As you study is not funded, please find attached to this email the original US English version of the ADRQL, as we do not have a specific English for Canada version available yet. You will also find attached the user manual for the questionnaire.

I would be most grateful if you could kindly confirm safe reception of these documents. Thank you in advance.

Please do not hesitate to get back to me should you have any question or need anything else.

Wishing you a nice day,
Sunita Shetty

Information Resources Specialist
PROs & ClinROs Information Support Unit, MAPI Research Trust
27 RUE DE LA VILLETTE | 69003 LYON | France. Tel.: +33 (0)4 72 13 65 75 | Fax: +33 (0)4 72 13 55 73 | sshetty@mapigroup.com. Please visit our websites: www.mapigroup.com

Date: Wednesday, April 3, 2013 7:01 AM
From: Charlene.Chu@mail.utoronto.ca

Hi there,
I am a third year doctoral student from the Faculty of Nursing, University of Toronto examining the feasibility of an intervention in a long-term care facility with nursing home residents who have Alzheimer's disease. I wanted to ask your permission to use the ADRQL to measure one of my outcomes.
Thank you very much, Charlene Chu
Appendix L (cont)

Alzheimer Disease Related Quality of Life™ (ADRQL™) instructions

*Interviewer: Read the following instructions aloud to the respondent:*

Quality of life means how someone feels about different areas of his or her life. To find out about quality of life, people are usually asked to answer questions about themselves. Because of the effects of dementia, it is hard to ask people with this illness questions about their own lives. Instead, this questionnaire has been developed so that it can be answered by someone who spends time with and cares for a person with dementia.

There are several areas that make up a person’s quality of life. I will briefly describe each area and then I will read statements about these. As I read each statement, please think about Mr/Mrs/Ms ____________ and whether the statement describes him/her over the last 2 weeks. If you agree that the statement describes Mr/Mrs/Ms ____________ over the last 2 weeks, please answer “Agree.” If you disagree, because the statement does not describe Mr/Mrs/Ms ____________ over the last 2 weeks, please answer “Disagree.”

Let me give you an example. I might read the statement, "He/She does not respond to his/her own name.” If this statement describes Mr/Mrs/Ms ____________ over the last 2 weeks, you should say “Agree.” If the statement, “He/She does not respond to his/her own name,” does not describe him/her in the last 2 weeks, you should answer “Disagree.” Do you have any questions?

*Interviewer: Pause, respond to any questions and finish reading these instructions aloud.*

I am going to begin the questionnaire now. Please tell me if you want me to speak louder, slow down, repeat a statement or stop so you can think about a statement. Also let me know if you want me to review the instructions.

*Interviewer: Read aloud the introductory statements and each item exactly as they are written in sections A to E below. Place an X in one box to the right of each item in the correct response column.*
1. These statements are about relating to and being around other people. After each statement, please answer “Agree” if the statement describes Mr/Mrs/Ms ____________ in the last 2 weeks or answer “Disagree” if it does not.

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>AGREE</th>
<th>DISAGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>He/She smiles or laughs when around other people...............................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>He/She does not pay attention to the presence of others........................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A3</td>
<td>He/She will stay around other people...............................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td>He/She seeks contact with others by greeting people or joining in conversations........................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A5</td>
<td>He/She talks with people.....................................................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A6</td>
<td>He/She touches or allows touching such as handshakes, hugs, kisses, pats.......................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A7</td>
<td>He/She can be comforted or reassured by others....................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A8</td>
<td>He/She reacts with pleasure to pets or small children...........................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A9</td>
<td>He/She smiles or laughs or is cheerful..............................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A10</td>
<td>He/She shows delight............................................................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A11</td>
<td>He/She shows a sense of humor.............................................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A12</td>
<td>He/She sits quietly and appears to enjoy the activity of others even though he/she is not actively participating........................................</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. These statements are about a person’s special identity and important relationships. After each statement, please answer “Agree” if the statement describes Mr/Mrs/Ms ____________ in the last 2 weeks or answer “Disagree” if it does not.

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>AGREE</th>
<th>DISAGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>He/She talks about or still does things related to his/her previous work or daily activities........</td>
<td>B1.</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>He/She is aware of his/her place in the family such as being a husband/wife, parent, or grandparent....</td>
<td>B2.</td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>He/She makes or indicates choices in routine daily activities such as what to wear, what to eat, or where to sit........................................................</td>
<td>PG 1</td>
<td></td>
</tr>
</tbody>
</table>
B4. He/She shows interest in events, places or habits from his/her past such as old friends, former residences, church or prayer.......................... B4. ☐ ☐ ☐

B5. He/She does not respond to his/her own name................................................................. B5. ☐ ☐ ☐

B6. He/She does not express beliefs or attitudes that he/she always had.................................................. B6. ☐ ☐ ☐

B7. He/She talks with people on the telephone........................................................................ B7. ☐ ☐ ☐

B8. He/She gets enjoyment from or is calmed by his/her possessions or belongings.................. B8. ☐ ☐ ☐

3. These statements are about different types of behaviour in the last 2 weeks. After each statement, please answer “Agree” if the statement describes Mr/Mrs/Ms ____________ in the last 2 weeks or answer “Disagree” if it does not.

<table>
<thead>
<tr>
<th>AGREE</th>
<th>DISAGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1. He/She squeezes, twists or wrings his/her hands......................................................</td>
<td>C1. ☐</td>
</tr>
<tr>
<td>C2. He/She throws, hits, kicks or bangs objects...................................................................</td>
<td>C2. ☐</td>
</tr>
<tr>
<td>C3. He/She calls out or yells or curses or makes accusations...............................................</td>
<td>C3. ☐</td>
</tr>
<tr>
<td>C4. He/She locks or barricades himself/herself in his/her room/house/apartment................</td>
<td>C4. ☐</td>
</tr>
<tr>
<td>C5. He/She is irritable or easily angered..............................................................................</td>
<td>C5. ☐</td>
</tr>
<tr>
<td>C6. He/She cries, wails, or frowns........................................................................................</td>
<td>C6. ☐</td>
</tr>
<tr>
<td>C7. He/She is restless and wound up, or repeats actions such as rocking, pacing, or banging against walls...................................................................</td>
<td>C7. ☐</td>
</tr>
<tr>
<td>C8. He/She resists help in different ways such as with dressing, eating or bathing, or by refusing to move........................................................................</td>
<td>C8. ☐</td>
</tr>
<tr>
<td>C9. He/She appears to be content or satisfied.........................................................................</td>
<td>C9. ☐</td>
</tr>
<tr>
<td>C10. He/She becomes upset or angry when approached by another person..................................</td>
<td>C10. ☐</td>
</tr>
<tr>
<td>C11. He/She pushes, grabs or hits people..................................................................................</td>
<td>C11. ☐</td>
</tr>
<tr>
<td>C12. He/She is upset or unsettled in his/her living environment..............................................</td>
<td>C12. ☐</td>
</tr>
</tbody>
</table>
4. These statements are about usual activities in the last 2 weeks. After each statement, please answer “Agree” if the statement describes Mr/Mrs/Ms ____________ in the last 2 weeks or answer “Disagree” if it does not.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D1.</td>
<td>He/She enjoys doing activities alone such as listening to music or watching TV......</td>
<td></td>
</tr>
<tr>
<td>D2.</td>
<td>He/She does not take part in activities he/she used to enjoy, even when encouraged to take part...........</td>
<td></td>
</tr>
<tr>
<td>D3.</td>
<td>He/She shows no signs of pleasure or enjoyment when taking part in leisure activities or recreation......</td>
<td></td>
</tr>
<tr>
<td>D4.</td>
<td>He/She dozes off or does nothing most of the time.........................................................</td>
<td></td>
</tr>
</tbody>
</table>

5. The last statements are about behaviour in a person’s living environment. After each statement, please answer “Agree” if the statement describes Mr/Mrs/Ms ____________ in the last 2 weeks or answer “Disagree” if it does not.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>E1.</td>
<td>He/She talks about feeling unsafe or says his/her belongings are not safe.............. .....</td>
<td></td>
</tr>
<tr>
<td>E2.</td>
<td>He/She is upset or unsettled when in places other than where he/she lives......................</td>
<td></td>
</tr>
<tr>
<td>E3.</td>
<td>He/She talks about wanting to leave or go home.........................................................</td>
<td></td>
</tr>
<tr>
<td>E4.</td>
<td>He/She says he/she wants to die.................................................................</td>
<td></td>
</tr>
</tbody>
</table>

That concludes the questionnaire. Thank you very much for your help.

Copyright © 1997, 2009 by Peter V. Rabins, M.D. Judith D. Kasper, Ph.D. and Betty S. Black, Ph.D.
Appendix M

Email correspondence with modified-TEI author

From: Philippe Landreville [Philippe.Landreville@psy.ulaval.ca]
Date: May 6 2013 3:22pm
To: Charlene Chu

Hi Charlene,

Of course you have my permission. Here are the paper and questionnaire you are interested in. Good luck with your thesis.

Sincerely,
Philippe

Philippe Landreville, Ph.D.
Professeur titulaire

École de psychologie
Université Laval
Pavillon Félix-Antoine-Savard
2325, rue des Bibliothèques
Québec, QC, G1V 0A6, Canada

De : Charlene Chu [mailto:charlene.chu@mail.utoronto.ca]
Envoyé : 5 mai 2013 00:05
À : Philippe Landreville
Objet : Article

Hello Dr. Landreville,
I hope you are well. I am a doctoral student at the University of Toronto, and I was interested in using the modified version of the TEI for my thesis work. However, your article:


Is limited access here at U of T - could you please send it to me? Also, may I have permission to use the modified-TEI? if you have it on hand, do you mind sharing it with me?
I am an admirer and reader of your work, thank you for your contribution to research.
Thank you, Charlene Chu
Appendix N

Date: __________  Resident code: __________  Staff or family code: __________

MODIFIED TREATMENT EVALUATION INVENTORY (MODIFIED-TEI)

Please complete the items listed below by placing a checkmark on the line next to each question that best indicates how you feel about the Multifaceted Walking Intervention (MWI) and its impact on walking, function, and quality of life for the resident. Please read the items very carefully because the scales for each question vary.

<table>
<thead>
<tr>
<th>Item</th>
<th>Please circle the number that corresponds with your answer. Please answer all the questions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How acceptable do you find the MWI to deal with the resident’s immobility issues?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td></td>
<td>Not at all acceptable</td>
</tr>
<tr>
<td>2. How willing would you be to carry out the MWI program yourself to change the resident’s mobility level and quality of life?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td></td>
<td>Not at all willing</td>
</tr>
<tr>
<td>3. How appropriate/suitable is the MWI for residents presenting with symptoms of immobility, functional decline and low quality of life?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td></td>
<td>Not at all suitable</td>
</tr>
<tr>
<td>4. How consistent is the MWI with common sense or everyday notions about what treatment should be for immobility, functional decline and low quality of life?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td></td>
<td>Not at all consistent</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5.</td>
<td>To what extent do you think there might be <strong>risks</strong> from participating in the MWI?</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lots of risks are likely</td>
</tr>
<tr>
<td>6.</td>
<td>How much do you like the <strong>procedures</strong> that will be used in the MWI program?</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do not like them at all</td>
</tr>
<tr>
<td>7.</td>
<td>How <strong>effective</strong> do you think the MWI is likely to be for the resident?</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not effective at all</td>
</tr>
<tr>
<td>8.</td>
<td>How likely is the MWI to result in <strong>any improvement</strong> in the resident?</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very unlikely</td>
</tr>
<tr>
<td>9.</td>
<td>How likely are <strong>undesirable side effects</strong> to result from the MWI?</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very unlikely</td>
</tr>
<tr>
<td>10.</td>
<td>How much <strong>discomfort</strong> do you think this person likely to experience during the MWI program?</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very much discomfort</td>
</tr>
<tr>
<td>11.</td>
<td>Overall, what is your general reaction to the MWI?</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very negative</td>
</tr>
</tbody>
</table>
Open ended questions:

12. How important is “person-centered care” as it relates to the care of your loved one and other nursing home residents with dementia? Please describe in sentences.

13. What’s your opinion of the effects of walking intervention on the mobility of residents who have dementia? Please use sentences.

14. What’s your opinion of the effects of walking intervention on a resident’s ability to perform daily care activities (e.g. toileting, transferring) if they have dementia? Please use sentences.

15. Describe your values, beliefs, or judgments about the effects of walking and talking on the quality of life in residents who have dementia? Please use sentences.
Appendix N (cont)

Date: _________  Resident code: ________  Staff or family code: ________

**POST Assessment: Modified Treatment Evaluation Inventory (Modified-TEI)**

The Multifaceted Walking Intervention (MWI) is now complete! Please complete the items listed below by circling the number next to each question that best indicates: how you feel about the MWI, the experience of your loved one as a study participant, and the MWI impact on the resident’s walking, function, and quality of life. Thank you for your participation. Please read the items very carefully because the scales for each question vary.

