# Understanding Late-life Loneliness and Its Detrimental Effects on Health: The Mediating Role of Perceived Control

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**Abstract**

*Loneliness* is arguably the most common and debilitating emotion that people may experience in later life. Undoubtedly, loneliness poses a very serious threat to the health and well-being of older adults. For this reason, researchers and gerontologists are actively searching for a better understanding of both the causes and effects of this detrimental emotional condition. I address this concern by asking: How does loneliness erode physical and emotional health in older people? This study focuses on *perceived control* (PC), a critical psychological variable thought as the means to arm people with *resilience* when they face challenging events especially common during the aging process.

The premise of this study is that PC plays a critical role both as a predictor and an outcome of loneliness, and together, PC and loneliness have considerable health consequences. Presumably, PC mediate the effect of loneliness, helping to explain why (or how) loneliness leads to poorer physical and emotional health outcomes. The analyses are based on seniors who participated in the Aging in Manitoba Study ($N$ = 167, $M$ age = 80) providing responses to in-home interviews over a 7-year period. Through a rigorous methodological procedure, the study addresses several novel research questions using an incremental model building strategy accompanied by specific mediational analyses.

Initially, the findings of this study have replicated the results from prior research showing that PC, indeed, represents a significant predictor of late-life loneliness. More importantly however, as a novel contribution to the research literature, the study has revealed a consistent pattern of significant partial mediation by PC of the loneliness–health association across three different health indicators.

Overall, the findings demonstrate a critical role of psychological variables, particularly, PC, in understanding the relationship between loneliness and the health of older people. Currently, effectiveness of the existing anti-loneliness interventions remains weak. But, as the results of this thesis imply, PC has a great potential to form the basis for a powerful and economically viable intervention. The need to develop such control-based treatments seems especially pressing today when the world is confronted with the unprecedented challenge of social isolation during the COVID-19 crisis.

*Keywords:* loneliness, perceived control, resilience, health, older adults

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## Prologue

Shortly after the work on this thesis began, increasingly more articles started appearing in social media talking about "loneliness epidemic" becoming "the biggest threat to our public health" (Howe, 2019; "Loneliness," n.d.; "Psych Congress Keynote," 2019). We are now growing more aware of the strikingly adverse effects that loneliness and social isolation have on health and well-being for people of all ages with the two groups of population being especially vulnerable: young people between 15 and 25 and adults of 75 years of age and older.

Because we live in a highly digital era when nearly every person has a cell phone and/or access to online communication, it may be rather surprising why loneliness appears to be an escalating rather than a subsiding phenomenon. More campaigns to combat loneliness, both in-person and online, are being launched but the evidence for their effectiveness remains weak (e.g., Fakoya, McCorry, & Donnelly, 2020; Gardiner, Geldenhuys, & Gott, 2018). It is also highly unclear whether our enhanced online presence, indeed, helps us feel less lonely (Chipps, Jarvis, & Ramlall, 2017). But, if for young people, turning to online platform may be among common ways to seek connection with others, for older adults, it may be far less true. In fact, older people may be more vulnerable than younger people because they may feel uneasy or even anxious about using technology and online communications as for some of them, if not the majority, it is a relatively novel experience (Andrews, Brown, Hawley, & Astell, 2019).

While we can continue our attempts to develop successful anti-loneliness interventions online and to make the use of technology more age-friendly, there is another angle through which we may try to confront the problem of loneliness among older people. Drawing from a large body of research literature, in this thesis I present an argument for advancing our

understanding of the *psychological* variables that contribute to the experience of loneliness and the associated health outcomes for people who are in later years of their lives.

What is the role of psychology and psychological research in this context? Today, with the increasing quantity of financial and industrial resources in our society, it may seem more reasonable and more effective to attempt implementing tangible, physical changes in people's lives. Yes, we can create online interest groups. We can facilitate co-housing communities and encourage extended families to live under one roof. Of course, we should continue shaping the external environment to enable social interaction between people, particularly between the younger and older adults (e.g., "Toronto HomeShare Program," n.d.). However, programs like this draw exclusively on substantial external assets, which, although becoming more commonly available, may still not be accessible by everybody, especially by those at an advanced age.

