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ENGAGEMENT IN SENIORS FROM SOUTHWESTERN ONTARIO: CAN IT PREDICT PHYSICAL AND COGNITIVE FUNCTION?

By

Jacqueline A. Liffiton

A Thesis
Submitted to the Faculty of Graduate Studies
Through the Faculty of Human Kinetics
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ABSTRACT

With the increasing number of individuals over the age of 65 years worldwide, it is critical for society to recognize the importance of helping seniors maintain their health, physical and cognitive functioning as well as their engagement with life. These three dimensions provide the foundation for successful aging (SA). The positive role of engagement with cognitive and physical functioning has been understated to date in the literature. The purpose of this study was to examine and compare how the frequency of engagement measured as the percentage of productive, social, passive and active leisure activities participated in, and the overall frequency of participation (high, moderate, low) can predict physical and cognitive functioning. A secondary data set (n = 287 participants, mean = 68.7± 8.09 years of age) provided the data, which was analyzed through a series of hierarchical regression analyses. Results suggest that activities participated in at a high frequency predict both physical and cognitive functioning. Even though on average active leisure activities were participated in the least frequently they predicted physical functioning. Findings from the present study augment the successful aging literature and theoretical, methodological and practical implications are discussed.

Keywords Aging • Successful Aging • Engagement • Physical Activity

DEDICATION

I dedicate my thesis and my academic career thus far to my parents for all of their love and support.

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INTRODUCTION

With the rise in life expectancy as well as population aging (National Advisory Council on Aging, 2006), it is becoming imperative for society and literature to recognize the importance in helping seniors work towards achieving successful aging (SA). Successful aging has been defined as either a continuous adaptation to age-related changes (Baltes & Baltes, 1990) or as a state of being that may be objectively measured at a particular moment in any stage of life (Fries, 1980; Shulz & Curnow, 1988; Strawbridge, Cohen, Shema & Kaplan, 1996; Palmore, 1979). In the scientific literature, the most commonly used and widely accepted model of SA has been by Rowe and Khan (1987); (Strawbridge, Wallhagen & Cohen, 2002; Depp & Jeste, 2006). Rowe and Khan (1987) proposed even though some age-related pathological changes are inevitable, normal aging is usually reserved for when disease-related physiological changes are not present. Normal aging can be divided into two categories: usual aging and successful aging. The term usual aging is defined as typical non-pathological age-related losses (Rowe & Khan, 1987). While these older individuals are fortunate to be disease free, decreases in cognitive and physical function are still present which puts them at risk for illness/disability. Successful aging, on the other hand, represents individuals who exhibit minimal or no cognitive and physical losses when compared to the average younger individual. They are at low risk for disease and are high functioning adults (Rowe & Khan, 1997).

Rowe and Khan (1997) describe SA as comprising of three main components. The first is a low probability of disease and disease-related disability. This not only includes the absence of disease but also the absence of risk factors for disease such as

changes in abdominal fat, changes in systolic blood pressure, or decreases in organ and immune function (Rowe & Khan, 1987). The second component of the model is high mental and physical functioning. This includes the potential for function and activity, as it is more important to know what an individual is capable of doing, not simply what they are doing. The final component is active engagement with life. This component of Rowe and Khan's model primarily focuses on interpersonal relations and productive activity. Interpersonal relations are classified as contact with others (i.e. emotional support), whereas productive activities must create societal value, such as through paid or volunteer work.

The component from Rowe and Khan's model that has received the least attention in SA literature has been engagement (Montross, Depp, Daly, Reichstadt, Golshan, Moore, Sitzer & Jeste, 2006). Interestingly, when examining the views of SA from older individuals, the importance of engagement seems to be stressed. Older adults often believe social engagement and a positive outlook towards life are important factors contributing to SA (Strawbridge et al., 2002). Derived from research and the theoretical framework of Maier and Klumb (2005), as well as classifications used by Glass, Mendes de Leon, Marottolli and Berkman (1999), Mendes de Leon, Glass and Berkman (2003), and Menec (2003) activities of engagement can be divided into four different categorizes: productive (e.g. paid work, volunteer work, house work, care for others), social (e.g. visiting with friends or family, social groups, phone conversations), passive leisure (e.g. reading, writing, watching television) and active leisure (e.g. walking, exercise classes, individuals or team sports).

Glass et al. (1999) found that social activities were significantly associated with survival. This supports Rowe and Khan's (1998) statement that being part of a social network of friends and family is one of the most obvious factors leading to longevity. Mendes de Leon et al. (2003) found that older adults who were more socially engaged reported less disability; in turn, prevention of disability due to active engagement allowed older individuals to continue to be social. A study done by Menec (2003) found that social activities were the most commonly performed activity, with 93.1% indicating that they visited or phoned a friend/family member; reading was the most common solitary activity and light housework/gardening was the most prevalent for productive activity. Social and passive leisure activities were found to be significantly related to happiness, while active leisure activities predicted life satisfaction. Furthermore, individuals who took part in productive activities were less likely to die within the next six years and social activities predicted better function over a six-year period. Similarly, Everard, Lach, Fisher and Baum (2000) stated that when older individuals remained involved in active leisure activities, higher physical functioning was noted and passive leisure activities were associated with better mental health and cognitive function.

These results indicate that being actively engaged is positively associated with aspects of SA. However, there has been little agreement on which types of activities are influencing cognitive and physical function the most. Good cognitive and physical functioning is an integral part of maintaining one's independence. Like younger people, older individuals want to remain independent. Independence would mean continuing to live in one's own home, taking care of oneself and carrying out routines of daily tasks

(Rowe & Khan, 1998). However, with age come natural declines in cognitive and physical functioning.

Bassuk, Glass and Berkman (1999) stated that social engagement can challenge an individual to communicate effectively and participate in complex interpersonal exchanges. It may also provide a dynamic environment requiring cognitive use and the social aspect can encourage a sense of commitment to a community or family bringing a sense of purpose or fulfillment. More socially active people report lower levels of disability than less active participants (Mendes de Leon et al., 2003). As well, participation in social and productive activities has been related to reduced functional decline (Menec, 2003). Therefore, it seem that different types of engagement help to improve cognitive and physical functioning and independence. Horgas, Hans-Ulrich and Baltes (1998), who looked at how seniors spend their day, created an activity profile and claimed that no single type of activity is more important than the next. Engaging in a variety of activities may influence successful aging and maintenance of cognitive and physical function (Horgas et al., 1998).

In previous research engagement has been measured in a variety of ways. There has been little agreement on how best to measure overall engagement. While this may be viewed negatively, it has proven advantageous to research. The different measures and methodologies that have been used across the studies have allowed for insight into the relationship between engagement and physical and cognitive functioning, and have left room for further research. In terms of frequency of engagement, Menec (2003) and Everard et al. (2000) used a variety of activities in their studies, however they only asked the participants if they participated in the activities or not. Acree et al. (2006) recorded

the time spent on participation in their study but used general questions such as: "do you participate in light physical activity done occasionally?"; "do you participate in moderate physical activity for more than three hours per week?"; and "do you participate in heavy physical activity done regularly done between 1 and 3 hours per week?". Mendes de Leon et al. (2003) measured their participant's engagement in a variety of ways, including yes/no scales, and 3- and 6-point Likert scales anchored to frequency estimates (3-point: never, sometimes, often; 6-point: never to more than once per week).

Given the breadth and depth of research involving SA, it is important to more completely understand the engagement component. The relationship between the different types of activities and the frequency to which they are participated in is important for the development of age appropriate interventions (i.e. social groups, fitness classes, variety of clubs) in the broader community in order to prevent disability, functional loss and to ultimately improve rates of SA (Liffiton, Horton, Baker & Weir, 2012). Given the lack of consistency in the published literature in terms of identifying both participation in specific activities, and the frequency of participation, the patterns of engagement in Canadian seniors should be explored more deeply with the goals of examining frequency of participation not only within specific engagement categories but as well as within individual activities and identifying how frequency impacts and predicts cognitive and physical functioning separately.

PURPOSES

The purpose of this study was four fold: 1) to calculate the percentage of activities that were participated in either *daily* (7 times per week) or *often* (4-6 times per week) within each engagement category; 2) to explore how participation within these categories influenced physical and cognitive functioning; 3) to determine an engagement profile based on how the activities group together based on a high, moderate, and low rate of participation; 4) to explore how high, moderate, and low frequency participation predicted cognitive and physical functioning.

HYPOTHESES

The hypotheses of the present study were as follows: 1) social and active leisure engagement will have the highest percentage of activities that are participated in either daily or often (Rowe & Khan, 1998; Mendes de Leon et al., 2003; Menec, 2003); 2) participation in productive (Glass, Seeman, Herzog, Kahn & Berkman, 1995), social and active leisure engagement (Glass et al., 1999) will predict better physical functioning, while participation in social (Bassuk et al., 1999) and passive leisure (Everard et al., 2000) engagement will predict better cognitive functioning; 3) productive and passive leisure type activities such as light housework, meal preparation, computer use, watching television and reading will be classified as high frequency activities, while social type activities such as visiting with friends and family and phone conversation will be moderately participated in activities and active leisure type activities will be participated in the least frequently (Rowe & Khan, 1998); 4) the activities from the high frequency category of participation will have the greatest influence on cognitive and physical function.