<table>
<thead>
<tr>
<th>Item</th>
<th>Please circle the number that corresponds with your answer. Please answer all the questions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. After the intervention (MWI), how <strong>acceptable</strong> did you find the MWI to address the resident’s immobility issues?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td></td>
<td>Not at all acceptable</td>
</tr>
<tr>
<td>2. How willing are you to have the resident <strong>continue</strong> the MWI program?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td></td>
<td>Not at all willing</td>
</tr>
<tr>
<td>3. How <strong>appropriate/suitable</strong> is the MWI for residents who experience immobility, functional decline, and low quality of life?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td></td>
<td>Not at all appropriate</td>
</tr>
<tr>
<td>4. Does the MWI make <strong>common sense</strong> as a program for mobility decline and low quality of life for residents with dementia?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td></td>
<td>Makes no sense at all</td>
</tr>
<tr>
<td>Question</td>
<td>Responses</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>5. Reflecting back on the intervention, were there any risks in having your loved one participate in the MWI?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>6. Reflecting back on the intervention, did the procedures used in the MWI program (surveys, interview prior to walking) make sense to accomplish the goals of the study?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>7. Reflecting back on the intervention, how effective do you think the MWI was for the resident?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>8. Reflecting back on the intervention, did the MWI result in any improvement in the resident?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>9. Did the resident experience any undesirable side effects from the MWI?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>10. To your knowledge, did the resident experience discomfort during the MWI program?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>11. Overall, what is your general reaction to the MWI?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>
OPEN ENDED QUESTIONS

Feedback about the MWI/walking intervention

16. What did you like about the walking intervention?

17. What did you dislike about the walking intervention?

18. Any other comments about the walking intervention?
19. In your opinion, **was the walking intervention “person-centered”?** (I.E. did it exhibit qualities of person-centered care?) Explain.

20. How important is “person-centered care” as it relates to the care of your loved one and other nursing home residents with dementia? Please describe in sentences.

21. Is the walking intervention suitable to maintain the **mobility** of residents who have dementia? Please use sentences.
22. Is the walking intervention suitable to maintain the *activities of daily living (e.g. transferring to the toilet, chair, bed)* of residents who have dementia? Please use sentences.

23. Is the walking intervention suitable to maintain the *quality of life* of residents who have dementia? Please use sentences.

24. Do you have any other comments about this study

THANK YOU FOR PARTICIPATING! ☺️
Appendix O

Functional Independence Measure (FIM)

Participant: __________________________________

<table>
<thead>
<tr>
<th>SCALE: FIM Scoring Criteria</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Helper Required</td>
<td>7</td>
<td>Complete Independence</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Modified Independence (patient requires use of a device, but no physical assistance)</td>
</tr>
</tbody>
</table>

**Helper (Modified Dependence)**

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Supervision or Setup</td>
</tr>
<tr>
<td>4</td>
<td>Minimal Contact Assistance (patient can perform 75% or more of task)</td>
</tr>
<tr>
<td>3</td>
<td>Moderate Assistance (patient can perform 50% to 74% of task)</td>
</tr>
</tbody>
</table>

**Helper (Complete Dependence)**

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Maximal Assistance (patient can perform 25% to 49% of task)</td>
</tr>
<tr>
<td>1</td>
<td>Total assistance (patient can perform less than 25% of the task or requires more than one person to assist)</td>
</tr>
<tr>
<td>0</td>
<td>Activity does not occur</td>
</tr>
</tbody>
</table>

Score each item from 0 to 7

<table>
<thead>
<tr>
<th>Item</th>
<th>Baseline</th>
<th>Beginning of MWI</th>
<th>Mid-MWI</th>
<th>Post-MWI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comprehension</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auditory</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expression</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-verbal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both</td>
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<tr>
<td>Social cognition:</td>
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<td>Social interaction</td>
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</table>
### Problem solving

### Memory

**Cognition score**
*(out of 35)*

Score each item from 0 to 7

<table>
<thead>
<tr>
<th>Item</th>
<th>Baseline</th>
<th>Beginning of MWI</th>
<th>Mid-MWI</th>
<th>Post-MWI</th>
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<tbody>
<tr>
<td><strong>Self care:</strong></td>
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<tr>
<td>Eating</td>
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<td>Bathing</td>
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<td>Grooming</td>
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<tr>
<td>Dressing – upper body</td>
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<tr>
<td>Dressing-lower body</td>
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<tr>
<td>Toileting</td>
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<tr>
<td><strong>Sphincter Control:</strong></td>
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<tr>
<td>Bowel management</td>
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<tr>
<td>Bladder management</td>
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<tr>
<td><strong>Transfers:</strong></td>
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<tr>
<td>Bed, chair, wheelchair</td>
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<tr>
<td>Toilet</td>
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<tr>
<td>Tub/shower</td>
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<tr>
<td>Locomotion: Walking</td>
<td>Walking</td>
<td>W</td>
<td>WC</td>
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<td>Stairs</td>
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<tr>
<td><em>Motor score</em></td>
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<td><em>(out of 56)</em></td>
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<td><em>Total FIM score</em></td>
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Appendix P

Questions to ask POAs about the resident

1. Tell me about the resident’s life.
2. Where they were born?
3. Who are important friends and family to the resident?
4. How many children did they have?
5. What was their profession?
6. What was the resident’s past living situations? (With who? Where? How long? What type of place?)
7. Where have they travelled to?
8. What are some activities the person enjoys?
9. What are their feelings about life? (personal philosophy, outlook)
10. What are some sources of happiness for the resident?
11. What does the resident like?
12. What are some sources of fear, anxiety?
13. Tell me a story that they would remember
14. What is their religious affiliation?
15. What was a typical day for them when they lived at home?
17. What do you refer to them as? What do they prefer to be referred to as?
18. Is the resident able to recognize people from their life?
19. What brings them joy while in the nursing home?
20. What communication strategies do you use with them? What works? What doesn’t work?
Appendix P (cont)

Questions to ask PSW home staff about the resident

1. Tell me about what it’s like to work with/care for Resident X.

2. Describe a typical interaction with Resident X.

3. Does the resident exhibit responsive behaviours? How do they look like?

4. What are some antecedents to responsive behaviours of resident X?

5. What are some specific strategies you use to mitigate responsive behaviours?

6. What communication strategies do you use with them? What works? What doesn’t work?

7. When do you notice the patient looking happy?

8. How much of their ADLs can they perform?

9. How much do they participate in programs and activities at the home?
Appendix Q

Letter to the Nursing home staff

My name is Charlene Chu and I am going to be conducting a research study on a multifaceted walking intervention for nursing home residents who have dementia. This study is being conducted in partial fulfillment of the requirements for the PhD at the Lawrence S. Bloomberg Faculty of Nursing at the University of Toronto. My thesis supervisor is Dr. Katherine McGilton. The purpose of this study is to evaluate the feasibility (Is the intervention practical?), acceptability (how do people like the intervention?), and efficacy (does the intervention work?) of the intervention to maintain the resident’s ability to walk, activities of daily living function and quality of life. Other pertinent data will be collected such as resident’s medications, co-morbidities, daily exposure to physical activity, and characteristics of the nursing home environment.

The study will follow residents for 6 months. For the first two months, I will follow their walking status based on usual care alone. During this time I will collect information about the resident from family members and develop a mobility and communication care plan. After this 2 month period, I will begin to walk the resident 3-5 times a week (as they tolerate the physical activity). This intervention will continue for 4 months. All participants enrolled will receive the intervention.

Your assistance would be greatly appreciated in assisting me to identify existing or new residents who are admitted into the home and who may be eligible to participate in this study. First, verbal permission must be obtained from the resident or their substitute decision maker/power of attorney prior to me approaching them.

Therefore, I will be asking the nursing home staff to provide eligible resident’s with the information letter and ask for permission for me to contact them to discuss the study. Secondly, any questions pertaining to the study should be directed to me at 416 456 8995.

The recruitment of participants will be conducted for a six month time period and your assistance is greatly appreciated. Additionally, I will provide you with the results of this study when completed.

If you have any questions or comments about this study, please do not hesitate to contact me at 4164568995.

I look forward to the commencement of recruitment and working with you.

Sincerely,
CONSENT FORM TO PARTICIPATE IN A RESEARCH STUDY (Family member)

Title of Research Study:
A feasibility trial of a multifaceted walking intervention to maintain functional mobility, ADL function, and quality of life among nursing home residents with dementia

Principal Investigator: Dr. Katherine McGilton
Kathy.McGilton@uhn.ca
416-597-3422, ext. 2500

Co-Investigator: Charlene Chu, RN, PhD Candidate at
Lawrence S. Bloomberg, Faculty of Nursing,
University of Toronto.
Charlene.chu@mail.utoronto.ca
416 - 597 3422 ext. 2242

Introduction
You are being asked to take part in a research study. Please read the information about the study presented in this form. The form includes details on study’s risks and benefits that you should know before you decide if you would like to take part. You should take as much time as you need to make your decision. You should ask the study doctor or study staff to explain anything that you do not understand and make sure that all of your questions have been answered before signing this consent form. Before you make your decision, feel free to talk about this study with anyone you wish including your friends, family, and family doctor. Participation in this study is voluntary.

Background and Purpose
Your family member was identified as a possible participant in this research study because he/she is a resident of Lakeside Long-Term Care or Kensington Gardens and has some problems communicating his/her needs and is moderately mobile.

Dementia is a term used to refer to problems with memory, understanding and speaking with others. These problems may include difficulty understanding instructions, following directions, and asking for help. Nursing home residents with dementia commonly experience a loss in walking ability resulting in a loss of activities of daily living (ADL) function and quality of life (QOL). An estimated 41% of residents will lose their ability to walk within a year of admission into the facility (Slaughter et al., 2011). This decline in residents' mobility is primarily attributed to physical inactivity, and is associated with poor health outcomes (e.g. death, pneumonia, etc.) and is a costly problem for our healthcare system. Previous physical activity interventions have reported promising results but with many people dropped out and were unable to comply with the physical activities.

Person-centered care is essential to interactions with residents who have dementia (Alzheimer's Society of Canada, 2011) and provide high quality dementia care. Yet, no previous physical studies included a person-centered care approach to deliver the physical activity or address residents' impaired cognition and communication skills (World Health Organization, 1992; Ballard et al., 2001). This intervention called the Multifaceted Walking Intervention (MWI) has combined person-centered care and physical activity.

The purpose of this study is to determine if the MWI is feasible, acceptable to residents and residents’ families, and effective in reducing resident’s mobility decline, improve ADL function, and QOL.

**Study Design**

This study is a time series design, which means that you will continue to receive the usual care at Lakeside or Kensington Gardens for two months after recruitment into the study. After this time, the walking intervention will begin and continue for four months. Thirty residents will be enrolled in the study. All enrolled participants will receive the walking intervention.

Your participation in the study will be for a total of 6 months.

**Study measures**

If you agree to participate, you will have to participate in the following research activities:
**Modified-treatment Evaluation inventory**

A 15 item questionnaire (10 10-point likert scale and 5 open ended questions) that collects what you think about the Multifaceted Walking Intervention (MWI) components. This short questionnaire will take approximately 10 minutes to complete and will have to be completed at the beginning and at the end of the intervention.

**Short Interview about the resident**

A co-investigator will audio-tape a 20-30 minute interview with you asking you about the resident. Questions about who they are: their biological history, hobbies, dislikes, values, beliefs, and preferences. The purpose of the interview is to get to know who the resident is as a unique person; the information will be documented in the care plan and only the co-investigator will have access to the care plan. Basic demographic information will be collected about you at this time like sex, age, relationship to the resident, and how well you know the resident. No confidential information will be collected and the tape will be destroyed at the end of the study.

**Observation of an interaction**

You will be asked for permission to be observed by the co-investigator for a short observation interacting with the resident. This will be done at the beginning of the study. The purpose of the observation is to see how the resident communicates and to further assess their mannerisms and behaviors. This information will be used to help develop a communication care plan. The observation will take place in the resident’s room and will be done in a manner to maintain confidentiality.

The study will involve the resident completing a cognitive test (Mini-Mental Status Examination), communication test (Functional Language Communication Inventory), and one short observation session where the co-investigator would observe the resident interacting with staff or family at the beginning of the study. Two simple physical measures (Timed up and go, and 2 minute walk test) will be completed during the walking sessions four times throughout the study.

**Communication care plan and Walking regime**

After all the evaluations are completed at the beginning of the study, the co-investigator who is a Registered Nurse with specialization in geriatric care and a PhD candidate from the University of Toronto will create a communication care plan, which is a list of ways the resident uses to communicate as well as a walking regime outlining the dosage of walking per week. The purpose of the care plan is to guide the co-investigator
to better understand how the resident communicates. The physical assessments will inform the co-investigator what the walking regime should be for the resident (e.g. 10-20 minutes a day, twice a day, four times a week). The co-investigator will use the communication care plan and apply the information in the care plan to deliver the physical activity with the hypothesis that person-centered care will increase the resident’s adherence to the walking sessions and reduce mobility decline over time. The care plan will be kept by the co-investigator at the nursing station so the co-investigator can refer to it. Over time the care plan can be modified if the resident has changes.

The resident’s exposure to physical activity will be documented in a journal to determine the average amount of activity the resident is involved in on a weekly or day to day throughout the study duration.

**Risks and Benefits**

The possible risks of the study include the resident becoming tired during the testing or feeling frustrated by some of the questions. However they may choose not to answer any question that makes them uncomfortable and may stop the evaluations at any time. Physical risks of mobility may be increased due to more physical activity.

Benefits to you include receiving periodic updates (if requested) about the amount of physical activity the resident is experiencing and that your family member is able to receive additional physical activity delivered by an experienced Registered Nurse certified in geriatric care. Possible benefits for the resident are improved functional mobility, ADL function, quality of life, decreased frustration and improved communication with the care provider. The resident will have the option to engage in physical activity and social interaction regularly which can reduce physical and cognitive decline. The study may also provide information on ways to improve communication and how to best provide physical activity to residents living in long-term care in the future.

**Rights as a volunteer**

Participating in a study is completely voluntary. You have the right to withdraw from the study at any time. Refusal to participate or early withdrawal from the study will not in any way affect the care that the resident receives at the home. If you have any questions, concerns or would like to speak to the study team for any reason, please call: Charlene Chu at 416 - 597 3422 ext. 2242. If you have any questions about your rights as a research participant or have concerns about this study, call the Chair of the University Health Network Research Ethics Board (UHN REB) or the Research Ethics office number at 416-581-7849. The REB is a group of people who oversee the ethical
conduct of research studies. The UHN REB is not part of the study team. Everything that you discuss will be kept confidential.