In contrast, psychological principles and knowledge refer to what each and every one of us naturally possesses irrespective of our age or stage in life, our technological proficiency, or our living conditions—the ability to deal with environmental stressors by being resilient. We all have considerable internal resources, and we all can benefit from using them wisely. How do such internal psychological resources affect people's experience of loneliness? Can they help us better understand exactly how loneliness—as a purely subjective emotional experience—can lead to poor health outcomes? Finding answers to these important questions through scientific research should help with the development of effective, evidence-based anti-loneliness programs that would have wide-spread implication. And that is what this thesis is dedicated to focusing on perhaps the most vulnerable group in our society—older adults.

# Chapter 1. Introduction

This Chapter presents the argument in this thesis. Starting off with the concept of loneliness, I provide the relevant statistics on the prevalence of the phenomenon among older adults and introduce two other variables central to the study: perceived control and self-rated health. I argue for the great significance of perceived control in relationship to late-life loneliness. I also explain why self-rated health measures, despite being subjective evaluations of one's health, are worth of both clinical and research attention. Finally, I present the main conceptual models for the statistical analyses to come, followed by a brief overview of the thesis.

## The Problem

Human beings are social creatures. Our striving for social connection is a natural desire to belong and to relate to others. But when we perceive that our social needs are somehow unmet, in either qualitative or quantitative ways, we feel lonely (Perlman & Peplau, 1981). This *subjective* experience of being alienated from others is highly corrosive and is recognized to be detrimental for both physical and emotional health. This is especially true for people at the later stages of their lives.

Of course, individuals' objective social circumstances, whether or not they have significant others, live alone, or frequently interact with other people they have close social ties with, have a direct effect on their sense of social integration. More important, however, is to understand the role of psychological variables in this context, inasmuch as these variables represent people's resilience, their natural capacities to cope with life difficulties. Generally, the quality of resilience comes into play when people face a variety of life challenges, for example, at the time of retirement, which is associated with a natural decline in health and social conditions. Given our still limited understanding of how psychological factors contribute to

loneliness in later life and, furthermore, how these variables affect health outcomes that are related to loneliness, this study addresses this limitation in the research literature, specifically, by examining one of the fundamental concepts in social psychology, the variable of *perceived control*—the cognitive resource that preserves and fosters peoples' resilience against major life stressors (see review by Chipperfield, Hamm, Perry, & Ruthig, 2017).

More precisely, the principal objective of this study is to examine how perceived control can explain the impact of loneliness on older adults' physical and emotional health. As a wealth of previous research suggests, perceived control has a great potential to mediate, at least partially, the association between loneliness and both physical and psychological health in older adults. This is a significant research issue because strategies of managing perceived control can form the basis of an effective intervention to help older adults deal with their increasingly difficult emotional and health conditions. Prior to defining the concept of perceived control and outlining the main findings evident in the literature, I provide some relevant statistics on late-life loneliness and introduce the concept that is closely related to loneliness but should not be confused with it—the concept of *social isolation*.

How common is loneliness among the older population? Research shows that loneliness affects between 5% and 40% of people over 65 years of age and an even greater percentage of those over 80 years of age, around 50% (Prince, Harwood, Blizard, & Thomas, 1997; Smith & Baltes, 1996). In the United States, about every third community-dwelling older adult feels lonely at least occasionally (Perissinotto, Stijacic Cenzer, & Covinsky, 2012). With such a high prevalence, loneliness poses a severe problem negatively impacting seniors' health, well-being, and even their life expectancy (e.g., Cacioppo, Hawkley, Crawford, et al., 2002; Holt-Lunstad, Smith, & Layton, 2010; Newall et al., 2009; Shiovitz-Ezra & Ayalon, 2010).

It is essential to distinguish loneliness from social isolation, which is an *objective* indication of social integration. More frequently than not, these two terms are used interchangeably in lay language, social media ("The Facts on Loneliness," n.d.), and even in some academic research reports (Cattan, White, Bond, & Learmouth, 2005; Zavaleta, Samuel, & Mills, 2017); however, they are decidedly not the same phenomena. People are regarded as socially isolated when they have no intimate partner, they live alone, and/or they have limited contacts with family members and friends (De Jong Gierveld & Havens, 2004). But, while being socially isolated, not all people consider themselves lonely; in a similar vein, a person may feel lonely even when living in a large household with an extensive social network of relatives and friends.