RELEVANCE

The topic of SA has become increasingly important as the Canadian population continues to age (National Advisory Council on Aging, 2006). It has been noted that in the literature surrounding SA engagement is the component that has garnered the least amount of empirical attention. Determining the impact of frequency of participation in different activities is of importance because this information would be of great use for informing public health messaging targeting interventions to seniors (Baker, Meisner, Logan, Kungl & Weir, 2009). This information can also be used to explore how communities and organizations that support active aging can play a larger role in helping seniors maintain their health, physical and cognitive function as well as engagement with life.

METHODOLOGY

Data were obtained through a secondary data set titled "The relationship between sport, physical activity and social engagement: A profile of Canadian Seniors" (Weir 2009). Participants completed a series of questionnaires that aimed to examine a) patterns of engagement and how they may be related to involvement in physical activity and b) how engagement impacts psychosocial health and functional independence. Using this information this thesis examined and compared how the percentage of activities participated in out of the total number of activities within each engagement category and how the frequency of participation among specific activities can predict physical and cognitive functioning.

Participants. Two hundred and eighty seven, English-speaking older adults between the ages of 55 and 90 years (mean = 68.7± 8.09 years) took part in this study. Of the participants 177 were females along with 110 males. There was also a fairly even split among age groups: 97 adults aged 55-64 years of age, 116 adults aged 65-74 years of age and 75 adults aged 75-90 years of age. Of the total participants 283 individuals reported never to participating in full/part time employment; 59.93% of participants reported attending some form of post secondary education; 81.53% reported living in their own home and only 27.2% reported living alone. When participants were asked about their income 103 individuals chose not to answer, 28 participants reported an income of ≤$20,000, 41 participants reported an income of ≤$40,000, 44 participants reported an income of ≤$60,000, 30 participants reported an income of ≤$80,000 and 41 participants reported an income of < $80,000. The participants were recruited throughout senior centres (n = 50), sports clubs (n = 21), fitness centres (63) and the Ontario senior's games (n = 134), and other (n = 19) from the Windsor and Essex County areas. Windsor has a large number of retired individuals as well as many active senior organizations. Demographic information was recorded for all participants. Participant anonymity was ensured and informed consent was obtained. This project has received Research Ethics Board approval.

Measures of Engagement. Four categories of engagement were examined: productive, social, passive leisure and active leisure (see Appendix B). This classification system of engagement was based on Maier and Klumb's (2005) theoretical model, as well as the categorizations used by Glass et al. (1999), Mendes de Leon et al.

(2003) and Menec (2003). The validity and reliability of activity measures has been evaluated in a variety of studies (Dallosso et al., 1988; Everard et al., 2000)

Productive Activities were defined as those that create societal value and are carried out for the purpose of their outcome. For example, you go shopping to buy the groceries so you may feed yourself. Productive activities include full-time or part-time employment, volunteer work, gardening or lighthouse work (e.g. laundry and dusting), meal preparation, heavy housework (e.g. vacuuming and raking), care for others (e.g. parent and grandchildren).

Social Activities were defined as those that provide interactions among others. Visiting with family (either outside or inside their home), visiting friends or neighbours (either outside or inside their home), phone conversations, attending church-related activities, meeting with formal or informal social groups, providing service, fraternal, or legion activities, enjoying day or overnight trips and playing games (e.g. cards) are all types of social activities.

Passive Leisure Activities were defined as activities that tend not to include a social component and are commonly carried out by a single person without any necessary company. Passive leisure activities are activities such as reading, writing, watching television, listening to music, attending theatre events (e.g. live, movies), collecting hobbies (e.g. stamps), handwork hobbies (e.g. knitting) and computer use.

Active Leisure Activities are defined as those that help with the maintenance of physical functioning and tend to require a larger expenditure of metabolic energy. In this study, these activities were used to quantify one's involvement in physical activity and

sport. Active leisure activities include participation in organized exercise classes, participation in self-directed exercise (e.g. cardio), walking for fitness, participation in solitary organized sport (e.g. cycling) and participation in team organized sport (e.g. hockey).

Quantification of Engagement. The completed questionnaire assessed how often the participants participated in productive, social, passive and active leisure activities over a seven-day recall period. Recall methods have been shown to be reliable on many different populations and have proven accurate when used within other physiological measures of activity involvement (Blair et al., 1985; Sallis et al., 1985; Washburn, Jacobsen, Sonko, Hill & Donnelly, 2003). Participants indicated their level of participation based on a four-category scale, permitting answers across a full range of engagement: *never* (0 times per week), *seldom* (1-3 times per week), *often* (4-6 times per week) and *daily* (7 times per week) (Glass et al. 1999; Mendes de Leon et al. 2003; Menec, 2003). The participants' answers were re-coded as 4 for never, 3 for seldom, 2 for often and 1 for daily.

Two measures of frequency were quantified. First, within each category of engagement the activities that were participated in *daily (7 times per week)* or *often (4 - 6 times per week)* were identified and summed across the participants. Next, this score was divided by the total number of activities within the engagement category, identifying the percentage of activities participated in within each category. Second, each of the 29 activities was also grouped into either a high, moderate or low activity frequency category. Mean scores for participation (ranging from daily coded as 1 to never coded as 4) as well as standard deviations for each activity were calculated across all of the

participants. Using the means and standard deviations, a coefficient of variance was also calculated for every activity. These coefficient of variance scores were used to rank order the activities from highest frequency to lowest frequency and split them into three groups.

Measures of Physical and Cognitive Function. Physical and cognitive functioning were both used as the outcome measures in this study. These variables were derived from a number of studies. The physical functioning questions and response scales were taken from the Rosow-Breslau Functional Health Scale Measure (Rosow & Breslau, 1966) as well as work done by Nagi (1976) and Strawbridge, Wallhagen, and Cohen (2002). These measures have been used in a variety of studies, including studies of large populations (Mendes de Leon, 2003; Beckett, Brock, Lemke, Mendes de Leon, Guralnik, Fillenabum, Branch, Welte & Evans, 1996). The cognitive functioning questions were also taken from Strawbridge et al. (2002) who asked their participants their ability to "remember things without difficulty"; "remember where one put something" and " find the right word when talking".

Physical performance and functioning (Appendix C). Participants rated their ability to perform a series of seven tasks to determine their physical function. The seven tasks were as follows: walk half a mile (0.8km); climb one flight of stairs without resting; lift or carry weights over 10 pounds (4.54kg) (a heavy bag of groceries); stoop, crouch, or kneel; push or pull a large object (like a living room chair); lift arms above shoulders; write or handle small objects. Participants indicated whether they were able to perform the task using the following categories: "having no difficulty doing," "having little difficulty doing," "having some difficulty doing," "having a lot of difficulty doing" or

"not able to do at all". Just as with social engagement, participants' answers were then re-coded as 5 for "no difficulty doing," 4 for "little difficulty doing," 3 for "some difficulty doing," 2 for "a lot of difficulty doing" and 1 for "not able to do at all". Summary scores were obtained by summing the responses.

Cognitive performance and functioning (Appendix D). Similar to physical function, participants rated their ability to perform a series of four tasks to determine their cognitive function. The four tasks were as follows: remember things you need to do; remember where you put something; find the right word when talking; do your own personal banking. Participants indicated if they were able to perform the task having "no difficulty doing", "having little difficulty doing", "having some difficulty doing", "having a lot of difficulty doing", or "not able to do at all". Participants' answers were re-coded the same as above. Once the participants' answers were coded an average was scored.

Quantification of Physical and Cognitive Function. An average score was calculated for the Physical Performance and Functioning as well as the Cognitive Performance and Functioning sections. An average grants easy comparison of the two sections because they both contained a different number of tasks.

Statistical Analysis. The data focused on the effects associated with all levels of an ordered categorical outcome (i.e., the various engagement measures). Thus, a series of hierarchical regression analyses were conducted through SPSS 20.0 to test the hypotheses under investigation.

When conducting hierarchical regression, Field (2005) suggests that a sample size ratio of 10 observations per predictor is typical. In this particular study, separate

regressions hold 4 or 5 predictors. Therefore, a sample size of at least 50 would be required. Given that the current sample size exceeds this minimum regression is a valid technique to make the predictions.

To assess *hypothesis one*, a percentage of activities that were participated in either *daily* or *often* within each of the engagement categories was calculated. The activities that were reported as *daily* and *often* were used because they were the activities that were participated in regularly among the participants, therefore, were the most likely to influence cognitive and physical functioning.

Next, two hierarchical regressions were used to test *hypothesis two*. Prior to the regressions, the assumptions of regression were evaluated for all of the dependent variables. Age of the participants was used as a predictor and was first entered in Step 1. Age was entered separately since the participants were unable to control this unlike the other four variables. Each of the percentage scores from the productive, social, passive leisure and active leisure engagement categories were entered in Step 2. Two separate regressions were run for each of physical and cognitive functioning.

To assess *hypothesis three* the engagement activities were divided into three categories based on high, moderate, or low frequency of participation. The mean scores for participation (ranging from daily coded as 1 to never coded as 4) as well as standard deviations for each activity were calculated across all of the participants to determine an average score. Coefficient of variance for every activity was calculated and then the activities were ranked from highest coefficient of variance to lowest coefficient of variance and divided into three equal groups. Coefficient of variance was used over the

mean scores because its takes into account standard deviation, therefore allowing for standardization.