You will be given a signed copy of this consent form.

If you or the resident leaves the study, the information that was collected before you/the resident left the study will still be used in order to help answer the research question. No new information will be collected without your permission.

**Cost**

There will be no cost to you or the resident for participating in this study. Neither you nor the resident will receive any payment for participating in the study.

**Conflict of Interest:**

Researchers have an interest in completing this study. Their interests should not influence your decision to participate in this study.

**Confidentiality**

*Personal Health Information*

If you agree to allow your family member to join this study, the co-investigator will look at your family member’s personal health information and collect only the information they need for the study. Personal health information is any information that could identify the resident and includes their year of birth.

Representatives of the University Health Network (UHN) including the UHN Research Ethics Board may come to the study site to look at the study records and at your family member’s personal health information to check that the information collected for the study is correct and to make sure the study is following proper laws and guidelines:

The co-investigator will keep any personal health information about your family member in a secure and confidential location for 10 years. A list linking your family member’s study number with their name will be kept by the co-investigator in a secure place, separate from your family member’s study file.

*Study Information that Does Not Identify You*
Some study information will be sent outside of the hospital to the main study site at Toronto Rehab E.W. Bickle Centre. Any information about your family member that is sent out of the nursing home will have a code and will not show your family member’s name or address, or any information that directly identifies you.

All information collected during this study, including your family member’s personal health information, will be kept confidential and will not be shared with anyone outside the study unless required by law. Your family member will not be named in any reports, publications, or presentations that may come from this study.

Assent

In addition to obtaining your consent for the resident, we will also ask the resident for assent, meaning agreement with the decision to participate. If at any time the resident does not indicate assent, the study activities would be stopped or delayed. Assent will be determined throughout the study at each interaction with the resident. If signs of dissent are noted three times consecutively, the resident will be withdrawn and you will be notified.

Consent

This study has been explained to me and any questions I had have been answered. I know that I may leave the study at any time. I agree to the use of my information as described in this form. I agree to take part in this study.

__________________________ ____________________ ____________________
Print Study Participant’s Name Signature Date

My signature means that I have explained the study to the participant named above. I have answered all questions.
☐ Your signature on this form indicates that you are acting as a substitute decision maker for the participant and the study has been explained to you and all your questions have been answered to your satisfaction. You agree to allow the person you represent to take part in the study. You know that the person you represent can leave the study any time.

________________________  ___________________  _____________
Name of Substitute Decision Maker  Signature  Date

________________________
Relationship to Participant
Appendix R (cont)

Consent form for Substitute Decision Maker – Informed consent checklist

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<tr>
<th>Were all the elements outlined in the approved informed consent form and GCP discussed with the participant?</th>
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<td>Name and contact information of the Principal Investigator</td>
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<td>Risks in participation</td>
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<td>The fact that consent may be withdrawn at any time</td>
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<th>Was the participant prompted for questions?</th>
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<th>Were all questions asked by the participant answered?</th>
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<th>Did the participant have any specific questions for the principal investigator?</th>
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<th>Did the Principal investigator or sub-investigator answer any questions that the participant may have had for them?</th>
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<th>Was the participant provided enough time to make an informed decision?</th>
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<tr>
<th>Was a copy of the informed consent form provided to the participant or to substitute decision maker?</th>
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Provide any additional notes regarding the consent process:

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Completed by: ___________________________ Date: _________________

Printed Name and Signature: ___________________________ yyyy/mm/dd
Appendix R (cont)

CONSENT FORM TO PARTICIPATE IN A RESEARCH STUDY (Nursing Home Staff)

Title of Research Study:
A feasibility trial of a multifaceted walking intervention to maintain functional mobility, ADL function, and quality of life among nursing home residents with dementia

Principal Investigator: Dr. Katherine McGilton

Kathy.McGilton@uhn.ca
416-597-3422, ext. 2500

Co-Investigator: Charlene Chu, RN, PhD Candidate at Lawrence S. Bloomberg, Faculty of Nursing, University of Toronto.
Charlene.chu@mail.utoronto.ca
416 - 597 3422 ext. 2242

Introduction
You are being asked to take part in a research study. Please read the information about the study presented in this form. The form includes details on study’s risks and benefits that you should know before you decide if you would like to take part. You should take as much time as you need to make your decision. You should ask the co-investigator (Charlene Chu) to explain anything that you do not understand and make sure that all of your questions have been answered before signing this consent form. Before you make your decision, feel free to talk about this study with anyone you wish including your friends, family, and family doctor. Participation in this study is voluntary.

Background and Purpose
You have been asked to provide consent because you are the primary care giver for a resident of Lakeside Long-Term Care or Kensington Gardens who has dementia with some problems communicating his/her needs and is moderately mobile.
Nursing home residents with dementia commonly experience functional mobility decline resulting in a loss of activities of daily living (ADL) function and quality of life (QOL). An estimated 41% of residents with dementia will lose some of their ability to walk within a year of admission into the facility (Slaughter et al., 2011). This decline in residents’ mobility is primarily attributed to physical inactivity, and is associated with poor resident outcomes and substantial economic consequences. Residents with dementia have problems with memory, understanding and speaking with others. These problems may include difficulty understanding instructions, following directions, and asking for help which can make providing physical activity difficult. Previous physical activity interventions have been conducted to address functional mobility decline with promising results but these studies reported high attrition and low adherence from residents.

*Person-centered care* is synonymous with high quality dementia care (Alzheimer's Society of Canada, 2011) and is essential to guide interactions with residents in order to address their cognitive impairment. Yet, previous physical activity studies did not include a person-centered care component to deliver the physical activity or address resident’s impaired cognition and communication skills associated with dementia (World Health Organization, 1992; Ballard et al., 2001), which likely contributed to the high attrition and low adherence rates. The **purpose** of this study is to examine the feasibility, acceptability, and efficacy of the *Multifaceted Walking Intervention (MWI)*. The hypothesis of this study is that person-centered care will increase the resident’s adherence to the walking sessions to reduce mobility decline over time which will increase ADL function and QOL.

### Study Design

This study is a time series design, which means that the resident will continue to receive the usual care at Lakeside or Kensington Gardens for two months prior to the four month walking intervention beginning. After this time, the walking intervention will begin and continue for four months. The study will last for 6 months and 30 residents will be enrolled in the study.

Caregivers and resident’s family are asked to provide information about the resident’s in order to inform the communication care plan. Care providers and family members will also give their opinion about the resident’s functional mobility, ADL function, and QOL at the beginning and the end of the study.

### Study procedures

If you decide to participate in the study you will be asked to participate in the following research activities:
Demographic information

Provide basic demographic information to the co-investigator, like your age, educational background, duration of employment, and how long you have worked with the resident.

Cornell scale of depression (CSDD), Alzheimer’s disease related quality of life scale (ADQRL), and the Functional Independence Measure (FIM)

Three short questionnaires about the resident will need to be completed by you.

The depression scale assesses depressive symptoms exhibited by the resident and is completed once at the beginning. This scale takes 5-10 minutes to complete.

The other two short questionnaires will have to be completed at the beginning and at the end of the intervention. One assesses the resident’s quality of life and the other indicates the level of assistance the resident required to complete basic ADLs. These two surveys will take no longer than 30 minutes combined.

Modified-treatment Evaluation inventory

A 15 item questionnaire (10 10-point scale and 5 open-ended questions) that collects what you think about the MWI components. This short questionnaire will take approximately 10 minutes to complete and will have to be completed at the beginning and at the end of the intervention.

Observation of an interaction

You will be asked for permission for the co-investigator to observe the resident interacting with either the care provider or family member/SDM for a short (5 minute) observation. This will be done at the beginning of the study. The purpose of the observation is to see how the resident communicates and to further assess their mannerisms and behaviors. This information will be used to help develop a communication care plan. The observation will take place in the resident’s room and will be done in a manner to maintain confidentiality.

Short Interview about the resident

A co-investigator will audiotape a 15-20 minute interview with you asking about the resident at the beginning of the study. Questions will be regarding who the resident is, how you communicate with them, and what it’s like working with them. The purpose of the interview is to get information that can be documented in the care plan and only the
co-investigator will have access to the care plan. No confidential information will be collected and the tape will be destroyed at the end of the study.

**Multifaceted Walking Intervention: Communication care plan and Walking regime**

After all the evaluations are completed at the beginning of the study, the co-investigator will create a communication care plan, which is a list of ways the resident uses to communicate as well as a walking regime outlining the dosage of walking per week. The purpose of the care plan is to guide the co-investigator to better understand how the resident communicates. The co-investigator will perform physical assessments to inform what the walking regime should be for the resident (e.g. 10-20 minutes a day, twice a day, four times a week). The co-investigator will use the communication care plan and apply the information in the care plan to deliver the physical activity. The hypothesis for the study is that person-centered care will increase the resident’s adherence to the walking sessions and reduce mobility decline over time. The care plan will be kept by the co-investigator at the nursing station so the co-investigator can refer to it. Over time the care plan can be modified if the resident has changes.

Participation in the study will last approximately 6 months with the majority of your involvement at the beginning and the end of the six month period. Occasionally, the co-investigator may ask you for any updates on the resident that she should be aware of, like a recent fall experienced by the resident, increased physical activity, or information that should be in the care plan.

The resident’s exposure to physical activity will be documented by the co-investigator in a journal to determine the average amount of activity the resident is involved in on a day to day basis throughout the study.

**Cost**

You will be compensated with a Tim Horton’s $5 gift card on completion of questionnaires at pre and another gift card at post-intervention. There will be no cost to you or the resident for participating in this study.

**Conflict of Interest**

Researchers have an interest in completing this study. Their interests should not influence your decision to participate in this study.

**Risks and Benefits**
There are no direct risks to you from participating in this research study. Findings from the study may help improve communication for both residents and care providers of long-term homes. The study may also provide information on ways to improve communication and how to best provide physical activity to residents with dementia living in long-term care.

**Confidentiality**

**Personal Information**

If you agree to join this study, the co-investigator will look at your personal information and collect only the information they need for the study. Personal information is any information that could identify you and includes your:

- Age
- Educational background
- Duration of employment
- How long you have worked with the resident

Representatives of the University Health Network (UHN) including the UHN Research Ethics Board may come to the hospital to look at the study records and at your personal health information to check that the information collected for the study is correct and to make sure the study is following proper laws and guidelines.

The co-investigator will keep any personal health information about you in a secure and confidential location for 10 years. A list linking your study number with your initials will be kept by the study doctor in a secure place, separate from your study file.

**Study Information that Does Not Identify You**

Some study information will be sent outside of the hospital to the main study site at Toronto Rehab EW Bickle Center. Any information about you that is sent out of the hospital will have a code and will not show your name or address, or any information that directly identifies you.

All information collected during this study, including your personal information, will be kept confidential and will not be shared with anyone outside the study unless required.
by law. You will not be named in any reports, publications, or presentations that may come from this study.

**Rights as a volunteer**

Participating in a study is completely voluntary. You have the right to withdraw from the study at any time. Refusal to participate or early withdrawal from the study will not in any way affect your employment. If you have any questions about your rights as a research participant or have concerns about this study, call the Chair of the University Health Network Research Ethics Board (UHN REB) or the Research Ethics office number at 416-581-7849. The REB is a group of people who oversee the ethical conduct of research studies. The UHN REB is not part of the study team. Everything that you discuss will be kept confidential.

You will be given a signed copy of this consent form.
Consent

This study has been explained to me and any questions I had have been answered.
I know that I may leave the study at any time. I agree to the use of my information as described in this form. I agree to take part in this study.

__________________________  ______________________  ______________________
Print Study Participant’s Name  Signature  Date

My signature means that I have explained the study to the participant named above. I have answered all questions.

__________________________  ______________________  ______________________
Print Name of Person  Signature  Date
Obtaining Consent
### Appendix S
Tables of articles from literature review

<table>
<thead>
<tr>
<th>Topic</th>
<th>Design (Research design used)</th>
<th>Sample (Complete description)</th>
<th>Outcome Measures</th>
<th>Results (Main results, focusing on outcomes in question)</th>
<th>Strengths and Shortcomings</th>
<th>Notable</th>
</tr>
</thead>
<tbody>
<tr>
<td>The aim of this study was to analyse the effects of 2 motor interventions on the cog. fxns and on the balance of institutionalized elderly w mixed dementia. Hypothesis: both interventions will have</td>
<td>6 months longitudinal; pre-post measures</td>
<td>3 arm design: Group 1: interdisciplinary program (PT, OT); 5x/week, 2hrs/day. arts and crafts + PA activities Group 2: PT only. 3x/week, 1 hr a day Group 3:</td>
<td></td>
<td>Intervention improved the balance of institutionalized elderly people with dementia. Global cognition did not improve in group 1, we observed an attenuation of its decline in 2 tests</td>
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<td></td>
<td></td>
<td>N= 54 → 41 finished Inclusion criteria: 1.Dxd dementia, 2. MMSE 3. Katz ADL Scale13; 4.no other neurologic al diagnosis or neuropsychiatric conditions associated to cognitive</td>
<td>Cognitiv e: 1.MMS E 2.the Brief Cognitive Screening Battery. (clock drawing, verbal fluency) Balance: 1. the Berg Balan</td>
<td>Group 1 vs. control: <strong>Cognition</strong>: MANOVA pointed to a main effect of time (F=9.0, P&lt;0.05; effect size=0.94) → cognitive decline in both groups after 6 months. Statistically insignificant main for group (F=1.4, P&gt;0.05) and for groupXtime interaction (F=1.1, P&gt;0.05). However, further testing with ANOVA showed statistically significant main effects for group X time interaction in cog tests (Verbal Fluency Test (F=26.5, P&lt;0.05) and Clock Drawing Test (F=4.4, P&lt;0.05) → the interdisciplinary intervention could reduce some of the decline in specific cognitive domains.</td>
<td>Unclear if intention to treat Randomized by envelope; blinded assessors. but no mention of who are the assessors or randomization concealment</td>
<td>This intervention can help balance as measured by the Berg; didn’t mention the TUG in results</td>
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<td><strong>Balance</strong>: main effect of groupXtime interaction (F=3.9, P&lt;0.05; effect size=0.76),</td>
<td>Excluded residents who showed depressive symptoms as it would be a confounder to the cognitive findings</td>
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</table>
positive outcomes for participants.