In short, loneliness and objective social isolation are distinct notions, and the latter is widely recognized as a risk factor for the former (e.g., Theeke, 2009; Victor, Scambler, Bowling, & Bond, 2005). And although social isolation represents a frequent challenge for older adults due to reduced economic resources, health limitations, and their friends' dying, it seems that people's psychological state, their mere perception of how socially connected they are, has a considerable effect on their physical health and emotional well-being independent of their objective social circumstances (e.g., Holt-Lunstad et al., 2013; Cacioppo, Hawkley, et al., 2006; Cacioppo, Hawkley, & Thisted, 2010; Cacioppo, Hughes, Waite, Hawkley, & Thisted, 2006; Shankar, McMunn, Banks, & Steptoe, 2011). Indeed, above and beyond what is predicted by objective social isolation, loneliness has been shown to produce numerous undesirable outcomes among which are increased blood pressure (Hawkley, Masi, Berry, & Cacioppo, 2006), elevated cortisol levels (Adam, Hawkley, Kudielka, & Cacioppo, 2006), suboptimal cognitive performance (Gow, Pattie, Whiteman, Whalley, & Deary, 2007), poor life satisfaction (Gow et al., 2007), depression

(Cacioppo, Hughes, et al., 2006), and, as I mentioned above, shortened life years (Holt-Lunstad, Smith, & Layton, 2010; Luo, Hawkley, Waite, & Cacioppo, 2012; Patterson & Veenstra, 2010). Consequently, addressing loneliness—as individuals' subjective, *perceived*, struggle of being isolated from others—and, further, identifying the way it impacts health (i.e., the mediation processes involved) is as important as assisting older adults in building rich social circles so they are less likely to feel lonely.

Today, researchers lack a clear understanding of how loneliness affects health of older people. A considerable number of studies provide insights into physiological and behavioral pathways of loneliness (e.g., Cacioppo, Cacioppo, Capitano, & Cole, 2015; Cacioppo, Hawkley, Berntson, et al., 2002; Cacioppo, Hawkley, Crawford, et al., 2002; Luo et al., 2012; Patterson & Veenstra, 2010; Segrin & Domschke, 2011; Shankar et al., 2011). For example, a strong link has been identified between loneliness and the expression of genes responsible for proper immune functioning (Cole, 2008; Cole et al., 2007). In addition, some research has considered psychological mechanisms of loneliness, but those studies remain relatively scarce, especially in the Western research literature (e.g., Segrin & Domschke, 2011; Ypsilanti, Lazuras, Powell, & Overton, 2019).

Nonetheless, the importance of psychological variables is clearly stated in the model of loneliness proposed by the prominent researchers in the field (Cacioppo & Hawkley, 2009; Hawkley & Cacioppo, 2010). According to this model, various psychological variables are associated with loneliness including hypervigilance towards threat, poor self-regulation, and prevalence of negative mood and of negative social expectations (Cacioppo & Hawkley, 2009). Furthermore, apart from the neurological factors (e.g., degenerative processes in the brain), chronic surveillance for threats as well as impairments in learning and memory have been shown

to explain—that is, to mediate—the effect of loneliness on cognitive decline (Cacioppo & Hawkley, 2009). However, the concept of perceived control, as a malleable psychological variable, has not yet received much attention in research literature. Given the central position this variable occupies in social psychology, this, indeed, raises my curiosity.

*Perceived control* (PC) is defined as people's personal beliefs in their own ability to change themselves and influence their surroundings to meet goals they set for themselves. Research convincingly indicates that PC has a significant relationship with many important outcomes in people's lives including their physical health and emotional well-being across the life span and in later life in particular (see review by Chipperfield et al., 2017). Related to this study, PC—and the analogous concepts of *mastery* and *self-efficacy*—has been shown to have a considerable negative association with loneliness (e.g., Moore & Schulz, 1987; Nicolaisen & Thorsen, 2012). In other words, the more efficacy people have, the less lonely they feel. Research using either domain-specific measure of PC (i.e., over a person's social life only; e.g., Newall et al., 2009) or *global* PC (i.e., in life in general; e.g., Newall, Chipperfield, & Bailis, 2013; Suanet & Van Tilburg, 2019) continuously demonstrates that sense of control is a strong correlate and a significant predictor of loneliness to an extent equal to, or even greater than, the effects of most sociodemographic and health variables that are typically used in gerontological research. Remarkably, the *change* in global PC across several years has also been shown to significantly predict loneliness (Newall, Chipperfield, & Bailis, 2013).