Hierarchical regression was used to test *hypothesis*. Just as for *hypothesis two*, the necessary assumptions were run with all of the variables being used within these analyses. Again, age of the participants was first entered in Step 1. Then using the categories determined by coefficient of variance, the mean representing frequency of participation was taken for the high, moderate and low activity frequency categories and was entered in Step 2. Two separate regressions were run for each of physical and cognitive functioning.

RESULTS

Assumptions. *Hypotheses two* and *four* were tested using four different hierarchical multiple regressions via SPSS 20.0. All assumptions to perform hierarchical regression were tested prior to the analysis of this study including: adequate sample size, normality, outliers and influential observations, multicollinearity and linearity. First, Field (2005) suggests a sample size ratio of ten observations per predictor. Regressions performed in this study contained either four (high frequency, moderate frequency, low frequency, age) or five (productive, social, passive leisure, active leisure, age) predictors. Therefore, an N of at least 40 to 50 was required. The current study met this assumption with an $N = 287$. Next, when looking at outliers concerning *hypothesis one*; specifically with the standardized residuals, Tabachnick and Fidell (2002) suggest a cut-off of an absolute value of 3.00 standard deviations. Using this criterion five univariate outliers on Y (outcome measures) were identified. Additionally two outliers on X (predictors) were

identified using Mahalanobis Distance test of multivariate outliers ($p < .001$). No influential observations[1] were found when testing for Cook's and Standardized DFfit. When examining outliers for *hypothesis three* eight outliers on Y were found, however, there were no outliers on X present. Again, no influential observations were found. Analyses were run with and without the outliers present; there were no significant differences. This could be due to that multivariate outliers have a greater influence as compared to univariate (Stevens, 2002) and influential observations are a larger concern than outliers on X and Y. Therefore, due to the low number of outliers and their limited influence on the results all of the values were kept within the analysis.

The final assumption for hierarchical regression is the absence of multicolinearity and singularity. In *hypothesis one* and *three* correlations between all variables ranged between .00 through .89, not exceeding .90 (Field, 2005). Tolerance and the variance inflation factor (VIF) scores were in the desired range indicating the absence of multicollinearity. Examination of residual scatter plots showed linearity for all variables except a slight non-linear relationship was found for physical function. However regression is robust to violations of this assumption. Skewness and kurtosis values for all variables were in the normal range supporting normality. The Durbin-Watson statistic for all analyses was in the desired range of 1.5 to 2.5 therefore the assumption of independence of errors was not violated (Stevens, 2002). Descriptive statistics (means, standard deviations) for all variables can be found in Table 1.

---

[1] Influential observations can be defined as how much the predicted scores for other observations would

Table 1

Mean and Standard Deviations for all Variables

	Possible Range	N	M	SD
Dependent Variables				
Physical Functioning	1-5	285	1.52	.71
Cognitive Functioning	1-5	283	1.55	.54
Independent Variables				
Age (years)	55-90	287	68.40	8.19
High Frequency	1-4	280	2.22	.50
Moderate Frequency	1-4	278	3.03	.41
Low Frequency	1-4	287	3.42	.32
Productive (%)	0-100.00	287	28.76	.18
Social (%)	0-100.00	287	24.40	.21
Passive Leisure (%)	0-100.00	287	37.24	.19
Active Leisure (%)	0-100.00	287	19.03	.21

Hypothesis One. The engagement category with the highest percentage of activities participated in was passive leisure with 37.24% of the activities being participated in often or daily. Productive engagement was second with 28.76% of the activities, followed by social activities at 24.4%, and active leisure at 19.03%.

Hypothesis Two. A hierarchical regression was run for each dependent variable: physical functioning and cognitive functioning. The predictor age was first entered in Step 1. This was done since age is a predictor the participants were unable to control

unlike the other four variables. The average score as a percent for productive, social, passive leisure and active leisure were entered in second for Step 2.

Physical Functioning. Table 2 provides the results summary and coefficients for the Physical Function regression. Results showed that Step 1 was significant and predicted 9.2% (8.9% adjusted) of the variance in physical functioning, $R = .303$, $F(1,283) = 28.663$, $p < .001$. The results also indicated that the full regression Step 2 was significant and predicted 17.7% (16.2% adjusted) of the variance in physical functioning, $R = .420$, $F(5, 279) = 11.971$, $p < .001$. The addition of the independent predictors in Step 2 resulted in an R^2 change of .085, $F(4, 279) = 7.173$, $p = .000$. This indicates that the predictors influence physical functioning beyond what age does, the addition of the independent predictors accounted for an additional 8.5% of the variance. Further examination of the standardized Beta weights within Step 2 indicate two significant coefficients, social activities ($\beta = .214$, $t(4, 279) = 3.410$, $p < .05$) and active leisure ($\beta = -.259$, $t(4, 279) = -4.295$, $p < .05$). This indicates that for every one standard deviation change in active leisure engagement, physical functioning increases - .259 standard deviations[2]. However, for every one standard deviation change in social engagement, physical functioning decreases by .214 standard deviations. These results indicate that daily or often active leisure engagement significantly predicts better physical functioning, however social engagement predicts lower physical functioning.

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[2] Due to reverse coding the negative represents better physical functioning.

Table 2

Hierarchical Regression Analysis for Variables Predicting Physical Functioning

Variable	B	SE B	β	R^2	Δ R^2
Step 1				.092	
Age	.019	.005	.214*		
Step 2				.177	.085*
Productive	-.423	.240	-.109		
Social	.730	.214	.214*		
Passive Leisure	-.140	.228	-.037		
Active Leisure	-.864	.201	-.259*		

* $p < .05$

Cognitive Functioning. Table 3 provides the results summary and coefficients for the Cognitive Function regression. Age in Step 1 was significant and predicted 10.2% (9.9% adjusted) of the variance in cognitive functioning, $R = .319, F(1, 281) = 31.866, p < .001$. The results also indicated that the full regression Step 2 was significant and predicted 13.4% (11.8% adjusted) of the variance in cognitive functioning, $R = .366, F(5, 277) = 8.554, p < .001$. The addition of the independent predictors in Step 2 resulted in an R^2 change of .032, $F(4, 277) = 2.551, p = .040$. This indicates that the predictors influence cognitive functioning beyond what age does, the addition of the other predictors accounted for an additional 3.2% of the variance. With further examination of standardized Beta weights within Step 2 indicate there are no significant predictors of cognitive functioning with the exception of active leisure engagement being close to reaching significance ($\beta = -.116, t(4, 277) = -1.875, p = .062$). This indicates that for

every one standard deviation change in daily or often active leisure engagement, cognitive functioning increases -.116 standard deviations[3].

Table 3

Hierarchical Regression Analysis for Variables Predicting Cognitive Functioning

Variable	B	SE B	β	R^2	ΔR^2
Step 1				.102	
Age	.018	.004	.268*		
Step 2				.134	.0321*
Productive	-.110	.189	-.037		
Social	.022	.170	.008		
Passive Leisure	-.278	.179	-.097		
Active Leisure	-.295	.157	-.116		

- $p < .05$

Hypothesis Three. The mean participation rates and standard deviations across all participants for each of the individual activities can be found in Table 4. These were used to calculate the coefficient of variation for each activity. The coefficients were then rank ordered from highest to lowest, and the activities were divided into three equal groups based on these values. The first group represented the activities participated in at the highest frequency, followed by moderate participation and low participation based on the coefficient of variation.

[3] Due to reverse coding the negative represents better cognitive functioning.

Table 4

Activities Groups Based on Frequency

Activities	Mean	SD	CV
High			
Computer Use	3.53	.74	.60
Watching Television	3.46	.84	.51
Meal Preparation	2.72	1.00	.51
Reading	3.01	1.01	.49
Listening to Music	3.47	.79	.48
Phone Conversations	1.89	1.14	.43
Gardening/Light Housework	3.50	.84	.42
Walking for Fitness	3.70	.61	.37
Participating in Self-Directed Exercise	3.45	.62	.34
Writing	2.20	1.06	.32
Moderate			
Playing games with Others	3.00	.95	.28
Volunteer Work	1.65	.84	.28
Care for others	1.99	.98	.28.
Social Groups for Older Adults	2.99	.85	26
Heavy Housework	3.23	.65	.26
Participation in Solitary Organized Sport	3.61	.63	.24
Handwork Hobbies	3.10	.80	.24
Church-Related Activities	3.21	.76	.24
Visiting with Friends Outside of Your Home	1.97	.84	.23
Visiting with Family in Your Home	2.97	.69	.23
Low			
Visited with Friends in Your Home	2.97	.69	.23
Visited with Family Outside Your Home	2.63	.61	.23
Participation in Organized Exercise Classes	.278	.64	.23
Participation in Team Organized Sport	3.24	.89	.21
Day or Overnight Trips	2.80	.72	.20
Attending Theatre Events	1.84	.93	.18
Service, Fraternal, or Legion Activities	2.12	.89	.17
Collecting Hobbies	2.98	.83	.16
Full-time or Part-Time Paid Employment	3.99	.18	.04

Hypothesis Four. A hierarchical multiple regression was again run for each dependent variable: physical function and cognitive function. The predictor age was entered first in Step 1. Then, the mean frequency scores from the High, Moderate and Low activity frequency categories were entered in second for Step 2.