“These tx improve the subject’s balance by the effects of motor training and attenuate the decline of several executive fxns, (e.g. attention and planning abilities), by stimulatin g social interaction s at the sessions.”

<table>
<thead>
<tr>
<th>study arm</th>
<th>analysis</th>
<th>outcomes</th>
<th>statistical tests</th>
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</table>
| control | ANOVA one-way for baseline info. MANOVA 2-way used for main and interaction effects on the pts’ cog fxns and balance, w. respect to group 1 vs. group 3, and group 2 vs. group 3. Covariate factors were utilized in those cases with baseline differences. | impairmen t: 5. medicall y fit 6. no antidepressant meds w. central anti-cholinergic or sedation actions; 7. no drug-related impairmen t of cog. or balance, and in a LTC psychiatric institution. Setting: Brazil. | and not for group (F=2.3, P>0.05) or time (F=1.4, P>0.05). ANOVA revealed a difference only with the Berg (F=10.3, P<0.05). Group 2 versus control:
Cognition: main effect of time (F=3.6, P>0.05; effect size=0.92) ➔ cognitive decline in both groups after 6 months. Statistically insignificant main effect was observed for group (F=1.7, P>0.05) or for groupXtime interaction (F=1.6, P>0.05). ANOVA showed statistically insignificant groupXtime interaction. Balance: main effect of groupXtime interaction (F=3.1, P<0.05; effect size=0.64), but not for group (F=0.9; P>0.05) or time (F=3.0, P>0.05). Univariate analysis revealed statistically significant groupXtime interaction for the Berg Balance Scale (F=7.9, P<0.05). |
| treatment 1 | TUG. | ce Scale | Bobath balls, elastic ribbons and proprioceptive stimulation plates were used; the OT (pictures, paintings, drawings and embroidering) that associated motor coordination with cognition. The interventions per groups are so different (dose, timing, and components) this makes it difficult to compare No mention of principles or approaches in dealing with elderly; no timing requirement. No walking tests for performance measures. |

ATTRITION
13/54 pts in the study were unable to complete the trial. The drop-out rate was higher in the tx groups (5 ppl in groups 1 &2) than the control (3 ppl): 4 developed clinical instability; 3 were disqualified after receiving tryciclic antidepressants; 3 withdrew for unknown reasons; 3 died.
STUDY TITLE: The Effects of a Walking/Talking Program on Communication, Ambulation, and Functional Status in Residents with Alzheimer Disease

AUTHOR: Cott, C. A., Dawson, P., Sidani, S., & Wells, D.


<table>
<thead>
<tr>
<th>TOPIC</th>
<th>DESIGN (Research design used)</th>
<th>SAMPLE &amp; SETTING</th>
<th>OUTCOME MEASURES</th>
<th>RESULTS</th>
<th>STRENGTHS AND SHORTCOMINGS</th>
</tr>
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<tr>
<td>The purpose of this study was to investigate the effects of a walking/talking program on in residents with Alzheimer disease (AD) communication, ambulation, and level of function when there were two 1 interventionist walked and talked with 2 residents; Residents were paired with similar walking speeds. Allowed to rest as many times as necessary.</td>
<td>N=86</td>
<td>Inclusion criteria: 1. Dxd with AD 2. a score of ≤ 20 on the Mini-Mental Status Examination (MMSE) (Folstein et al., 1975) 3. no cardiac conditions r/t ambulation 4. a score of less than 3 on item #8 of MMSE 5. can walk 5 meters with or without an assistive device or supervision. Excluded: if the attending physician did not approve. MMSE mean = 7.</td>
<td>Functional Assessment of Communication Skills for Adults (FACS) (Frattali et al., 1995); an observational measure by the RAs Evaluates the communicatio n skills of adults in everyday contexts 2-min walk test- Ok to use aids, done 3x, with the distance covered in the 3rd test as the most accurate</td>
<td>Those in walk-and-talk group DID NOT demonstrate statistically significant differences vs. residents who received the talk-only or control, post-intervention, even after controlling for indiv differences. There was improvement in residents with moderate cognitive impair in communication and maintenance of walking abilities over 4-mont s (p. 86) Cognitive</td>
<td>No description of randomization process was provided Raters were blinded to the group membership of the residents when completing the measures, but not to the study design; RAs were all health professionals with some graduate prep. Power calculation: A large effect size was expected, based on previous studies. Setting the level of significance at 0.01 and the power = 0.80, the required number of subjects for each group was 30, yielding a total sample of 90. Almost enough Interindiv idual</td>
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No mention of personhood, or environment The RAs assumed the conversational burden (Wertz, 1984; Beck and Heacock, 1988). Conversation was guided by the Resident Interest Information Sheet (RIS) and Pleasant Events Schedule (PES) (Teri and Logsdon, 1991), which were completed by the family members.
| Residents to one care provider (2:1) | between the 3 groups at posttest by one-way ANOVA. Paired t tests were used to examine differences in the scores on the outcome measures from pretest to posttest within each of the 3 study groups. \( P = 0.05 \).
Factorial (two-way) ANOVA used to examine the potential moderating effect of cog. impair. on the posttest outcome measures. (p85). The 74 residents were subdivided in to 2 subgroups: MMSE score \( \leq 10 \) and MMSE score > 10 |
| 25% had a MMSE score of 0. | 3 NHs in Toronto. |
| **Enrolment:** | **London Psychogeriatric Rating Scale:** rating scale developed for the assessment of geriatric patients mental disorganization |
| - introductory letter | impairment had a direct effect that was statistically significant. Variability in the outcomes post-test is explained by diffs in the residents’ level of cog. impairment before the study. These findings are contradictory to those of previous studies. |
| - follow-up call Individual meetings to describe study Verbal consent from residents; proxy consent from family. Residents were then screened | variability in the MMSE scores \( \rightarrow \) increased within-group variance may have **reduced the power** to detect significant group differences and may have influenced the effectiveness of the interventions in producing the desired outcomes (Sidani and Braden, 1998). |
| Attrition: | Including residents who could walk 5 meters independently (for safety reasons) it may have resulted in a ceiling effect (some were already walking 90m or more in 2 min pretest, which is within normal ranges for this age group.) So there was little room for improvement. |
| 86 participants with AD | Residents continued to attend facility programs during the course of the intervention \( \rightarrow \) may have muddled effect of |
| - 12 lost – died or surgery (14% attrition rate) = | These provided background info about the residents’ interests and helped the RAs direct conversation toward topics of interest to the residents. |
| **TREATMENT FIDELITY:** RAs were trained & one of the co-PIs observed the RAs implementing the interventions on randomly selected days, completed an Intervention Implementation Checklist | **Reflection** |
| | | | 74 total - 103 approached (those who refused to participate did not differ across the 3 sites or the 3 study groups) | intervention therefore implementing these interventions in less program rich settings may result in significant between-group differences. (p86)

*impt to take note of programs and activities being offered. |
<table>
<thead>
<tr>
<th>TOPIC (Include how variable(s) are defined)</th>
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<th>SAMPLE &amp; SETTING</th>
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<th>COMMENTS (other STRENGTHS AND SHORTCOMINGS)</th>
<th>NOTABLE</th>
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<tbody>
<tr>
<td>Measured the effects of regular exercise on muscle strength and functional abilities in a group of severely demented chairbound Alzheimer residents that was designed by a PT, OT, a Head Nurse on a dementia unit, and the PI</td>
<td>RCT - allocation to either group was concealed by assigning each resident a number Mainly play/fun based for non-ambulatory residents only</td>
<td>N=11 (6/5) Inclusion: dx w AD; English; medically fit; needs 1-2 people to help transfer (nonambulatory) 1 NH in North Virginia</td>
<td>Lower/upper extremity strength, Tinetti balance scale Assessment by Physiotherapist Advanced Dementia Scale (CADs)</td>
<td>Statistically significant difference in exercise group in strength &amp; Tinetti balance = effective (p=&lt;0.05) Regular exercise regime does not improve functional abilities(CADS) in residents. Not significant.</td>
<td>Small sample No adherence reported NO ITT, no analysis section No recruitment, grouping, blinding, exclusion criteria; no description of intervention; no power calculation Music provided for all; snack provided after each 20 min session</td>
<td>Poorly reported study Conducted a pilot with 2 people first</td>
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By: Kemoun, G., Thibaud, M., Roumagne, N., Carette, P., Albinet, C., Toussaint, L., … Dugué, B.

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<tr>
<td>The primary aim of this study was to influence of physical training on the cognitive functions of elderly people suffering from dementia. The second aim was to demonstrate that this training can also influence loco-motor efficiency.</td>
<td>RCT</td>
<td>N=31 (81.8 +/- 5.3 years)</td>
<td>Mobility: walking speed, stride length, double limb support time</td>
<td>significant interaction between overall ERFC score and group (F (1, 29) = 55.1, p &lt; 0.01)</td>
<td>Small sample No adherence reported NO ITT, no analysis section</td>
<td>Four patients withdrew from the IG group after a few months. Three stopped due to lost motivation, and one stopped due to a psychotic disorder (hallucinations). Three CG patients missed the post-test evaluation because of a health complication (stroke). Among the 38 patients initially present, only 31 completed the whole</td>
</tr>
<tr>
<td>software for walking assessment</td>
<td>0.01) diminished</td>
<td>series of initial and final evaluations.</td>
<td></td>
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</tbody>
</table>
### Study Title

### Author
Roach, K. E., Tappen, R. M., Kirk-Sanchez, N., Williams, C. L., & Loewenstein, D.

### Purpose of this study
To determine whether an activity specific exercise program is more effective than an assisted walking program or social conversation in improving ability to perform basic mobility ADLs.

### Interventions
**Dose:** 5 days per week for 16 weeks:
- Activity specific exercise group: designed to slow the decline in or improve ability to perform basic mobility activities such as balancing in sitting and standing, transferring etc; strength, flexibility, weight shifting and balance exercises, walk

### Sample
N135 → 82

### Outcome Measures
**Acute Care Index of Function (ACIF)**

<table>
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<tr>
<td>Purpose of this study was to determine whether an activity specific exercise program is more effective than an assisted walking program or social conversation in improving ability to perform basic mobility ADLs</td>
<td>Randomized, controlled, single-blind study comparing an activity specific exercise program to a walking program and an attention control (conversation) group.</td>
<td>N135 → 82 Recruitment plan not reported</td>
<td>Inclusion criteria: (1) resides in a LTC facility; (2) clinical evidence based on a thorough chart review, of probable or possible AD based on the NINCDS-ADRDA criteria; (3) dependence in at least 1 of the</td>
<td>There was no statistically significant difference in effectiveness between the exercise group and the walking group.</td>
<td>Walking intervention was not as good as exercise group but there was still improvement → therefore no evidence to say that exercise is SS better than walking alone</td>
<td>Walk: The subject was allowed to use gait aids and/or moderate physical assistance and to rest as needed. Verbal cues and physical assistance were given to encourage the subject to attend to the walking task</td>
</tr>
<tr>
<td>INTERVENTION: Dose: 5 days per week for 16 weeks: - Activity specific exercise group: designed to slow the decline in or improve ability to perform basic mobility activities such as balancing in sitting and standing, transferring etc; strength, flexibility, weight shifting and balance exercises, walk</td>
<td></td>
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<td>Transfer scale - exercise group increased 6.0% v. 2.5% decrease in the conversation group v. 5.7% decrease in the walking group (odd and unexplained)</td>
<td>Unclear if intervention was done in groups or individually; No falls screening</td>
<td>Interveners met with a PI weekly to problem solve and discuss each participant’s progress. On-site visits were made by PI every 2-3 weeks to observe sessions for quality and consistency.</td>
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<td>Bed Mobility scores: no change, convo group decreased by 11% (NS)</td>
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</table>

**Bed Mobility** scores - no change, convo group decreased by 11% (NS)
in LTC residents with AD.

- Walking: up to 30 mins
- Conversations Treatment sessions lasted 15 minutes during weeks 1 through 6, 20 min during weeks 7-12, and 30 mins weeks 13-16.