Furthermore, a number of studies have linked PC to self-rated physical health (e.g., Bailis, Segall, Mahon, Chipperfield, & Dunn, 2001; Chipperfield et al., 2012; Nicolaisen, Moum, & Thorsen, 2018; Maciejewski, Prigerson, & Mazure, 2000; Ruthig, Chipperfield, Newall, Perry, & Hall, 2007) and to depression as a measure of self-assessed emotional health (e.g., Bailis et al.,

2001; Gallagher & Mckinley, 2009; Nicolaisen et al., 2018). As well, the relationships have been established between loneliness and PC (e.g., Andrew & Meeks, 2018; Fry & Debats, 2002), between PC and health (e.g., ), as well as between loneliness and health (e.g., Nummela et al., 2011; Segrin & Domschke, 2011). As a result, the primary focus of this thesis is directed towards the examination of a potential intervening, or mediating, role of PC between loneliness and several health outcomes, both physical and emotional, using a representative sample of older Canadians.

**Conceptual Models**

I begin, however, with another, yet related, question that concerns replication of the findings from past research with respect to the effect of PC, specifically global PC, on loneliness measured later in time (i.e., 5 years later). The corresponding model is depicted in Figure 1.1(1). Beyond simply providing replication of previous research, this analysis serves as a departing point for building a mediation model which is much more complex.

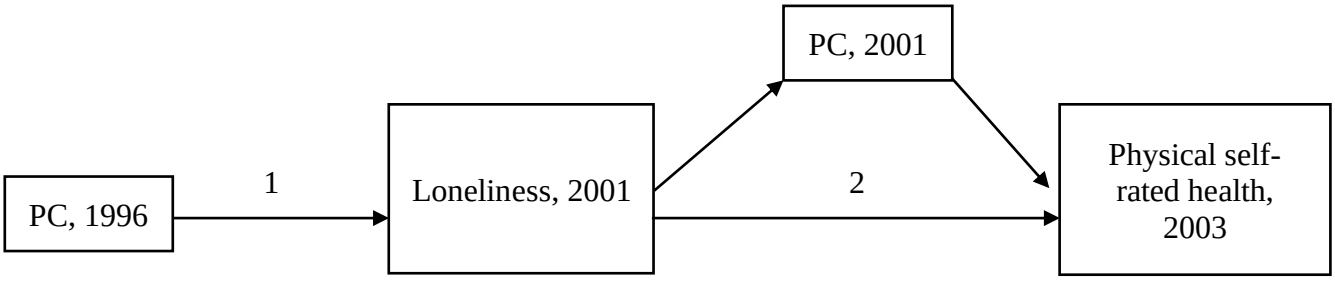


*Figure 1.1.* A conceptual model of Perceived Control predicting Loneliness five years later (1) and the indirect effect of Loneliness on physical self-rated health two years later (2).
PC = Perceived Control.

Subsequently, in the next three questions in this study, I consider global PC as a plausible mediating variable between loneliness and older adults' physical and emotional health (see Figure 1.1(2) and Figure 1.2). This part of the argument uses two physical health variables—a global physical health measure, General Self-Rated Health (GSRH; Idler & Kasl, 1991), and a more detailed physical health measure, Recent Physical Health (RPH; Ruthig, Chipperfield, Newall, et al., 2007)—as well as an emotional health measure, the Center for Epidemiologic Studies Depression scale (CES-D; Radloff, 1977).

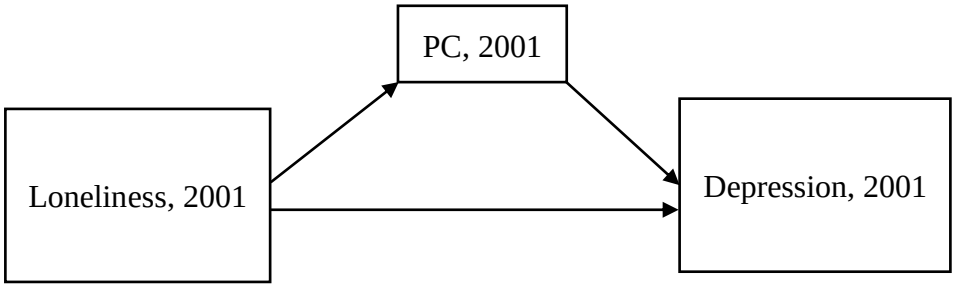


*Figure 1.2.* A conceptual model of the indirect effect of Loneliness on Depression via Perceived Control. PC = Perceived Control.