Physical Functioning. Table 5 provides the result summary and coefficients for the Physical Functioning regression. Results showed that Step 1 was significant and predicted 8.3% (8.0% adjusted) of the variance in physical functioning, $R = .288, F(1,274) = 24.795, p < .001$. The results also indicate that the full regression Step 2 was significant and predicted 10.3% (8.9% adjusted) of the variance in physical functioning, $R = .320, F(4, 271) = 7.741, p < .001$. The addition of the independent predictors in Step 2 resulted in an R^2 change of .020, $F(3, 271) = 1.969, p = .119$. This result provides evidence that there was no significant effect present in Step 2, i.e. the predictors did not influence physical functioning beyond what age already predicted. With further examination of standardized Beta weights within Step 2 indicate one significant coefficient, high frequency activities ($\beta = -.151, t(4, 271) = 2.361, p < .05$). This indicates that for every one standard deviation change in high frequency activities, physical functioning increases - .151 standard deviations.

Table 5

Hierarchical Regression Analysis for Variables Predicting Physical Functioning

Variable	B	SE B	β	R^2	Δ R^2
Step 1				.083	
Age	.026	.005	.288*		
Step 2				.089	.020*
High	.218	.092	.151*		
Moderate	.000	.140	.000		
Low	-.151	.180	-.066		

* $p < .05$

Cognitive Functioning. Table 6 provides the result summary and coefficients for the Cognitive Function regression. Results showed that Step 1 was significant and predicted 9.1% (8.8% adjusted) of the variance in cognitive functioning, $R = .302, F(1, 271) = 27.297, p < .001$. The results also indicate that the full regression Step 2 was significant and predicts 16.0% (14.7% adjusted) of the variance in cognitive functioning, $R = .400, F(4, 269) = 12.792, p < .001$. The addition of the independent predictors in Step 2 resulted in an R^2 change of .069, $F(3, 269) = 7.323, p = .000$. This indicates that the predictors influence cognitive functioning beyond what age does, the addition of the other predictors accounted for an additional 6.9% of the variance. With further examination of standardized Beta weights within Step 2 indicate high frequency activities are a significant predictor of cognitive functioning ($\beta = -.233, t(4, 269) = -3.758, p < .05$). This indicates that for every one standard deviation change in the high frequency activity category, cognitive functioning increases - .233 standard deviations.

Table 6

Hierarchical Regression Analysis for Variables Predicting Cognitive Functioning

Variable	B	SE B	β	R^2	ΔR^2
Step 1				.091	
Age	.020	.004	.302*		
Step 2				.160	.069*
High	.253	.067	.233*		
Moderate	.047	.102	.036		
Low	.066	.130	.039		

*$p < .05$

DISCUSSION

The topic of SA has become increasingly more important as the Canadian population continues to age. The purpose of the present study was to further examine the engagement component of Rowe and Khan's (1987) model of SA with a goal of identifying the role that the frequency of participation plays in maintaining or improving physical and cognitive function. While Rowe and Khan's (1998) model highlights that interpersonal relations/social activities and productive activities are the two key factors contributing to engagement among older individuals, the current study suggests that it isn't simply participating that is important, but also the frequency with which someone participates. Frequency was quantified in two different ways. First the percentage of productive, social, passive and active leisure activities participated in, and secondly activities were grouped on the basis of high, moderate and low frequency of participation. The findings of the current thesis add to the existing literature base by demonstrating the

role that frequency of engagement generally, and in specific activities plays in physical and cognitive functioning.

Hypotheses One and Two. The hypotheses that the percentage of activities participated in will be highest for social and active leisure was not supported. The only significant predictor of physical functioning was active leisure, which provided partial support for hypothesis two. In previous literature productive and social activities have been significant predictors (Glass, Seeman, Herzog, Kahn & Berkman, 1995). The difference between the current studies and others might be the use of the frequency based measures. Additionally, the percentage of participation in social (Bassuk et al., 1999) and passive leisure (Everard et al., 2000) activities did not predict better cognitive functioning. While older individuals state that they believe engagement in physical activity (Knight & Ricciardelli, 2003) and keeping active/fit (Tate, Leedine & Cuddy, 2003) are significant contributors to maintaining physical and cognitive functioning their activity profile suggests that they are not acting on their beliefs. In 2006 it was recorded that 62% of seniors in Canada were inactive despite their knowledge that physical activity increased their odds of achieving SA and higher cognitive and physical functioning (National Advisory Council on Aging, 2006). This thesis shows that even though the participants reported participating in only 19.03% of active leisure engagement activities daily or often, these activities still predicted higher physical functioning, suggesting this level of participation was sufficient. However, despite the important role regular active leisure engagement plays in maintaining and improving physical function, frequency of active leisure participation did not predict cognitive function in the current sample.

These results extend the work by Acree et al. (2006), who examined whether physical activity was associated with health-related quality of life (HRQL). Similar to this thesis participants were asked to indicate on a scale ranging from 0 – 7 (0 = avoid physical activity, 7 = physical activity done regularly for more than 3 hours per week) how often they engage in physical activity. Participants that responded with a three (physical activity done for more than one hour per week) or higher were considered to be in a high physical activity group. Using The Medical Outcome Survey Short Form-36 (MOS SF-36) questionnaire they reported that individuals who participated in physical activity for more than one hour per week were found to have better physical functioning and mental health. Acree et al.'s study along with the results from this thesis, show that even the less-structured and less-intense forms of active leisure activities (walking for fitness, participation in organized sport such as golf) can significantly improve physical and cognitive functioning. The results from this thesis add to Acree et al.'s (2006) work since four different types of engagement activities were examined, whereas in Acree et al.'s study active leisure was the only form of engagement measured. Acree et al. measured participated based on time, where as in this thesis participation was looked at in a different angle, using frequency. Therefore, the combination of these two studies show that even when active leisure activities are used as a predictor for cognitive and physical functioning along with productive, social and passive leisure activities they are still the leading type of engagement to predict higher physical and cognitive functioning, despite the fact that they are the least regularly participated in.

The results from this study differ from those of Mendes de Leon (2003) and Menec (2003). In Mendes de Leon's (2003) study the importance of social activities for

the maintenance of physical functioning was stressed. However, Mendes de Leon (2003) followed Rowe and Khan's model of SA and only used social and productive activities as predictors for physical functioning. When Mendes de Leon (2003) only looked at the two predictors, results suggested that social activities played an important role; while the current study has a broader range of predictors, engagement in social activities did not emerge as a predictor for physical functioning. Menec (2003) included a variety of engagement activities in her study: social activities, solitary activities and productive activities. As you can see again no specific category for active leisure activities or physical activities was included. However, the only activity that significantly contributed to life satisfaction was participating in sport or games, an active leisure activity, which in this study was classified as a social activity. A difference in Menec's (2003) study from this thesis was that she provided the participants with a 21-item activity check list and simply had the participants indicate if they have participated in this activity over the past week; there was no indication of how frequently they participated in the specific activity within a week.

If we look at studies that include a variety of different forms of engagement, active leisure activities tend to be a significant predictor of physical functioning. Everard et al. (2000) surveyed older adults using four activity categories: instrumental activities (e.g., shopping, cooking, paying bills and doing housework), social activities (e.g., traveling, entertaining, attending parties and attending church), high-demand leisure activities (e.g., swimming, walking and gardening) and low-demand leisure activities (e.g., sewing, reading, watching television and listening to music). These four different categories were very similar to those used in this study, however Everard et al. (2000)

simply asked the participants if they participated in the activity or not, there was no indication of frequency of participation. Everard et al. (2000) found that productive, social and high-demand leisure activities were significantly related to physical functioning. These results coupled with the findings of earlier studies support the idea that using more than only productive and social activities is important when examining their role in successful aging.

Hypotheses Three and Four. The hypotheses that productive and passive leisure type activities will be the most frequently participated in activities on average, while social type activities will be moderately participated in and active leisure type activities will be participated in the least frequently (Rowe & Khan, 1998) and that the activities from the high frequency category of participation will have the greatest influence on cognitive and physical function were partially supported. The ten activities that were participated in on average at the highest frequency were found to be writing, participation in self-directed exercise, walking for fitness, gardening/light housework, phone conversations, listening to music, reading, meal preparation, watching television and computer use. When examining these activities the majority seems to come from the passive leisure and active leisure categories. Gardening and light housework were also present which have been classified as an active leisure activity is past studies (Everard et al., 2000). This list of high frequency activities was found to predict both cognitive and physical functioning. Previous research has indicated that participation in active leisure type activities has been associated with higher physical functioning (Acree et al., 2006; Everard et al., 2003). However there have been few other findings (Acree et al., 2006; Everard et al., 2000; Menec, 2003; Strawbridge et al., 2002) supporting that the

frequency of participation (daily or often) within active leisure engagement enhances cognitive functioning.

In the SA literature few studies have examined the effects of passive leisure type activities. Passive leisure activities are those that tend not to include a social component and are commonly carried out by a single person without any necessary company. Studies that have found significant findings in regards to passive leisure engagement predicting cognitive and physical functioning are limited (Everard et al., 2000); this along with the frequency component is what makes this thesis distinct. Everard et al. (2000) included low demand leisure activities (sewing, reading, watching television and listening to music) as one of their predictors to physical functioning and mental health. Everard et al. (2000) found that low demand leisure activities were the only significant predictor associated with good mental health.