INTERVENTIONISTS: Graduate nursing and physical therapy students trained and supervised by the investigators provided all 3 interventions

ANALYSIS: Descriptive statistics; student t-tests and chi square between dropouts and finished participants; ANOVA to compare baseline of 3 groups; RM-ANOVA to compare changes over time in three groups, subgroup

MMSE Mean score = 8-12 coefficients ranging from 0.98 to 0.99.29

6 minute walk - measure of functional mobility. It was performed as a free walk; Subjects were allowed to use assistive devices and were provided physical assistance as needed; measured with a calibrated surveyor’s wheel. Intrarater and interrater reliabilities ranged from 0.80 to 0.99; Stability over 1 week yielded ICCs of 0.99 for the

6mwt- walking group increased 11.4% & convo group increased 9.5%. exercise group unchanged. Subgroup with “low mobility” at baseline, following the intervention, the 6-MWT scores of subjects in the exercise group increased 29.5% and the walking group increased 23.2% whereas the conversation group only increased 7.1%; however, these findings were not statistically significant

ATTRITION: 27% of the supervised ambulation group failed to complete or walking session - Walkers didn’t maintain transfer scores, but improved in walking test, whereas the convo group declined

A study of the 6MW found that residents of retirement homes walked an avg. of 901ft in 6 mins and their scores ranged from 300-1665 ft. Since 300 ft was the lowest score found in this study, authors classified subjects as having “low mobility” if they had a baseline scores on the 6MWt of fewer than 300 ft.
analysis with those with “low mobility”
morning and 0.97 for the afternoon
follow-up testing compared to 18% of the exercise group and 19% of the conversation group - the difference was not statistically significant ($P = .55$).

**AUTHOR:** Rolland, Y., Pillard, F., Klapouszczak, A., Reynish, E., et al

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<tbody>
<tr>
<td>Aim of this study was to determine whether an exercise program would improve ability to perform activities of daily living (ADLs), physical performance, and nutritional status and decreasing behavioural disturbance</td>
<td>12-month multicenter, randomized, controlled, single-blind study of parallel groups of ambulatory subjects with AD living</td>
<td>n = 134 Inclusion: 1) required that participants be able to transfer from a chair and walk at least 6 min w.out human assistance, 2) Dxd w. AD by a geriatrician 3) participants had to have been living in the nursing home for 2 months Exclusion: Parkinson’s disease or vascular dementia.</td>
<td><strong>Katz Index of ADL:</strong> measured changes in function <strong>Neuropsychiatric Inventory (NPI).</strong> evaluated behavioural disturbances as a secondary outcome <strong>CADS scales:</strong> from baseline to completion of the physical activities programs (7 weeks and 6 months respectively). <strong>Montgomery Åsberg Depression Rating Scale (MADRS):</strong> Depression was Baseline age, sex,</td>
<td>ADL mean change from baseline for intervention patients showed a slower decline than in pts in control → intervention group patients declined approx one-third as much as the routine medical care patients (0.6 +/-1.2 vs 0.9 +/-1.1, P5.02). The treatment did not appear to affect any of the 6 ADL items</td>
<td>indicated that the mean adherence to the exercise program was 33.2 (SD25.5) sessions out of the 88 sessions offered to the tx group, although 100% were included in the intention-to-treat analysis. This trial reported that physical activity adherence was significantly related to less deterioration in ADL scores.</td>
<td>Investigators need to be sensitive to the importance of controlling for these differences in pathology and severity of dementia and level of mobility when designing trials that examine the effectiveness of physical activity. Further research should focus on exploring the barriers and facilitators to improving adherence. (p. 164) - “Perhaps attempting to</td>
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*The table above summarizes the study design, sample details, outcome measures, and results of a study on the effectiveness of an exercise program for nursing home residents with Alzheimer’s Disease. The study was a 12-month multicenter, randomized, controlled, single-blind trial involving 134 participants. The outcomes included changes in ADLs, physical performance, nutritional status, and behavioral disturbances. The results indicated a slower decline in ADL scores for intervention group patients compared to control patients.*
and depression with AD living in nursing homes over a 12-month period

- interventionist; 1 hour session, 2x week separated by at least 2 days for 12 months.
- activity program differed from walking for the first half hour of the session followed by strength, flexibility and balance training (increased in exertion over time individualized; based their physical activity programs on previous interventions for frail or impaired residents and the programs were

- current medication (number of meds and use of cholinesterase inhibitors and psychotropic treatments (anxiolytics, neuroleptics, SRIs, and other antidepressants)), and visual and hearing impairment (assessor’s subjective assessment from “good” to blind or deaf, respectively) were recorded. Comorbid disease, history of past surgery or trauma, and depression were recorded from the medical records. Adverse events, falls, fractures, evaluated, examined changes in behavioural disturbances and depression from baseline, 6 months, and 12 months

**MMSE:**
- 6-meter walking speed, Get-up-and-Go test, and one-leg balance test – assessed physical performance
- Nutritional status assessed w. body weight and the Mini-Nutritional Assessment (MNA).

**ANALYSIS:**
- 2 Groups compared using: t, nonparametric Kruskal-Wallis, chi-square, and Fisher exact tests.
- mean change scores and significantly, analyzed one by one. A significant difference between the groups in favor of the exercise program was observed for 6-meter walking speed
- Intervention associated with improvement in mean walking speed but had no significant effect on nutritional status, behavioural disturbance, or depression measures.

**ADHERENCE & ATTRITION**
- No differences between the physical activity plus usual care group and usual care group were reported. designed to have greater than 80% power to detect a relative improvement of 0.5 points or more in total ADL score at 12 months in intervention group than in control (with a 2-sided type I error rate of 0.05).

- match the physical activity programs with the needs, capabilities, and preferences of persons with dementia, to provide regular, appropriate programs, over extended periods, by qualified instructors would increase adherence” (Forbes 2007).

Several observational studies have found that the preventive effects of PA may be weaker for vascular dementia than for AD or dementia in general (Rockwood 2007).

ADL changes
accompanied by music. enrolment in each nursing home, an inside circular walking trail was created and adapted for each exercise group hospitalization, in 5 nursing homes in Toulouse, France.  

SD change scores from baseline to 12 month measurements were used  

Multiple logistic regression analyses used the 6-month and 12-month measurement and time, controlling for the baseline value of the outcome.  

Exploratory analyses were performed according to adherence to the exercise program. Conducted to examine associations between adherence to exercise and change in ADL score using the Spearman correlation  

In the intervention group, adherence to the program sessions in exploratory analysis predicted change in ability to perform ADLs.  

- 101 (82.1%) residents completed the study.  

- Of the 56 exercisers who completed the study, mean adherence was 33.2 +/- 25.5% of the 88 sessions. (35/67 participants attended less than one third of the activity sessions.)  

resulted from the intervention but no behaviour-intervention- only comparison group can’t determine the specific effect of exercise versus the non-exercise intervention. However, the significant improvement in walking speed suggested a direct link between the exercise program and the disability measures.
**TOPIC**
(Include how variable(s) are defined)

**DESIGN**
(Research design used)

**SAMPLE**
(Complete description)

**OUTCOME MEASURES**
(Main results, focusing on outcomes in question)

**RESULTS**
(Main results, focusing on outcomes in question)

**STRENGTHS AND SHORTCOMINGS**

**NOTABLE**

| The purpose of this study to determine the effects of a short-term (12-week), combined training program (including resistance, joint mobility and coordination exercises) for patients with AD on their i) overall functional capacity (muscle strength and flexibility), | Randomized block, controlled (single blind) design (i.e., to remove the confounding effect of gender on physical capacity, pts were divided in 2 blocks by gender before group assignment). | N=16 (8/8) (10 female, 6 male) Training (n = 8; 3m, 5 f; mean±SD age, body mass and height of 76 ± 4 yrs, 70.2 ± 14.1 kg and 164.9 ± 13.0 cm) or control group (n = 8; 3 m, 5 f; 73 ± 4 yrs, 66.7 ± 9.5 kg and 161.1 ± 7.9 cm) | The **Senior Fitness test**: a battery of tests used to evaluate the functional capacity of the pts (weights, flexibility of the lower (chair sit-and-reach test) and upper body (back scratch test); speed, agility and balance while moving (8-foot up-and-go test); and | Significant improvements after training (p < 0.05) in: upper and lower body muscle strength and flexibility, agility and dynamic balance, and endurance fitness (using the Senior Fitness test), gait and balance abilities (with subsequent decrease in risk of falls) (Tinetti scale) and in the ability to perform ADLs independently | Small sample, fairly high MMSE training program included: resistance, joint mobility and co-ordination exercises significantly improved their overall functional capacity and their ability to perform ADLs independently. |
| For patients with AD on their i) overall functional capacity (muscle strength and flexibility), | **PROGRAM**: 36 programmed training sessions 12-week | | | | |
| DOSE: 75 min x 3x/weekly sessions (MWF) | **VS. Control (usual care) Joint mobility exercises; resistance bands (3 sets of 15 reps each). Stretching exercises at | | | | |
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| Agility and balance while moving, and endurance fitness), and ii) ability to perform ADLs. | the end of each set of resistance exercises; Coordination exercises with foam balls, e.g., bouncing a ball with both hands, tossing/catching a ball. | MMSE mean score = **20.1 ± 2.3** (training group) and **19.9 ± 1.7** (control group). NH in Spain. | aerobic endurance (2-min step test). | higher than baseline values in the training group vs. no changes in controls (p > 0.05). Chair stand test: main group (F(1,14) = 9.66; p = 0.008; h2 = 0.408), time (F(1,14) = 81.64; p < 0.001; h2 = 0.854) and interaction effect (F(1,14) = 48.74; p < 0.001; h2 = 0.777). Adherence to our training program was 98.9% (individual values of 100% in 5 subjects and 97% in 3 subjects). = this type of exercise intervention is feasible and tolerated by pts. Walking trail and “gentle” stretching exercises for all major muscle groups. Music (from their youth) was played. Senior Fitness test were preceded by 5 familiarization sessions for all the subjects (spread over a 2-weeks) that finished with repeated tests showing significant (p < 0.01), high (r ≥ 0.97) intra-class correlation coefficients for all types of tests. For each subject and test, we took the highest value of the repeated tests. | health problem were noted in the subjects of both groups over the 12-week period. |

AUTHOR: Stevens, J., Killeen, M.,

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<thead>
<tr>
<th>TOPIC (Include how variable(s) are defined)</th>
<th>DESIGN (Research design used)</th>
<th>SAMPLE &amp; SETTING (Complete description of sample, how it was selected, etc)</th>
<th>OUTCOME MEASURES</th>
<th>RESULTS (Main results, focusing on outcomes in question)</th>
<th>STRENGTHS AND SHORTCOMINGS</th>
<th>NOTABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A hypothesis being tested in this randomised control trial then is that exercise effects the cognitive function of residents with dementia; and the level of disability related to</td>
<td>Three arm RCT: CG1- usual care, Cg2- social activity, IG- exercise</td>
<td>N=120 consented → n= 75 complete data sets (56female/19male) Mean Age=80.5</td>
<td>1. The Clock-Drawing Test measured the progression of the symptoms of dementia; and</td>
<td>Clock drawing -Both control groups declined in cog. Function v. The IG improved in cognitive function, however was not statistically significant. (p = .524). between group analysis showed that statistically significant diffs exist between the CG, Group 2, and IG (p=0.002)</td>
<td>Power calc: power analysis was conducted setting a significance level at .05, an ES of .25, standard deviation and power of .8 = approx 30 per group (90 overall) BUT Sample smaller than in the power analysis</td>
<td>Consent: The participants were regularly questioned by research and facility staff to ensure that they were participating as a matter of their perceived free choice. For those with memory and cognitive problems, this inquiry was made by researchers and staff many times between and per session. Anecdotal evidence from some residents and their carers as well as direct observations by the researchers suggest</td>
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<tr>
<td>INTERVENTION Dose: 3 min sessions 3xweek for 12 weeks. accompanied with 'generation appropriate' music, is based on joint and large muscle group movement with an intention to create a gentle aerobic exertion.</td>
<td>Inclusion criteria: •mild to moderate dementia (MMSE scores &lt;23) and who had a confirmed diagnosis of dementia; •lives in an aged care facility; •legally and cognitively capable of providing informed consent to participate (proxy from POA if not</td>
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<td>2. The Revised Elderly Disability Scale (REPDS) measured the disability of participants in a range of categories related to</td>
<td>REPDS- the CGs both declined with the usual care group declining more. The IG had improvements that</td>
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| activities of daily living and thus their care needs. | ANALYSIS: Within within groups analysis- Wilcoxon Signed Ranks tests of clock drawing and REPD. Between groups analysis of REPDS- repeated measures T-Test analysis over time | capable themselves); able to respond appropriately to a majority of verbal requests (as would be req’d by the exercise prog); be physically capable of undertaking gentle but regular exercise (as ax’d by home staff and project team) Exclusion criteria: severe dementia (MMSE scores between 0-9) 6 nursing homes in Australia | activities of daily living. and is able to calculate and track the amount of nursing care a resident requires. No psychometric properties identified | were statistically significant (p = .019) in Self help. Between groups analysis showed significant improvement in the IG. Attendance records were kept for both IG and CG → Data from those whose records showed 75% attendance or greater were eventually analyzed = no ITT | would be due to Alzheimer's Disease? Clock draw - Whether the tool is responsive to change in a 12-week trial period that the activity was enjoyed by all participants, their carers and many of the staff. Physiological adaptation will occur in frail older people with 20-30 minutes of exercise 3 times per week over a period of 3 months (Bonner & Cousins 1996). |
**STUDY TITLE:** Effect of a Combined Walking and Conversation Intervention on Functional Mobility of Nursing Home Residents With Alzheimer Disease


<table>
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<tr>
<th>TOPIC/PURPOSE</th>
<th>DESIGN (Research design used)</th>
<th>SAMPLE &amp; SETTING</th>
<th>OUTCOME MEASURES</th>
<th>RESULTS (Main results, focusing on outcomes in question)</th>
<th>Strengths and shortcomings</th>
<th>Notable</th>
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<tbody>
<tr>
<td>Examine the effect of a combination of exercise and conversation with walking only exercise and conversation-only</td>
<td>repeated measures three-group design with random assignment</td>
<td>N=71 → 65 (20/22/23)</td>
<td>Modified 6 minute walk-modified to allow the use of a gait aid and/or physical assistance from the examiner. ICC for intra- and inter-rater reliabilities = 0.80-0.99. Stability over 1 week =ICCs of 0.99 for the morning and 0.97 for the afternoon.</td>
<td>Subjects in the assisted walking group declined 20.9% in functional mobility (p = 0.0119); the conversation group declined 18.8% (p = 0.0874). The combined walking and conversation treatment group declined only 2.5% (non sig change in this group). Significant changes between the groups</td>
<td>Raters were blinded to group assignment. “Staff should be prepared to use effective communication strategies to gain acceptance of the intervention” (p5) → but no communication strategies outlined</td>
<td>An effective intervention for preventing deterioration in functional mobility in residents with AD. The social interaction/social support during walking exercise is essential to increase level of compliance to thereby improve tx outcomes! Consent for participation was obtained from the resident’s proxy health care surrogate; Subjects themselves assented to participate. (No protocol described)</td>
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</table>

- **Dose:** 30 mins x 3 times a week x 16 weeks

- **Intervention- 3 arms:**
  1. Talking: 30 mins of conversation about personal interests
  2. Walking: Self-paced assisted walking; Patient was encouraged to ambulate as far as possible during the session; interventionist was not allowed to provide social support/cannot initiate conversation but responded.
  3. Walking and talking: interventionist encouraged resident, and engaged in conversation about hobbies

- **Dose:** 30 mins x 3 times a week x 16 weeks

- **N=71 → 65 (20/22/23)**

- **Diagnosis:** AD

- **Subjects had to be able to stand and walk with the assistance of one individual and/or an assistive device and have physician clearance to**

- **Physician clearance:**

- **Physician clearance:**

- **Physician clearance:**

- **Physician clearance:**

- **Physician clearance:**
treatments on the functional mobility of frail nursing home residents with AD.