The moderate and low activity frequency categories did not have a common thread in terms of the types of activities; each category was made up of a variety of productive, social, few passive leisure activities and few active leisure activities. This along with the lack of evidence in the literature supporting the assumption that the majority of the high frequency activities generally consist of passive leisure and active leisure type activities, the data supports that it is not the specific activities that predict functioning but simply the frequency in which participation occurs. Horgas et al. (1998) looked at how seniors spend their day and created an activity profile. It was found that seniors spend one third of their day doing leisure type activities such as reading and watching television. However, the results indicated that no single type of activity was more important than the next. Horgas et al. (1998) found that engaging in a variety of

activities may influence successful aging and maintenance of cognitive and physical function.

This body of research makes several contributions to the existing SA framework. To date the majority of the research has examined and measured engagement by determining if the participants take part in certain activities or not, not including how regularly or the frequency of participation (Glass et al., 1999; Maier & Klumb, 2005; Mendes de Leon, 2003). In this thesis when the importance of engagement in physical and cognitive functioning was measured using the four engagement categories (productive, social, passive and active leisure) only active leisure activities participated in daily or often predicted higher physical functioning beyond what age already predicts. Age was the only predictor for cognitive functioning, frequency of engagement in any type of activity did not predict function. However, when the high, medium and low activity frequency categories were used as the predictors the activities that made up the high frequency group predicted both physical and cognitive functioning. Looking at engagement in terms of frequency adds to the literature by showing that it may not be the specific category of engagement that an individual participates in, but the frequency in which they do participate overall; the higher the frequency of participation in a variety of activities the higher the physical and cognitive functioning. These results suggest that high frequency activities may need to be added to the engagement framework (Maier & Klumb, 2005) extending it beyond the activities solely based on their categories.

Limitations. Some limitations to this study are important to note. The data set, which was used for this study, had only surveyed individuals that were present in areas within the community (community centres, seniors' clubs, the Ontario Senior Games).

These individuals were already out of their homes engaging in some sort of activity. When the data was examined a sufficient amount of variance between participants among the activities was found and the fact that the lowest numbers of activities participated in regularly came from active leisure engagement suggests the sample was not biased. However different participation results may have been noted if some of the sample had included individuals who seldom leave their home or from individuals who reside in an assisted living facility.

A second limitation to this study was that the participants' physical and cognitive functioning was based on self-report measures. The measures that were used in this study were common measures present throughout the SA literature but there was no way of validating if the participants were recording responses that properly matched their present functioning.

A final limitation to this thesis concerns grouping the activities into the four different engagement categories. In hypotheses one and two the activities are classified as either productive, social, passive leisure, or active leisure engagement. However, some of the activities could have been placed in more than one category. For example, participating in team organized sports was classified as an active leisure type activity but could of also fallen under social engagement. Therefore, these specific groupings could have affected how each category predicted cognitive and physical functioning. More specifically, if the activity groupings had been shifted or different results concerning the prediction of better cognitive functioning may have been found.

Relevance. The findings from this thesis support that remaining actively engaged is a crucial part of maintaining and even improving one's physical and cognitive functioning as they age. It has been common knowledge throughout the aging population that participation in active leisure activities will help with the maintenance and improvement of physical functioning (Liffiton, Horton, Baker & Weir, 2012). What some older individuals may not understand is that even less-structured and less-intense forms of active leisure activities can significantly improve physical functioning. This information could encourage older individuals to participate in active leisure activities knowing it is not necessary to take part in high intensity exercise or physical activity and may be used as a tool for the promotion of physical activity among seniors. If seniors understand that going for a daily walk rather than suiting up for a hockey match will help maintain their physical functioning they may be more inclined to remain engaged in the simple forms of active leisure activities.

The most important findings from this thesis are that the frequency (the highly participated in activities) rather than the type of engagement (productive, social, passive leisure, active leisure) participated in are able to in influence one's cognitive and physical functioning. As many individuals age they may not be able to carry out some of the more physically demanding activities. It is important to inform aging individuals that it is not the specific activity that is crucial for maintaining or even improving their function but that they remain engaged with activities at a high frequency throughout their week regardless if it is participating in self-directed exercise, gardening, reading, or listening to music.

Using this information parks and recreation departments, community centres, seniors' centres and administrators of retirement and nursing homes can help inform seniors of the importance of different types of engagement. Promotion of engagement can be facilitated through the organization of a variety of different activity groups and clubs not specific to any category. Future research should include determining if the engagement pattern of the individuals who took part in this study changes over time. This will expand the literature by determining how engagement patterns of seniors may change over time. The use of interviews or focus groups may also be beneficial for future work to determine why engagement patterns may change as an individual continues to age and how new opportunities for engagement may be developed.

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Appendix A – Demographic Information

1. Name: _____ Participant Code: _____

2. Phone Number: _____

3. Gender: _____

4. Age: _____

5. Height: _____

6. Weight: _____

7. Highest Level of Education: Please check the highest level:

___Elementary School ___High School ___College ___University ___Post-graduate

8. Total household Income: Please check the most appropriate value:

___≤$20,000___≤$40,000___≤$60,000___≤$80,000___>$80,000__prefer not to answer

9. Living Environment: Please check the most appropriate location:

____House ____Apartment/Condominium ____Retirement residence

10. Living Arrangement:

____With Spouse ____With Family ____Alone

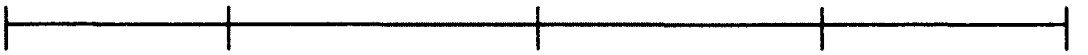
Appendix B – Engagement Activity

For each item below, please indicate the frequency with which you performed the activity over the last 7 days: Never (0 times), Seldom (1-3 times), Often (4-6 times), or Daily (7 times)

Activity	Never (0 times)	Seldom (1-3 times)	Often (4-6 times)	Daily (7 times)	# of hours per week
Example:					
Volunteer work		**X**			**4**
Social groups for older adults			**X**		**12**
Full-time or part-time paid employment					
Volunteer work					
Gardening /light housework (e.g. laundry, dusting)					
Meal preparation					
Heavy housework (e.g. vacuuming, raking)					
Care for others (e.g. parent, grandchildren)					
Visited with family outside of your home					
Visited with friends outside of your home					
Visited with family in your home					
Visited with friends in your home					
Phone conversations					
Church-related activities					
Social groups for older adults					
Service, fraternal, or legion activities					
Day or overnight trips					
Playing games with others (e.g. cards)					
Reading					
Watching television					
Writing					
Listening to music					
Attending theatre events (e.g. live, movies)					
Collecting hobbies (e.g. stamps)					
Handwork hobbies (e.g. knitting)					
Computer use					
Participation in organized exercise classes					
Participation in self-directed exercise (e.g. cardio)					
Walking for fitness					
Participation in solitary organized sport (e.g. cycling)					
Participation in team organized sport (e.g. hockey)					

Appendix C – Physical Function

On the following scale, please rate your ability to perform the following tasks

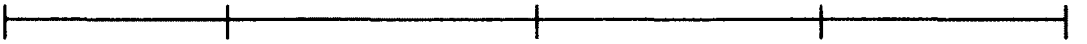


Not able to do at all	Have a lot of difficulty doing	Have some difficulty doing	Have a little difficulty doing	Have no difficulty doing

1. Walk half a mile (0.8 km)

Not able to do at all	Have a lot of difficulty doing	Have some difficulty doing	Have a little difficulty doing	Have no difficulty doing

2. Climb one flight of stairs without resting

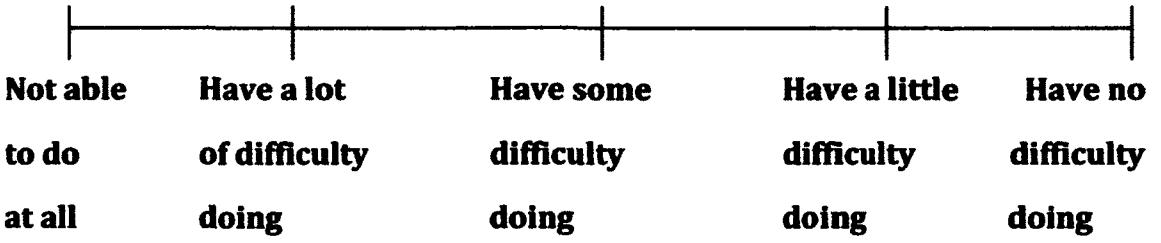


Not able to do at all	Have a lot of difficulty doing	Have some difficulty doing	Have a little difficulty doing	Have no difficulty doing

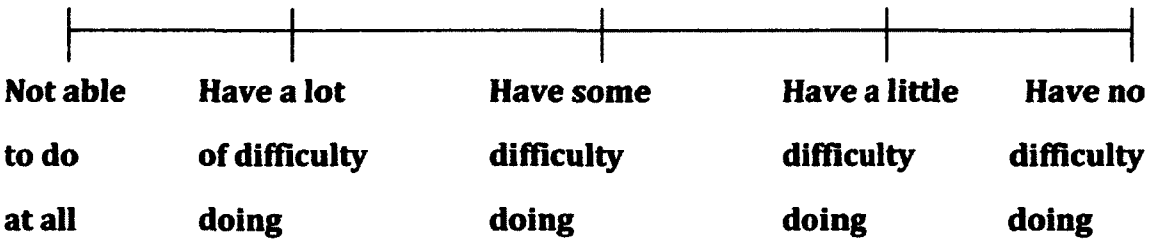
3. Lift or carry weights over 10 pounds (4.54 kg) (a heavy bag of groceries)

Not able to do at all	Have a lot of difficulty doing	Have some difficulty doing	Have a little difficulty doing	Have no difficulty doing

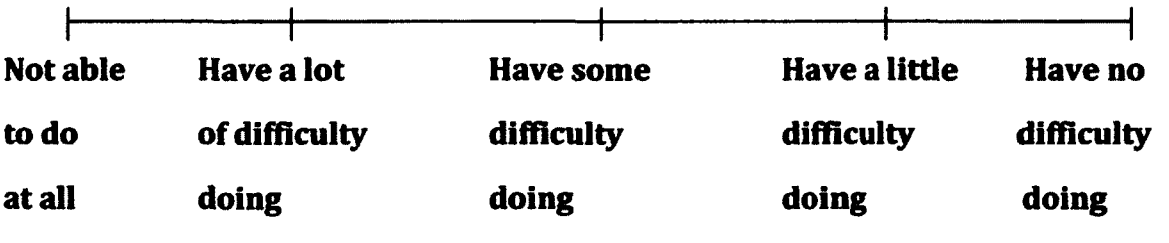
4. Stoop, crouch, or kneel



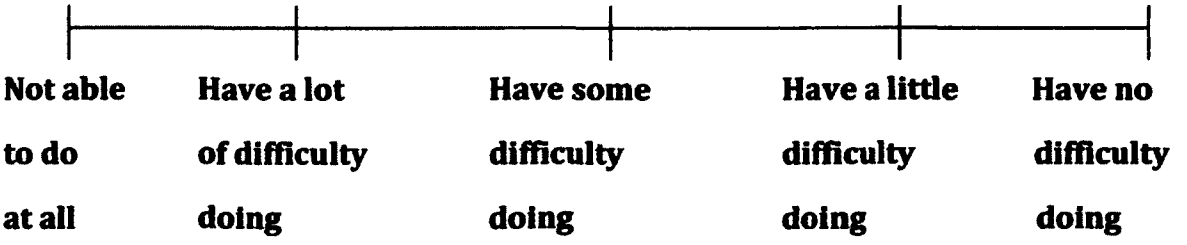
5. Push or pull a large object (like a living room chair)



6. Lift arms above shoulders



7. Write or handle small objects



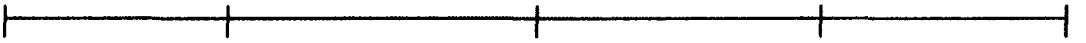
Appendix D – Cognitive Function

Cognitive Function

On the following scale, please rate your ability to perform the following tasks

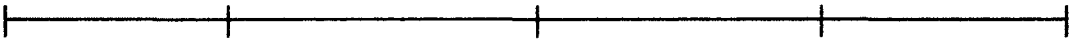
Not able to do at all	Have a lot of difficulty doing	Have some difficulty doing	Have a little difficulty doing	Have no difficulty doing

1. Remember things you need to do



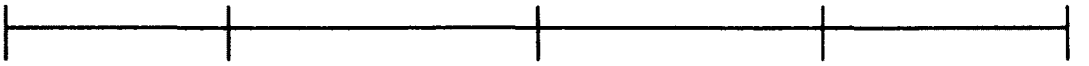
Not able to do at all	Have a lot of difficulty doing	Have some difficulty doing	Have a little difficulty doing	Have no difficulty doing

2. Remember where you put something



Not able to do at all	Have a lot of difficulty doing	Have some difficulty doing	Have a little difficulty doing	Have no difficulty doing

3. Find the right word when talking



Not able to do at all	Have a lot of difficulty doing	Have some difficulty doing	Have a little difficulty doing	Have no difficulty doing

4. Do your own personal banking

Not able to do at all	Have a lot of difficulty doing	Have some difficulty doing	Have a little difficulty doing	Have no difficulty doing

Appendix E – Review of Literature

Review of Literature

Dimensions of Successful Aging

A renewed interest in aging has recently presented itself in literature due to the increase in life expectancy and the rise in global population aging. The report prepared by the United Nations for their World Assembly on Aging in 2002 noted that current aging trends worldwide are unprecedented in human history. In Canada for example, the population of older adults (> 65 years) is increasing at a faster rate relative to any other age cohort. In 2006, for the first time in Canadian census history, the number of people over the age of 65 years topped the four million mark, representing 11.5% of the total Canadian population (National Advisory Council on Aging, 2006). As 'baby boomers' (i.e., those born between 1946 and 1964) reach the age of 65 years, the aging population is expected to continue to grow, resulting in an increase in the elderly dependency ratio, or a higher ratio of older adults to younger adults (Batini, Callen & McKibbin, 2006). By 2026, it is expected that 20% or 1 in 5 Canadians will be classified as seniors (i.e. > 65 years) (Health Canada, 2002). This change in population proportion of older Canadian adults can be in part attributed to the rise in life expectancy in the last fifty years from 68.6 years of age to 80.7 years of age (St-Arnaud, Beaudet, Tully & Tully, 2005; National Advisory Council on Aging, 2006). The impact of an aging society can be felt in many sectors from the funding of pensions, to healthcare, to increased spending on disability (National Advisory Council on Aging, 2006). Therefore, it is imperative for society as a whole to recognize the importance of helping seniors to maintain their health, physical and cognitive functioning and their engagement with life.

These three dimensions provide the foundation for successful aging (SA). SA has mainly been defined in two different ways. The first reflects a continuous adaptation to age-related changes (Baltes & Baltes, 1990). Aging presents unavoidable declines in performance as well as function; and an individual must learn how to live productively with these deteriorations. The second defines SA as a state of being that may be objectively measured at a particular moment in any stage of life. These measures include variables such as disease and disability (Fries, 1980), cognitive performance (Salthouse, 1991), physical functioning (Shulz & Curnow, 1988; Strawbridge, Cohen, Shema & Kaplan, 1996), as well as life satisfaction (Palmore, 1979). Over the past few decades, these two views of SA have been incorporated into many different models and frameworks all of which include various factors and criteria (Depp & Jeste, 2006).

Rowe and Khan's (1987) model of SA has been the most commonly used and widely accepted in research (Strawbridge, Wallhagen & Cohen, 2002; Depp & Jeste, 2006). They reported that research on aging had mainly focused on 'losses'; meaning, that many geriatricians believe that decreases in cognitive and physical functioning are simply a product of aging, even when disease and pathology are absent (Rowe & Khan, 1987). While some pathological changes are age-determined and inevitable, normal aging is usually reserved for situations when disease-related physiological changes are not present. Normal aging can be divided into two different categories: usual aging and successful aging. Usual aging is defined as typical non-pathological age-related losses (Rowe & Khan, 1987). While, these older individuals are fortunate to be disease free, decreases in cognitive and physical functioning are still present which puts them at risk for illness/disability. Successful aging, on the other hand, represents individuals who

exhibit minimal or no cognitive and physical losses when compared to the average younger individual. They are at low risk for disease and are high functioning adults (Rowe & Khan, 1997). One very important contribution from Rowe and Kahn (1998) is the power to which lifestyle related factors such as diet, smoking and exercise can influence the aging process. They suggest that when lifestyle factors are managed and ".... people realize their potential benefits, we can finally make the move from a gerontology of inevitable decline to one of sustained success " (Rowe & Khan, 1998, p.54).

Rowe and Khan (1997) describe SA as containing three main components. The first is a low probability of disease and disease-related disability. This not only includes the absence of disease but also the absence of risk factors for disease. Disease or diseases-related disability is considered to be any physical or health related problem that lasts for at least six months and limits daily tasks and occupations (Gilmour & Park, 2004). Common risks for disease include changes in abdominal fat, changes in systolic blood pressure, or decreases in organ and immune function (Rowe & Khan, 1987). The second component of the model is high mental and physical functioning. This includes the potential for function and activity, as it is more important to know what an individual is capable of doing, not simply what they are doing. The final component is active engagement with life. This component of Rowe and Khan's model primarily focuses on interpersonal relations and productive activity. Interpersonal relations are classified as contact with others (i.e. emotional support), whereas productive activities must create societal value, such as through paid or volunteer work. All three of Rowe and Khan's components work together as a hierarchy to create successful aging. When

disease/disability is absent mental and physical function are easier to maintain. In turn the maintenance of function helps individuals stay engaged with their lives (Rowe & Khan, 1998).

As mentioned Rowe and Khan's (1987) model has been the most commonly used and widely accepted in research (Strawbridge et al., 2002; Depp & Jeste, 2006), however it does not come without criticisms. Many researchers believe that Rowe and Khan's model is too restrictive only including individuals that are disease free (Young et al., 2008), while others believe social structure, self-efficacy (Riley, 1998) and spirituality (Crowther, Parker, Achenbaum, Larimore & Konig, 2001) should be included as main components to the model. Therefore, it is important to continue to investigate this model.