ANALYSIS:
Descriptive statistics, Student t test, ANOVA, and chi-square were used to compare the 3 groups at baseline and to compare subjects who completed the intervention period with those who did not. RM-ANOVA and ANCOVA with planned comparisons were used to examine the change over time.

Initial descriptive analysis of the 6-min walk measure =magnitude of the variance of the 3 groups was proportional to the magnitude of the means of the groups. This is not uncommon → This type of instability of variance adversely affects the statistical power of repeated measures ANOVA. To address this, a variance stabilizing transformation was made \[\log(6\text{-minute walk score } +1)\]; the constant was added to account for values near 0.

<table>
<thead>
<tr>
<th>MMSE mean</th>
<th>Age mean</th>
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<tr>
<td>11</td>
<td>88</td>
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</table>

Units from 2 NHs in Florida

scored as the distance in feet walked in the 6-min. with distance (use of a calibrated surveyor’s wheel)

measured pre and post gait belt, aids and rests used because many LTC individuals have very low endurance and are unable to ambulate the full 6 mins.

After adjusting for baseline scores and tx fidelity, the mean 6-minute walk distance at post-test was \[238.5\ (SD 30.2)\) for the conversation group, \[284.8\ (SD 29.01)\) for the walking group and \[322.6\ (SD 28.3)\) for the combined treatment.

When tx fidelity is statistically equalized across the 3 groups: combo group has the highest score but the walking group score is no longer significantly diff from the combined group. Both groups scored significantly higher than the convo group. Difference between the walking and the combined tx groups in 6min walk due to diffs between tx fidelity in groups.= findings imply that the convo component of the combined tx intervention improved tx fidelity= improving the outcome

ATTRITION:
Subjects in the conversation treatment group completed 90% of intended treatment compared with 75% in the combined group and only 57% in the assisted walking group. Failure to treat was due to subject refusal and physical illness. Subjects lost to follow-up were significantly older and had more comorbidities than did the subjects who completed the study

Treatment fidelity— the proportion of actual tx to intended treatment; Records were kept of the actual amt of tx received by each subject (Pocock, 1983).

From Tappen (2001): The intervenors noted that participants were easily distracted =had to be redirected to continue walking; Residents were encouraged to express a preference for the route taken during the walk; The opportunity to go outdoors or to peer out a large picture window added to the pleasure derived from the experience. Those who were afraid of falling were reassured by the use of a guiding hand or arm for support in addition to the gait belt. Several wanted their wheelchair nearby for
security, “just in case I need it.”

Those who became ill or injured were remobilized ASAP to minimize disuse sarcopenia (high risk).
STUDY TITLE: Six-Month **Walking Program** Changes Cognitive and ADL Performance in Patients With **Alzheimers**.

**AUTHOR:** Venturelli, M., Scarsini, R., & Schena, F.

**YEAR:** 2011 *American Journal of Alzheimer’s Disease & Other Dementias*, 26(5), 381–388.

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<tr>
<td>Aim: To determine whether an institution-based walking program carried out together with family member caregivers could reduce the functional, cognitive, and physical decline of</td>
<td>RCT: IG versus CG (usual care) 12 people in each group</td>
<td>N=21 (11 in IG v 10 in CG) Age=84 +/- 5 years.</td>
<td><strong>Barthel index:</strong>- done by observing each resident’s daily ADLs between 7.00am - 12.00.; done by geriatric nurse from team</td>
<td>Barthel: WG showed significant improvement in transfers (bed to chair, P = .01), mobility on a level plane (P=.002), and stairs (P = .01), whereas the CG maintained the same scores</td>
<td><strong>Used family as the interventionists</strong> ⇒ compliance was very high. 93.4 % +/- 3.2% in 90 sessions -KNOWING THE PERSON =HIGH ADHERENCE AND GOOD RESULTS -Primary reason for missing session was constipation tx</td>
<td>stabilized the progressive cognitive dysfunctions in NH residents with AD through a specific walking program. Team made a record of anthropometrics, walking abilities, diagnoses, current medication, and clinical characteristics of the participants, physiotherapy hours, and organized leisure programs that were regularly offered to the residents excellent measures section to develop intervention protocol (p382)</td>
</tr>
<tr>
<td>Intervention:</td>
<td><strong>Intervention:</strong> Dose: Goal of 30 mins 4x a week x 6 months Simple aerobic walking activity. Caregivers were instructed to encourage the participant to maintain the “fastest” walking speed possible &amp; maintain a constant walking speed (avoid accelerating or stopping, but to try, to understand the</td>
<td>Inclusion criteria: - nursing home residents of an Alzheimer’s care unit - 65 y.o. &gt;; Dependent on assistance in 2+ ADLs according to the Barthel index.19 - MMSE 5&gt; &lt;15 - Performance Oriented Mobility Assessment</td>
<td><strong>MMSE</strong> - done in the AM</td>
<td>MMSE: No significant change in MMSE scores before and after the training period, whereas the CG group showed a decrease in scores.</td>
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<td><strong>physical performance test</strong> (PPT)- meas. physical functions; by PT</td>
<td><strong>POMA test</strong> -</td>
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nursing home residents in the later stages of AD.

same caregiver followed the same nursing home resident during the 6-month program.

The CG participated Usual care activities

Logs: the walking session times, how long the walking session lasted, and number of laps (distance) were recorded in the log and checked before and after each visit.

ANALYSIS

independent sample t test and z test were used to compare values between the groups. 2-way ANOVA with a df of 1 for time, 1 for

(POMA) index, 23> (absence of mobility limitations)
- constant oxygen saturation during walking (SpO2 > 85%).
- be in the later stages (CDR3-CDR4) of AD
- recruitment selected based on inclusion criteria (35 eligible 7 excluded)
- one nursing home in Italy

measures the gait/balance performance; by PT

6-minute walking test (6WT) - walking Performance using the special care unit hallway of 60 m.; by kinesiologist according to a standardized protocol24 all team members blinded

6MWT: WG showed a significant improvement in walking performance, whereas the CG declined significantly. A statistically significant interaction between groups and time (P < .001): the statistical power performed (a=05) for groups was 1.00 to 0.05 for time and 0.997 for groupsXtime. The weekly distance covered during the 4 sessions of the 30-minute walking program significantly improved for the WG in 24 weeks (P

failure

The multidisciplinary staff recorded medical measurements: BP, blood sugars, body mass, height, and weight. The staff took these measurements, caregivers appreciated this program because they were actively involved

As positive psychological reinforcement for the exercise, cookies were offered to the NH resident and walker at the end of the session

health status Before each session (exclusion criteria were fever, constipation treatment, low blood pressure, or other serious medical conditions).

All the logs were kept in the ACU and filled out after each visit
group, 1 for time _
group, with a residual
of 38, and a total of
41. Tukey all pairwise
multiple comparison
< .001).
No changes in
biomedical
outcomes
No reports of
POMA or PPT

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<tr>
<th>ATTRITION AND ADHERENCE</th>
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<tbody>
<tr>
<td>Authors</td>
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<tr>
<td>(Venturelli et al., 2011a)</td>
</tr>
<tr>
<td>Authors</td>
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<td>--------------------</td>
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<tr>
<td>(Santana-Sosa et al., 2008)</td>
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<td>Authors</td>
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<td>(Cott et al., 2002)</td>
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<tr>
<td>(Christofoletti et al., 2008)</td>
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<tr>
<td>Not randomized</td>
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Not randomized
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<tr>
<th>Authors</th>
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<th>Measures</th>
<th>Interventions</th>
<th>Results</th>
<th>Resident compliance</th>
<th>Dropout</th>
<th>Recruitment rate</th>
<th>Statistical analysis</th>
<th>Other (randomization)</th>
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<tbody>
<tr>
<td>Francese et al., 12 parti no baseli No mmse; Vague activities (used balls, leg Lower/upper extremity CNS (author)</td>
<td>P&gt;0.05). ANOVA revealed a difference only with respect to Berg Balance Scale F=10.3, P&lt;0.05). multidisciplinary or physiotherapeutic intervention were able to improve a person’s balance. No change in global cognition.</td>
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<tbody>
<tr>
<td>1997) Stevens &amp;120</td>
<td>80.5</td>
<td>“moder”</td>
<td>Group exercise of muscle movement</td>
<td>Physical: The Revised</td>
<td>The “researcher”</td>
<td>SS improvement</td>
<td>75%</td>
<td>45/120 = 37.5</td>
<td>NA</td>
<td>Repeat</td>
<td>Lotter</td>
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<td>1997) cipants → 11</td>
<td>11</td>
<td>info about patients; choose nonambulatory patients</td>
<td>weights) to music 20 mins x 3x a week x 7 weeks</td>
<td>strength, Tinetti balance scale Advanced Dementia Scale (CADs)</td>
<td>and 2 volunteers = did the intervention and completed measures (no nursing assessment)</td>
<td>difference in exercise group in strength &amp; Tinetti balance</td>
<td>data suggest that a regular exercise regime does not improve functional abilities (CADS) in residents.</td>
<td>No adherence reported</td>
<td>in control group</td>
<td>‘working with advanced AD takes much time and manpower to mobilize the group ’</td>
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<td>Killeen, 2006.</td>
<td>75</td>
<td></td>
<td></td>
<td>“ate” with aerobic exertion to music 30 min x 3x a week x 3 months</td>
<td>Elderly Disability Scale</td>
<td></td>
<td>t in PF in strength training group (F=4.29 and p=.019), especially in self-care, confusion, and behaviour. SS decline in both control and convo group and NS improvement in cognitive (p=.524) (p=&lt;.00)</td>
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<tr>
<td>Rolland et al. (2007)</td>
<td>134 (67/67)</td>
<td>83</td>
<td>mean =8.8</td>
<td>30 mins (walking; squats, leg exercises, flexibility, balance to music)</td>
<td>6-meter walking speed</td>
<td>Occupational therapist</td>
<td>NS in MADRS,</td>
<td>Only 54 completed the interve</td>
<td></td>
<td></td>
<td>ITT</td>
<td>5 falls during exercise sessio</td>
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<tr>
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<td>1 hour session, 2x week separated by at least 2 days for 12 months.</td>
<td>test, one-leg balance test, Katz Index of ADL</td>
<td>and NPI</td>
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<td>Tappen et al. (2000)</td>
<td>71</td>
<td>65</td>
<td>11</td>
<td>30 minutes x3 times a week for 4 months</td>
<td>Nutritional Assessment (MNA).</td>
<td>Secondary: falls</td>
<td>Subjects in the assisted walking group declined 20.9% in functional mobility; the conversation group declined 18.8%. The combined walking and conversation treatment group declined</td>
<td>Adherence = 57% walk; walk talk = 75%, talk was 90%.</td>
<td>6</td>
<td>NA</td>
<td>= social conversation seems to have a positive effect on adherence</td>
<td></td>
</tr>
<tr>
<td>Authors</td>
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| Toullette et al. (2003) | 20  | 14-18 |    | Strength, proprioception: walking on a variety of surfaces; balance: one foot stand, obstacle avoid/step over; flexibility: ankle ROM; sit and reach | TUG, chair sit and reach, 10 m walk speed, platform QFP (for balance + postural sway) | only 2.5%.
= reduced decline (no improvement.) | Walking, mobility, balance all improved significantly in training group; no change in control | NA                  | NA                  | NA                  | Quasi experimental |
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<th>Statistical analysis</th>
<th>Other (randomization)</th>
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<tbody>
<tr>
<td>Kemoun et al. (2009)</td>
<td>31</td>
<td>82</td>
<td>MMSE mean=12</td>
<td>Walking, arm-leg ergometer, combined endurance, balance, walking sessions 3x 1-hour sessions per Week X 15 weeks</td>
<td>Gait parameters (gait speed, stride length, time in double-limb support) (Rapid Evaluation of Cognitive Functions test (ERF French version) and walking analysis)</td>
<td></td>
<td>the subjects from the intervention group improved their overall ERFCognitive score (F (1, 29) = 55.1, p &lt;0.01) (while the CG decreased their ERFC score. Interactions were also observed between walking parameters and groups (F (1, 29) = 53.4, p &lt;0.01) and the stride</td>
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<td>RCT</td>
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<td>Brill et al.</td>
<td>10</td>
<td>NA</td>
<td>NA</td>
<td>Stretching warm up and cool-down to improve flexibility; strength exercises using therabands three times per week for 20 minutes a session X 11 weeks</td>
<td>Timed chair stand; hand grip strength; Cybex chest press; sit and reach; standing reach; habitual gait Cognitive: MMSE, GDS</td>
<td>Qualitative improvements in strength and balance; no statistics reported. Just t tests to show sig difference.</td>
<td>Adherence – not reported</td>
<td>Pilot, quasi-experimental Very bad quality study No control</td>
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<tr>
<td>Binder (1995)</td>
<td>34</td>
<td>£25</td>
<td>88.7</td>
<td>3x/week: Strength of hip, knee, ankle movers, flexibility of all upper/lower</td>
<td>Standups X1, X5; knee extensor torque (0 + 60</td>
<td>Balance improved (0.002); knee extensor</td>
<td>75%</td>
<td>9 (8 did not want to exercise</td>
<td>100%</td>
<td>Per protocol</td>
<td>Pilot, quasi-experimental</td>
<td></td>
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<tr>
<td>Authors</td>
<td>N</td>
<td>Age</td>
<td>MMSE</td>
<td>Intervention</td>
<td>Measures</td>
<td>Interventions</td>
<td>Results</td>
<td>Resident compliance</td>
<td>Drop out</td>
<td>Recruitment rate</td>
<td>Statistical analysis</td>
<td>Other (randomization)</td>
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<td>Littbrand, Lundin-Olsson, L., Gustafsson, Y., &amp; Rosendahl, E. (2009)</td>
<td>191</td>
<td>85</td>
<td>17</td>
<td>extremity joints, increase movement speed; chair, ball, theraband, ankle weights, parallel bars x 8 weeks</td>
<td>degrees/sec), hip extension 1RM; time/# steps to walk 24 ft, # steps to turn, # of Romberg posits</td>
<td>torque declined; 1RM for hip extension increased</td>
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<td></td>
<td>1, 1 reverted proxy = 36%</td>
<td>No control</td>
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</table>

- **GROUPS of 3 to 9
  - 3 month intervention - The sessions were approx 45 minutes long and were held 5 times during each 2 weeks period = 29 sessions
  - The exercises mimicked movements used in everyday tasks, e.g. standing up from a sitting position, step-ups, squats, turning
  - PT for IC
  - And OT for controls
  - **Barthel Index (10 item measure)
  - Berg Balance Scale
  - Functional Ambulation Categories (FAC)
  - MMSE (>10 only)
  - 15-item Geriatric Depression Scale

- **Clinically significant Short term effect on ADLs in people with dementia (change of 1.1 on Barthel), not statistically sig
  - 5% adverse events

- **Attendence = 71-72% but adherence = 53% during first 3 months, and then only 36% partially adhered, and 46% did not adhere at all.
  - 4 (did not want to continue,; the other 20 died, moved on)

- **ITT Rct
<table>
<thead>
<tr>
<th>Authors</th>
<th>N</th>
<th>Age</th>
<th>MMSE</th>
<th>Intervention</th>
<th>Measures</th>
<th>Interven tionists</th>
<th>Results</th>
<th>Resident compliance</th>
<th>Drop out</th>
<th>Recruitment rate</th>
<th>Recruit ment rate</th>
<th>Statistical analysis</th>
<th>Other (randomization)</th>
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<tbody>
<tr>
<td>Roach et al., 2011</td>
<td>N13 5 → 82</td>
<td>88</td>
<td>110.7</td>
<td>trunk and head while standing, and walking over obstacles.</td>
<td>Scale</td>
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<td>NA</td>
<td>53/135 = 39.2</td>
<td>NA</td>
<td>Other (randomization)</td>
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<td>After intervention, 3 months of Physical tasks given for staff to work into daily care</td>
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<td>NA</td>
<td>53/135 = 39.2</td>
<td>NA</td>
<td>Other (randomization)</td>
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<td>Specific activities a related to transferring and mobility (strength training, flexibility, balancing, weight shifting) Versus walking (self-directed pace)</td>
<td>Acute Care Index of Function; 6-Minute Walk test</td>
<td>Graduate nursing and physical therapy students</td>
<td></td>
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<td>NA</td>
<td>NA</td>
<td>53/135 = 39.2</td>
<td>NA</td>
<td>Other (randomization)</td>
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</table>

Roach et al., 2011
N13 5 → 82
88
110.7
Specific activities a related to transferring and mobility (strength training, flexibility, balancing, weight shifting) Versus walking (self-directed pace)
# Appendix T

*Table 11: Overview of Sessions per Resident, their Walking Milestones, and if Sessions Were Missed in each week*

<table>
<thead>
<tr>
<th>Resident</th>
<th>Wk 1</th>
<th>Wk 2</th>
<th>Wk 3</th>
<th>Wk 4</th>
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<th>Wk 14</th>
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<td>R1</td>
<td>8x/wk</td>
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<td>R16</td>
<td>1x/wk 1000 feet</td>
<td>1 x/wk</td>
<td>1x/wk 1500 feet</td>
<td>2x/wk 2000 feet</td>
<td>2x/wk -2</td>
<td>2x/wk -J</td>
<td>2x/wk 2000 feet -1</td>
<td>2x/wk 2500</td>
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<td>R17</td>
<td>1x/wk 180 feet</td>
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<td>1x/wk 1 breaks</td>
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<td>1x/wk 200 feet 2 breaks</td>
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<td>1x/wk 250</td>
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<td>Pain in legs -J</td>
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<td>1x/wk 1x/wk</td>
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<td>R21</td>
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<td>1x/wk 1850</td>
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<td>1x/wk 1x/wk</td>
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<td>1x/wk 4000, one break</td>
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<td>4x/wk</td>
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<td>1x/wk</td>
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<td>4x/wk</td>
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<tr>
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<td>R28</td>
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<td>400</td>
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</tr>
</tbody>
</table>
## Appendix U

### Care plan example (initials used for anonymity)

<table>
<thead>
<tr>
<th>Schedule: 1015am and/or 1pm x 5 days a week.</th>
<th>Mobility related communication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Routine</strong></td>
<td></td>
</tr>
<tr>
<td>Daughter or caregiver will have the resident in a wheelchair</td>
<td>• Wheelchair bound most of the day, except for two walks taken daily. Walks with a 4 wheeled walker and minimal contact assistance on the tailbone</td>
</tr>
<tr>
<td>• Walk her from outside the door, to the end of the hallway. SIT. Turn the chair around, walk back.</td>
<td>• Unsteady without support</td>
</tr>
<tr>
<td>• Need to support her tail bone with your hand, otherwise she will slump ++</td>
<td>• Is able to generally walk at least half way to the end of the hall before taking a rest.</td>
</tr>
<tr>
<td>Caregiver here everyday except Tues, Thursday</td>
<td>• Will say she is tired and wants to sit down; she is easily encouraged so get her to “walk a bit further, you’re almost there”</td>
</tr>
<tr>
<td></td>
<td>• Requires cues ++ to correct posture from head to toe: “chin up, look forward...stand tall...Belly and hips forward...walk using your feet, don’t lean on your hands or else you’ll hurt your shoulders and arms.”</td>
</tr>
<tr>
<td></td>
<td>• Take standing rests instead of sitting ones. Take this as an opportunity to correct her posture “stand tall”</td>
</tr>
<tr>
<td></td>
<td>• Gets cortisone shots in her right shoulder, has two replaced knees, gets half a Percocet every AM and Pm for pain in her neck</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Verbal and nonverbal communication strategies:</th>
<th>Person:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Painful to turn to the Right → stand on the left side</td>
<td>• 91 y.o., Was born in a little village in Saskatchewan called S. Her parents were the founders of this village</td>
</tr>
<tr>
<td>• no hearing aids or glasses required</td>
<td>• oldest of five siblings: N., T., M. and L.</td>
</tr>
<tr>
<td>• Use the person’s name when addressing them to help them retain a sense of identity</td>
<td>• lived in Thunder bay from when she was a little girl until moving to kengsinton. Got married at 24 to Steve</td>
</tr>
<tr>
<td>• establishing eye contact is helpful because she is HOH</td>
<td>• lived on a farm, worked with horses</td>
</tr>
<tr>
<td>• using a calm tone of voice</td>
<td>• Loves to garden</td>
</tr>
<tr>
<td>• using overemphasis and exaggerated facial expression</td>
<td>• Has three children: R., M., J.</td>
</tr>
<tr>
<td>• She is good with gentle touch</td>
<td>• Was the chef at a restaurant, cleaned hospitals; volunteered with the Cancer association and meals on wheels</td>
</tr>
<tr>
<td>• Pointing (Use actions as well as words. E.g. talk and show) helps get the point across</td>
<td>• Will forget she lives here, need to remind her “yes you’ve been here for 6 months now”</td>
</tr>
<tr>
<td>• Able to answer closed-ended questions (yes/no questions) well</td>
<td></td>
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<tr>
<td>• Occasionally open ended questions are handled well but she may answer “I don’t know/I can’t remember”. Needs prompting++</td>
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<tr>
<td>• simple sentences/ reduced syntactic complexity</td>
<td></td>
</tr>
<tr>
<td>• asking one question or giving one direction at a time</td>
<td></td>
</tr>
<tr>
<td>• minimal use of pronouns</td>
<td></td>
</tr>
<tr>
<td>• Giving a choice of responses</td>
<td></td>
</tr>
<tr>
<td>• Reduce distractions in the environment to get her to answer</td>
<td></td>
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<tr>
<td>Things to know</td>
<td></td>
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<tr>
<td>-------------------------------------------------------------------------------</td>
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<tr>
<td>• Able to follow along simple story lines</td>
<td>• Kind; pleasant; may need to be engaged into the conversation</td>
</tr>
<tr>
<td>• Still able to conceptualize and understand stories about social things like</td>
<td>• great sense of humor</td>
</tr>
<tr>
<td>etiquette, the lottery, the environment.</td>
<td>• excellent vision</td>
</tr>
<tr>
<td>• Daughter is very involved; family also has a private caregiver (RPN) who</td>
<td>• loves beer and wine</td>
</tr>
<tr>
<td>is with her at all times.</td>
<td>• When she was a child, kids used to make fun of her by calling</td>
</tr>
<tr>
<td></td>
<td>her N.</td>
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</tbody>
</table>
### Appendix V