Engagement with Life

In the scientific literature surrounding SA, the component that has garnered the least attention has been engagement (Montrosset al., 2006). Interestingly, when examining the views of SA from older individuals, the importance of engagement seems to be stressed. Older adults often believe social engagement and a positive outlook towards life are important factors contributing to SA (Strawbridge, Wallhagen & Cohen, 2002). For example, Knight and Ricciardelli (2003) used semi-structured interviews to ask seniors "What they thought successful aging was?" Fifty-three percent of the participants responded 'health' with 'activity' a close second, being mentioned by 50% of participants. After Knight and Ricciardelli's interview they asked their participants to rate the importance of ten common criteria of SA that emerge from the literature. Their rank ordered answers were as follows: health, happiness, mental capacity, adjustment,

life satisfaction, physical activity, close personal relationships, social activity, sense of purpose and withdrawal. Similarly, Fisher (1995) employed a similar interview methodology where participants reported that SA was described as a person's ability to adjust to their present as well as future conditions. Activity, income, health, interactions with others and a positive attitude were the common factors leading to SA in their study. Tate, Leedine and Cuddy (2003) surveyed a group of retired individuals from an Air Force crew and asked, "What is your definition of SA and would you say you have aged successfully?" Of the participants 83.8% felt they were successfully aging based on components such as health, life satisfaction, keeping active and keeping fit. In all three of these studies the seniors included the importance of remaining physically and socially active as important factors for SA, running parallel with the third component of Rowe and Khan's SA model, remaining actively engaged with life.

Types of Engagement

Engagement with life can be divided into four different categorizes: productive, social, passive leisure and active leisure. These classifications of engagement are derived from Maier and Klumb's (2005) theoretical model, as well as the categorizations used by Glass, Mendes de Leon, Marottolli and Berkman (1999), Mendes de Leon, Glass and Berkman (2003) and Menec (2003). While much of the literature has focused on different categories of engagement, Mendes de Leon et al., (2005) suggested they all fall under the term *social engagement*. While this umbrella term expands the focus of engagement beyond productive activities, it is useful to consider the positive impact of all forms of engagement on the maintenance of cognitive and physical functioning in aging.

Maier and Klumb's (2005) theoretical model is comprised of two categories of social engagement activities: regenerative activities and discretionary activities. Regenerative activities are those that are physiologically necessary for surviving, such as eating, while discretionary activities are those that are completed by choice (Maier & Klumb, 2005). Discretionary activities are then further divided into productive and consumptive. Productive activities are those that are carried out for the purpose of an outcome, for example, you go shopping to buy the groceries so one may feed themselves. On the other hand consumptive activities are completed simply for their own sake, (e.g. watching television). A positive aspect of this model is that the term productive activity has been presented consistently across the literature; however, there has been great variability when trying to define consumptive activity. It includes social as well as leisure activities that have been referred to as high demand leisure (e.g., swimming, walking) (Everard, Lach, Fisher & Baum, 2000), low demand leisure (e.g., sewing, listening to music) (Everard et al., 2000), active leisure (e.g., swimming, walking) (Dallosso, Morgan, Bassey, Ebrahim, Fentem & Darie, 1998) and social leisure (e.g., visits to theatre, shopping) (Medes de Leon et al., 2003).

Glass et al.'s (1999) categorizations of engagement included social, productive and fitness activities. Social activities were broken down into church attendance, visits to cinema, day or overnight trips, playing games and participation in social groups. Productive activities were considered gardening, meal preparation, shopping, volunteer work and paid work. Finally, active sports, walking for fitness and physical exercise were considered to be fitness activities. Mendes de Leon et al. (2003) simply divided engagement into social and productive activities, which included a characterization of the

types of activities common among older persons. Eleven types of social and productive activities were classified: visits to theaters, shopping, gardening, meal preparation, game playing, day or overnight trips, paid community work, unpaid community work, church attendance, active sports, walking and physical exercise. Menec (2003) created an 18-item checklist to define engagement. The items were divided into three different components: social activities (visiting family or relatives, visiting friends, phone conversations, church related activities, social groups, fraternal or legion activities, travel and sports or games), solitary activities (collecting hobbies, handwork hobbies, music, theatre, reading and writing) and productive activities (work, volunteer work, housework or gardening and heavy housework or yard work).

For the purpose of the current thesis, *Productive Activities* are defined as those that create societal value and are carried our for the purpose of their outcome. For instance, you go shopping to buy the groceries so you may feed yourself. Productive activities include full-time or part-time employment; volunteer work; gardening or lighthouse work (e.g. laundry, dusting); meal preparation; heavy housework (e.g. vacuuming, raking); care for others (e.g. parent, grandchildren). *Social Activities* provide interactions among others. Visiting with family (either outside or inside their home), visiting friends or neighbours (either outside or inside their home), phone conversations, attending church-related activities, meeting with formal or informal social groups, providing service, fraternal, or legion activities, enjoying day or overnight trips and playing games (e.g. cards) are all types of social activities. *Passive Leisure Activities* are defined as activities that tend not to include a social component and are commonly carried out by a single person without any necessary company. Passive leisure activities

are activities such as reading, writing, watching television, listening to music, attending theatre events (e.g. live, movies), collecting hobbies (e.g. stamps), handwork hobbies (e.g. knitting) and computer use. *Active Leisure Activities* are defined as those that help with the maintenance of physical functioning and tend to require a larger expenditure of metabolic energy. In this study, these activities will be used to quantify one's involvement in physical activity and sport. Active leisure activities include participation in organized exercise classes, participation in self-directed exercise (e.g. cardio), walking for fitness, participation in solitary organized sport (e.g. cycling) and participation in team organized sport (e.g. hockey).

Concomitant with defining active engagement there has been little agreement on how best to measure overall engagement. While this may be viewed negatively, it has proven advantageous to research. The different measures and methodologies that have been used in various different studies have allowed for insight into the relationship between engagement and psychosocial function and have left room for further research. Now it is important to determine which types of engagement seniors most often engagement themselves in and look at how the different types of engagement and activities play a role in making up an engagement profile for seniors.

Developing an Engagement Profile

As previously mentioned, of all the components in Rowe and Khan's model of SA, engagement has received the least attention in research and literature (Montross et al., 2006). According to Rowe and Khan (1997), engagement includes activity and social support. Engaging in productive activities has been associated with better health and

functioning (Glass, Seeman, Herzog, Kahn & Berkman 1995) while social activities were predictive for increased physical function and a slower decline in functional status (Unger, Johnson & Marks, 1997) and passive and active leisure activities have been associated with better overall functioning and survival (Glass et al., 1999).

Rowe and Khan (1998) believed that being part of a social network of friends and family is one of the most obvious factors leading to longevity. This socio-emotional support is so vital to SA because it assures individuals that they are valued someway in society. It can be actions as simple as helping with chores, transportation, physical or financial needs (Rowe & Khan, 1998). The level of intimacy occurring throughout social engagement plays an important role in well-being with greater intimacy connections leading to greater life satisfaction (Lemon, Begtson & Paterson, 1972). Many older adults also believe that social engagement and a positive outlook towards life is just as important to SA as remaining physically active.

Glass et al. (1999) conducted a study that examined the relation between survival and three types of activities separately: social, productive and fitness activities. Results found that social activities were significantly associated with survival. Those who were more socially active had longer survival compared with those who were less socially active. This study was important because it suggests that activities that entail little or no physical exertion may also be beneficial to the elderly (Glass et al., 1999). Similarly, Bassuk, Glass and Berkman (1999) interviewed older individuals in their home to determine the relation between social disengagement and cognitive decline. They found that individuals who had five to six social ties compared to those who had no social ties were at less of a risk for cognitive decline.

Mendes De Leon et al. (2003) looked at engagement and its influences on well-being. In their study they examined participation in social and productive activity and its association with a reduced risk of disability in adults over 65 years. Disability was determined via self-report measures based on performance of self-care tasks (e.g. bathing, dressing, eating), strength and mobility, as well as upper and lower extremity function. Eleven types of social and productive activities were included in their data collection: visits to the theater, sporting events, shopping, gardening, meal preparation, cards, game playing, trips, community work, fitness activities and church attendance. They found that adults who were more socially engaged reported less disability. In turn, prevention of disability due to active engagement allowed older individuals to continue to be social. Active engagement might also help modify age-related effects by providing individuals with a sense of purpose and control of their lives (Mendes de Leon et al., 2003).

A similar study conducted by Menec (2003) looked at aging Canadian seniors. Their activity level was measured at the beginning of the study; and, six years later function, well-being and mortality were examined in the same individuals. Menec (2003) also examined the relationship between specific types of activities and their individual influence on well-being, function and mortality. The level of well-being was measured based on happiness as well as life satisfaction and function was defined using a measure, which combined physical as well as cognitive functioning. Participants were instructed to indicate the types of activities they participated in throughout the past week via a 21-item checklist. The activities were then divided into three different categories: social activities (e.g. visiting family), solitary activities (e.g. collecting hobbies) and productive activities (e.g. housework or volunteering). Results showed that the individuals

participated in eight activities on average. Social activities were the most common, with 93.1% indicating that they visited or phoned a friend/family member; reading was the most common solitary activity and light housework/gardening was the most prevalent for productive activity.

Menec (2003) found that several of the activities were related to happiness. These included social activities such as participating in social groups, sports, or games; solitary activities being handwork hobbies, music/art/theatre and reading; and productive activities namely light housework and gardening. However, the only activity that significantly contributed to life satisfaction was participating in sport or games. There were also a number of activities that contributed to maintained function and reduced mortality. Individuals who attended church and performed housework/gardening were less likely to die within the next six years. Mass activities (e.g. Bingo) and church attendance predicted better function over the six years studied. Of the solitary activities that were looked at only music/art/theatre were positively correlated with maintained function.

It is widely known that participation in physical activity has significant positive effects on improving and maintaining mental health, preventing and minimizing effects of chronic diseases, as well as enhancing physical health and function in older adults. However, regardless of the benefits, Canada's National Advisory Council on Aging graded Canadian seniors with a letter 'C'. In 2005 it was recorded that 62% of seniors in Canada were inactive despite their knowledge that physical activity increased their odds of achieving SA, an absence of cardiovascular disease, cancer and chronic pulmonary disease. The National Advisory Council on Aging (2006) attributed the low grade of the

report card to the fact that physical activity is not incorporated into individuals' daily living because of ageist issues and negative stereotypes that are directed to the elderly.

While the majority of studies to date have focused on passive leisure, social and productive activities, it is also important to consider active leisure as contributing to overall engagement. Active leisure includes participation in sport or physical activities. Physical activity is defined as any bodily movement produced by skeletal muscles that result in energy expenditure (Caspersen, Powell, Christenson, 1985). In daily life it can be categorized into occupational, sports, conditioning, or other activities that utilize strength, power, endurance, speed, flexibility, or range of motion (Caspersen et al., 1985). Menec (2003) found sports or games were the only significant predictor of life satisfaction; however, it is unclear how these variables were defined, as they were included as a social activity. Similarly, Everard, et al. (2000) surveyed older adults to examine the relationship between the maintenance of performing leisure, social, physical, productive and instrumental activities and active engagement with life. Functioning was measured using the SF-12 Health Survey, which assesses the effects of both physical and mental health on functioning (Ware, Kosinski & Keller, 1995); and, active engagement was determined through an Activity Checklist. When older individuals remained involved in high demand leisure activities (i.e. swimming, walking, gardening) higher physical function scores were maintained. It was further noted that low demand leisure activities were associated with better mental health and contributed to the maintenance of function. This association is important because as an individual experiences age-related changes in health they will have to give up more physically demanding activities for these lower intensity leisure activities (Everard et al, 2003). This is consistent with

(1995) post-modern description of identify, where the goal is to remain flexible and open in terms of adapting to changing roles and activities.

Being actively engaged with life has been positively correlated with physical activity. However, as Baker and colleagues (Baker, Meisner, Logan, Kungl & Weir, 2009) point out, little is known about physical activity's role when it comes to promoting SA including cognitive and physical functioning in older adults. They believe having this information would be of great importance for informing public health messaging targeting interventions to the elders most in need. Using data from the Canadian Community Health Survey they conceptually defined the components of successful aging and reported that older adults who were physically active were two times more likely to be aging successfully with better function than those who were not physically active. Extending this work, Meisner, et al. (2010) revealed that participants classified as inactive had greater than two times the odds of having a functional limitation compared to a chronic condition or being socially disengaged with life.

It is clear that there has been little agreement on which types of activity contributes most to seniors' engagement profile and is most important in influencing cognitive and physical function. Rowe and Khan (1997) concentrate on productive and social activities, while others may disagree claiming physical activity vital (Everard et al., 2000; Menec, 2003). Horgas, Hans-Ulrich & Baltes (1998), who looked at how seniors spend their day, created an activity profile and claimed that no single type of activity is more important than the next. Engaging in a variety of activities may influence successful aging and maintenance of cognitive and physical function (Horgas et al.,

1998). Therefore, the frequency of participation in different types of engagement and how they may influence cognitive and physical function is important to determine.

Cognitive and Physical Functioning

There has been research supporting regular involvement in physical activity being related to improved mental and psychological functioning (Strawbridge et al., 2002), however not all individuals who are physically active are more engaged with their lives than sedentary individuals. Future research might also make a point to consider the independent and interactive effects of different types of engagement on cognitive and physical function. Study that have examined physical functioning have commonly used the Rosow-Breslau Functional Health scale measure. This measure consists of three items that assesses one's ability to do heavy work around the house, to walk up and down the stairs and to walk half a mile. Summary scores are usually formed by adding the three items. Nagi (1976) developed a measure, which determines the degree of difficulty in pulling or pushing a large object; stopping, crouching, or kneeling; reaching or extending the arms above shoulder level; and writing or handling small objects. Cognitive functioning measures have been used by Strawbridge et al. (2002), who asked their participants their ability to "remember things without difficulty"; "remember where one put something" and " find the right word when talking".

As an individual ages there seems to be a natural decline in cognitive and physical functioning. However, good cognitive and physical functioning is an integral part of maintaining independence. Beginning around the sixth decade of one's life their strength declines 1.0% to 1.5% per year (Vandervoort & McComas, 1986) and the probability of functional dependence increases by approximately 22% each year after the age of 70

years (Paterson, GovinDasamy, Vidmar, Cunnigham & Koval, 2004). This age associated natural decline and an increase in the probability of chronic health conditions are associated with failure of performing activities of daily living (ADLs) and a loss of functioning and independence. Just like younger people, older individuals want to remain independent. Independence would mean continuing to live in one's own home, taking care of oneself and carrying out routines of daily tasks (Rowe & Khan, 1998).

Even though some natural declines in physical and cognitive function among older individuals do occur they are not completely inevitable. Rowe and Khan (1997) stated that education, physical activity, peak pulmonary flow rate and self-efficacy were directly related to be predictors of the maintenance of cognitive functioning. Increasing physical activity levels has shown to enhance central nervous function, particularly memory function (Rowe & Khan, 1997). On the other hand, moderate or strenuous leisure activity as well as emotional support from family or friends was found to be the direct predictors of physical function (Rowe & Khan, 1997).

Bassuk et al., (1999) stated that social engagement can challenge an individual to communicate effectively and participate in complex interpersonal exchanges. It may also provide a dynamic environment requiring cognitive use and the social aspect can encourage a sense of commitment to a community or family with a sense of purpose or fulfillment (Bassuk et al., 1999). This study examined the relationship between social disengagement and incident cognitive decline in community dwelling older individuals. Interviews were conducted over the phone at four different times across a twelve-year period. Cognitive function, social disengagement and emotion support were all measured using interview questionnaire methods. Cognitive decline was determined through the

ten-item Short Portable Mental Status Questionnaire (SPMSQ) including questions such as "What is your address?" (Pfeiffer, 1975). Presence of a spouse, monthly visual contact with at least three relatives or close friends, yearly non-visual contact with at least ten relatives or close friends, attendance to religious services, membership in other groups and regular participation in recreational social activities were used to assess social disengagement. Finally, emotional support was determined by using the question, "Can you count on anyone to provide you with emotional support – that is, talking over problems or helping make a difficult decision?".

Results showed that social disengagement was significantly associated with the probability of cognitive decline; as the number of social ties increased, the likelihood of cognitive decline was further reduced. Participants who had no social ties compared to those who had five or six were twice as likely as experiencing cognitive decline. Therefore, findings of this study indicate that maintaining many social connections and activities may help prevent or postpone a decline of cognitive function.

Mendes de Leon et al.'s (2003) study examined the effects of social and productive activity on functional decline. More socially active people reported lower levels of disability than the other participants. Mendes de Leon et al. (2003) suggest that social engagement can provide a sense of purpose and control over one's life and efficacy in one's abilities. Therefore, social engagement can lessen the impact of physical decline on physical functioning and independence. Menec (2003) also found that participation in social and productive activities was related to reduced functional decline. Church-related activities and mass activating predicted better function as well as productive activities such as volunteer work, heavy housework and yardwork. Therefore, it seems clear that

different types of engagement help to improve cognitive and physical functioning and independence. However, often a combination of aging and inactivity come together and the problem of functional decline is only exacerbated.

Acree et al. (2006) used questionnaires that examined physical activity level and health related quality of life (HRQL) in seniors. Subjects were divided into either a low or high physical activity classification based on their response to how often they participated in physical activity throughout the week. The Medical Outcome Survey Short Form-36 (MOS SF-36) was included in the questionnaires to assess HRQL. The MOS SF-36 assessed both physical and mental health. Role limitations due to physical health, bodily pain and general health comprised the physical functioning component of HRQL. Vitality, social functioning, role limitation due to emotional health and mental health made up the cognitive and mental functioning component of HRQL. Results indicated that those individuals who participated in regular physical activity of at least moderate intensity had higher HRQL in both the physical and cognitive components. Specifically role-limiting physical function, overall physical function, vitality, social functioning and bodily pain were proven to be better in more physically activity group.

Conclusion

The research, clearly suggests that engagement plays a vital role in predicting cognitive and physical functioning and therefore functional independence. However, to date it has not been clear which types of activities are performed most frequently in seniors' engagement profile as well as which activities best predict cognitive and/or physical functioning. Therefore it is important for future research to obtain a more

comprehensive picture of what Canadian seniors' engagement profile looks like and how that is contributing to their independence.

VITA AUCTORIS

Name:	Jacqueline Liffiton
Place of Birth:	Windsor, Ontario
Year of Birth:	1988
Education:	Vincent Massey Secondary School, Windsor, ON 2001-2006
	University of Windsor, Windsor, ON 2006-2010, B.H.K
	University of Windsor, Windsor, ON 2010-2012, M.H.K