**Table 12: POA qualitative responses from TEI open-ended questions**

<table>
<thead>
<tr>
<th>Question</th>
<th>Responses pre-intervention</th>
<th>Responses post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please describe how important is “person-centered care” as it relates to the care of your loved one and other nursing home residents with dementia?</td>
<td>FM-R3: Because everyone is an individual and [institutional] policies can be annoying and detrimental to health, as it doesn’t consider that people are at different levels of the disease and of their dementia. Care and the approach needs to be tailored to each individual. Not everyone is the same.</td>
<td>R5: Person centered care is very important; he would have no-one here to visit him. He has no friends; he has no-one to treat him like a person here. He hasn’t made any friends here on the unit either. He lost himself towards the end and I think if the staff had spent 30 minutes with him like you do, it would have gotten to get some of his stuff done here; he would have been better off if people spent more time with him.</td>
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<td></td>
<td>FM-R5: The difference of person centered care gives the biggest difference; knowing what makes them tick is important, it is the most important aspect. It’s like caring for a baby; you can tell when the baby is cared for, when they’re clean, when they’re happy etc., but here he gets ignored, he’s not shaved and he is in dirty clothes. There is also more open communication with person centered care, with myself and including me as well, because person centered care means that the care is family centered.</td>
<td>R8: It is important to have an individual approach as not everyone can relate to group activities and it must be even harder when you have dementia to focus on so many people and things going on at once. The person-centred approach seems to be based on having the person's permission and building on their initial ability and interest. It's also important to build on the capability that remains, and to take time to learn the individual's patterns of communication</td>
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<td></td>
<td>FM-R7: You need to know the person because they can’t tell you what happened 24 hours ago; they can’t tell you what they want or what happened. If you know them, you can read them and meet their needs, also their routines and knowing their families. You can talk to them about things no-one here can talk to them about.</td>
<td>R1: In my mother’s case, it has maintained her mobility plus, I believe, made her stronger. She walks with greater strength and confidence in completing her daily distances and walking goals.</td>
</tr>
<tr>
<td>Do you think regular walking and talking/person-centered care will influence the mobility of residents who have dementia? Why?</td>
<td>FM-R6: She can walk, but the engagement can help distract and break the day for her so she’s just not walking around the nursing station. She can’t verbalize and she doesn’t realize what she’s doing any more, and practicing talking to another person might help that.</td>
<td>R5: [This intervention] kept him up and going to the dining room when no-one else could. It is interesting for him, I think. He got up and moved; he was stimulated. The physio here is so boring; all he does is stand there and raise his legs up and down 5 times and that’s it. Those activities were not tailored to his level, because at that time</td>
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<tr>
<td>FM-R8: Yes, it will maintain her abilities so she won’t lose them; so walking and talking will be positive; any mobility will alleviate decline and mobility issues, especially if you go outside and she can do some of the things that she enjoys, like looking at nature and the trees.</td>
<td>R12: Yes! It helps with mobility! It gets her up and walking and talking so that she doesn't even realize that she's actually working on improving her mobility. She's just enjoying the social aspect of things.</td>
<td></td>
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<tr>
<td>FM-R12: I think that it will help them with their mobility and it will improve; the body is just meant to move, not just lie around all day. I think movement and walking releases good hormones into the body and makes everything flow better. Talking makes the walking go by faster and you don’t realize that you are actively exercising.</td>
<td>R3: Over the past few months, my mom became happier, more aware, more articulate and better socialized. I know from past experience that walking has always helped her mood and cognition. I think the intervention also helped her settle into her new routine and I feel like it helped her overcome her feeling like she was kept in a prison in an institutionalized setting.</td>
<td></td>
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<tr>
<td>Do you think regular walking and talking/person-centered care will influence a resident’s ability to perform daily care activities (e.g. toileting, transferring) if they have dementia?</td>
<td>FM-R10: The more she walks, the stronger she will be, so she can be more independent. She needs some help now and the activities here only provide seated exercise, so the walking will help her maintain her standing and walking abilities more,</td>
<td>R23: Yes, if they can walk they can assist the attendant taking them to the toilet. They can sit in a chair and move around with assistance. Thus preventing issues such as bed sores. They are keeping their muscles working so can do things for themselves like eating.</td>
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<tr>
<td>FM-R21: It can keep her able to walk to the toilet or understand the R27: Yes. repetition in movement helps in transferring</td>
<td></td>
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<td><strong>caregiver more. The cognitive stimulation can help her follow directions.</strong></td>
<td>weight from sitting to standing and vice verse. It helps maintain some muscle tone.</td>
<td>FM-R23: In the early stages, walking and talking might help their daily care activities more. In later stages, it would keep their minds able to participate and help with daily care. It may help with response capability in dressing and getting out of bed when someone isn’t there to help them.</td>
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<tr>
<td><strong>Describe the effects you think regular walking and talking//person-centered care would have on the quality of life of residents with dementia?</strong></td>
<td>FM-R6: Absolutely, walking and talking can increase their quality of life. She’s not lying down in bed and she’s not walking in circles alone. She won’t engage in other activities that they offer here. It gives her something to do, someone to be with.</td>
<td>R28: The increase social interaction has ease her anxiety to a degree. Having regular conversations has helped her with her word retrieval and her ability to maintain her thoughts and emotions long enough to verbally convey them. Walking and talking our activities that she still able to take part in and enjoy, and having an enjoyable way to pass the time with the familiar person while getting physical activity has really bring her days. My mother is often withdrawn and worried, but when she's with Charlene she's been beaming and out outgoing.</td>
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<td></td>
<td>FM-R13: I believe it will really benefit my father; he will enjoy the conversation and the walks, and might help decrease his agitation in here. So that might help his quality of life.</td>
<td>R30: Walking gives you the ability to do whatever you want when you want, versus being in a wheelchair all day, you couldn’t.</td>
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<tr>
<td></td>
<td>FM-R14: Increased quality of life is definitely going to happen if you have increased social interactions and increased mobility.</td>
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<tr>
<td>Question</td>
<td>Nursing staff responses</td>
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<td>-------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Please describe how important is “person-centered care” as it relates to the care of your loved one and other nursing home residents with dementia?</td>
<td>NS-R21: Very important to residents, because the happier the residents, to improve their walking and memory. If you talk to the resident, it makes her happy. The resident enjoys the companionship and friendship, without person centered care she will decline for sure.</td>
<td></td>
</tr>
<tr>
<td>Do you think regular walking and talking/person-centered care will influence the mobility of residents who have dementia? Why?</td>
<td>NS-R23: Person centered care is important because it is about the client; we try to include the client in their daily lives and would like to make sure their needs are met.</td>
<td></td>
</tr>
<tr>
<td>Do you think regular walking and talking/person-centered care will influence a resident’s ability to perform daily care activities (e.g. toileting, transferring) if they have dementia?</td>
<td>NS-R26: Person centered care is very important to people who have dementia…I just let her try to do her best first, so she can feel normal, and then I’ll redo it for her after, rather than me doing it myself first because I know that would upset her. NS-R21: It will help keep them active, their physical body and mind, so they can remember things and what they used to do. They can recall more; you can provide orientation so that you can remind them where they are. NS-R30: Walking and talking might help him walk better; he sits there all day and gets no exercise. I tell him that physiotherapy will see him and he gets happy that they’re going to come see him to walk with him. He’s very bored and only watches TV in his room.</td>
<td></td>
</tr>
<tr>
<td>Do you think regular walking and talking/person-centered care will influence a resident’s ability to perform daily care activities (e.g. toileting, transferring) if they have dementia?</td>
<td>NS-R21: It will help keep them active, their physical body and mind, so they can remember things and what they used to do. They can recall more; you can provide orientation so that you can remind them where they are. NS-R11: It can increase his confidence for ADLs, so it could help like that. He can maybe start walking in the bathroom by himself. NS-R19: Cues can help her do more things; maybe she can understand more because they use their brain more after the study. NS-R29: She gets weak…and gets very tired very quickly. She won’t follow our instructions; I’m hoping that regular walking and talking will help, so that it can help her understand our instruction</td>
<td></td>
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</tbody>
</table>
and maintain her ability to help.

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe the effects of regular walking and talking/person-centered on the quality of life of residents with dementia?</td>
<td>NS-R15: It will be excellent for her as she has declined and is acting out to get attention from people. So she will scream at the top of her lungs and try to get out of the chair by herself, even though it’s not safe. She needs a walker, so having someone walk with her and talk to her will be helpful. This will help her physically and cognitively.</td>
</tr>
<tr>
<td></td>
<td>NS-R25: Walking outside will be good to get her up, especially in the summer, and this will help increase the quality of life. It’s good, because everybody needs company and social interaction and attention. She won’t feel so useless.</td>
</tr>
<tr>
<td></td>
<td>NS-R28: it will help her quality of life because she would like the companionship; she enjoys chats but because we don’t have the time,</td>
</tr>
</tbody>
</table>
Appendix W

Table 14

*Mean differences and SDs of Functional Mobility Outcome Measurements during the Pre-intervention Phase (T1 and T2) and the Intervention Phase (T2, T3, T4) (N=25)*

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pre-intervention phase (Difference from T2 – T1)</th>
<th>First half of the MWI (Difference from T3 – T2)</th>
<th>Second half of the MWI (Difference from T4-T3)</th>
<th>Intervention phase (Difference from T4-T2)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>T2-T1 (SD)</td>
<td>% change</td>
<td>P</td>
<td>T3-T2 (SD)</td>
</tr>
<tr>
<td>TUG, seconds.</td>
<td>4.15 (7.40)</td>
<td>4.43%</td>
<td>0.010*</td>
<td>-6.02 (6.49)</td>
</tr>
<tr>
<td>2MWT, meters</td>
<td>-5.78 (12.89)</td>
<td>-9.73%</td>
<td>0.034*</td>
<td>22.31 (20.55)</td>
</tr>
<tr>
<td>Gait speed, meters per second</td>
<td>-0.05 (0.11)</td>
<td>-11.31%</td>
<td>0.022*</td>
<td>0.20 (0.16)</td>
</tr>
</tbody>
</table>
Table 17

*Mean differences and SDs of FIM and ADQRL scores during the Pre-intervention Phase (T1 and T2) and the Intervention Phase (T2, T3, T4) (N=25)*

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pre-intervention phase (Difference from T2 – T1)</th>
<th>First half of the MWI (Difference from T3 – T2)</th>
<th>Second half of the MWI (Difference from T4-T3)</th>
<th>Intervention phase (Difference from T4-T2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T2-T1 (SD)</td>
<td>% change</td>
<td>P</td>
<td>T3-T2 (SD)</td>
</tr>
<tr>
<td>FIM total score</td>
<td>-17.88 (11.10)</td>
<td>-22.28%</td>
<td>0.000*</td>
<td>11.68 (13.30)</td>
</tr>
<tr>
<td>FIM-motor</td>
<td>-12.52 (10.58)</td>
<td>-21.78%</td>
<td>0.000*</td>
<td>7.96 (7.62)</td>
</tr>
<tr>
<td>FIM – cognitive</td>
<td>-5.36 (5.18)</td>
<td>-23.50%</td>
<td>0.000*</td>
<td>3.72 (5.94)</td>
</tr>
<tr>
<td>ADQRL</td>
<td>-1.84 (3.97)</td>
<td>-5.56%</td>
<td>0.030*</td>
<td>2.24 (5.59)</td>
</tr>
</tbody>
</table>
Appendix X

TUG transformed data

Table 15

Raw TUG data and log transformed TUG data (N=25)

<table>
<thead>
<tr>
<th>Raw TUG data</th>
<th>Log transformed data</th>
<th>Back-transformed data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>T1</td>
<td>22.56</td>
<td>9.46</td>
</tr>
<tr>
<td>T3</td>
<td>20.69</td>
<td>9.28</td>
</tr>
<tr>
<td>T4</td>
<td>18.13</td>
<td>10.18</td>
</tr>
</tbody>
</table>

Legend: ^ =10^{mean+SD} and 10^{mean-SD}
Figure 5: Back-transformed means and lower and upper values of mean ± SD on the original scale^
Table 20

*Three PEAP subscales and the environmental features of each home*

<table>
<thead>
<tr>
<th>Maximize Awareness and Orientation</th>
<th>Home 1</th>
<th>Home 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Floor plan</strong> – “H” configuration with the lounge, dining room, nursing station, and activity rooms just off the main hallway, but dead ends in each hall</td>
<td></td>
<td>Large continuous floor plan in the shape of a square; which I find assists residents to getting around and if they keep going they end up at the nursing station if they need assistance.</td>
</tr>
<tr>
<td><strong>Living spaces</strong> - The dining room, lounge/TV room are fully decorated and furnished with doors to close off the areas, the activity rooms have a small kitchenette and room for recreation activities with doors. Small balconies with two chairs.</td>
<td><strong>Living spaces</strong> – The dining room resembles a cafeteria; the TV area is open concept, with one couch, various chairs, large fish tanks, or bird cages. Each floor has a designated activity room with doors. Spacious balconies with several patio chairs and tables for outdoor time.</td>
<td></td>
</tr>
<tr>
<td><strong>Signs</strong> - Calendars are also hung in every resident’s room every month as well as in activity room</td>
<td><strong>Signs</strong> – Way finding signs in the halls to show residents how to get to the dining room; toilet signs to show them where the washroom is; these signs are also in their primary language to help awareness. Monthly calendars are also hung in every resident’s room as well as in activity room. The schedule is written on the board each day to identify activities taking place.</td>
<td></td>
</tr>
<tr>
<td><strong>Programs</strong> - Regular and consistent 3 to 6 programs throughout the weekday and 5-6 on Saturday; exclusive to each floor/unit</td>
<td><strong>Programs</strong> – regular programs; separate</td>
<td></td>
</tr>
</tbody>
</table>
calendar with more Montessori activities plus the residents on that floor can go to all the other home activities no matter where they are in the building. There is some regular programming on a weekly basis: Art therapy, Music Therapy, Horticultural Therapy, Bingo, iPod visits, Beauty Club, spiritual groups, large music program. Exercise group 3x a week, There are monthly programs: Birthday Party, Diners Club, and Pancake Breakfast, and outings every 2 weeks.

Quality of Stimulation

**PA system** – Mobile phones are used for regular messaging unless there is an emergency. When the PA system is used, the message is only heard at the nursing station, not overhead. A second overhead PA system is used for emergencies, (i.e. missing resident, fire, evacuation) which is heard overhead. This emergency overhead PA is very loud (per fire regulations) and has contributed to several resident falls during drills.

**Music** - Some RHAs play soft music on a regular basis. Soft music of the residents’ choosing is played at mealtime on some RHAs. Sometimes residents do not wish to have music played.

**Challenges** - Call bells are a frequent occurrence and contribute to noise on the RHAs but are only moderately loud, and non-compliant residents are probably the

**PA system** - Our PA system cannot go into resident’s spaces and only comes through on the phones on the unit at the nursing station so that it does not interrupt the residents too much.

**Music** – Occasionally music is played in the TV area

**Challenges** - For vocal residents who can scream or moan we try our best to assess these responsive behaviours. We start a behavioural DOS right away to assess what could be triggering this (what time is it happening etc.). We also look at pain, under stimulation, offering the resident an iPod or Montessori activities. We do our best and involve the Baycrest Team, PRC, and GMHOT etc. and then our last resort is sending them to a CASS bed. The negative vocalizations can be very challenging for other residents.
challenges to regulating stimulation.

<table>
<thead>
<tr>
<th>Support Functional Abilities</th>
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</thead>
<tbody>
<tr>
<td>- Restorative care programs and life enhancement programs throughout the day to keep residents cognitively engaged and physically active.</td>
</tr>
<tr>
<td>- The floor plan of the RHAs support wandering pathways. The secure outside areas have oval shaped wandering paths that support residents.</td>
</tr>
<tr>
<td>- There are grab bars in all bathrooms in the home, handrails throughout the home.</td>
</tr>
</tbody>
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</thead>
<tbody>
<tr>
<td>- Restorative nursing program led by an RN and a PSW. They do range of motion exercises, walking and helping residents with ADL’s to maintain their skills longer.</td>
</tr>
<tr>
<td>- The home supports wandering and educates families and other residents on Dementia.</td>
</tr>
<tr>
<td>- The secure outside areas have oval shaped wandering paths that support residents.</td>
</tr>
<tr>
<td>- There are handrails and grab bars on benches in the hallways. They also have grab bars in the washrooms, and install saskapoles in resident’s rooms to assist them to get up on their own.</td>
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</tbody>
</table>