It is important to emphasize that these health variables represent one's self-evaluations, which means they are subjective. Of course, to not have any objective health outcomes included may be viewed as one of the study's limitations; however, an independent consideration of the self-assessed health measures merits attention because such measures have been shown to provide information about patients' health status that is superior in some respects to what is available through actual medical examinations (Benyamini & Idler, 1999; Bjorner & Kristensen, 1999; Cislaghi & Cislaghi, 2019; Griffiths, Ullman, & Harris, 2005; Heistaro, Jousilahti, Lahelma, Vartiainen, & Puska, 2001; Idler & Benyamini, 1997).

In fact, even when controlling for a person's medical history, self-assessed health has a significant association with life expectancy being an independent risk factor of mortality and *not*

merely a proxy for objective clinical assessments of health (Griffiths et al., 2005). Moreover, in the recent research by Cislaghi and Cislaghi (2019), self-rated health has been found to be a stronger predictor of medicine use and hospitalization than an objective measure of chronic health conditions. This finding highlights the importance of focusing on subjective self-reported health outcomes as critical indicators of people's well-being and quality of life.

Different forms of self-assessment of health are used in both research and clinical practice (Griffiths et al., 2005). As one of the most common self-reported variables, GSRH, is often regarded as a strong indicator of older adults' physical health (i.e., Bailis et al., 2001) due to its established associations with mortality and physical morbidity markers, such as people's chronic condition profiles and hospital visits (e.g., Chipperfield, 1993; Van Doorn, 1999). However, as it is argued in the literature (Ferraro & Wilkinson, 2015; Ruthig & Chipperfield, 2007; Ruthig, Chipperfield, & Payne, 2011), similarly to other self-rated health variables, this measure is inevitably affected by people's psychological states hence capturing important aspects of their well-being far beyond their physical health conditions.

It also appears that distinct self-rated health variables, especially physical health variables, although representing parallel assessments of the same concept, do not always have high agreement. It is argued that these variables may tap into slightly different dimensions of health or they may be differentially affected by age-related factors or the time those variables are measured (Baron-Epel & Kaplan, 2001; Griffiths et al., 2005; Heidrich, Liese, Löwel, & Keil, 2002). By including two measures of physical self-rated health (i.e., GSRH and RPH), I am able to strengthen the evidence and the conclusions I draw from this study, while also highlighting some plausible difference between these two measures in terms of their associations with the

other key variables in the study, Loneliness and PC. In this part, I go well-beyond the findings of the relevant research literature.

**Overview of the Thesis**

This concludes Chapter 1 of this thesis. In Chapter 2, I review the major findings in the literature that concern the key relationships of interest and subsequently pose four research questions: 1) Does PC predict Loneliness in older Canadians within a five-year period? 2) Can PC explain the effect of Loneliness on older adults' General Self-Rated Health? 3) Can PC explain the effect of Loneliness on older adults' Recent Physical Health? 4) Can PC explain the effect of Loneliness on older adults' Depression? The literature review in this chapter is not intended to be exhaustive but to only form a backbone for the arguments and analyses presented later.

Chapter 3 is dedicated to the methodology of the study providing a thorough discussion of the variables and the analytical strategies used to examine their relationships. In Chapter 4, I engage in a step-by-step process of model development, called incremental model building, through which, in addition to the main analyses, I also conduct a number of supplementary analyses supporting and extending the main analyses. The supplementary analyses are exploratory in nature and stem from my choice of incremental model building as the analytical technique that appears to foster a better understanding of the relationships between the variables. Also, in Chapter 4, some additional research is discussed to help rationalize the study's findings. In Chapter 5, which is the concluding chapter of this thesis, I review both the main and the supplementary results arguing for their importance in relevance to the existing literature. Finally, I outline the study's strengths and limitations and share a few concluding thoughts presented in the Epilogue.

# Chapter 2. Literature Review

In this chapter, I discuss the established relationships between the study variables that are most pertinent to the statistical models and the analytical approach used in this thesis. Specifically, I discuss the links between perceived control (PC) and loneliness (as well as between loneliness and PC), between PC and physical and emotional health, and between loneliness and health. Subsequently, I review mediators of loneliness as suggested by previous studies, focusing specifically on the known psychological mediators. The chapter ends with the presentation of the major research questions.

## Variable Relationships

**Perceived control and loneliness.** As suggested in Chapter 1, substantial evidence exists linking the concept of PC to late-life loneliness (e.g., Anderson & Riger, 1991; Andrew & Meeks, 2018; Cohen-Mansfield & Parpura-Gill, 2007; Fry & Debats, 2002; Kramer, Kapteyn, Kuik, & Deeg, 2002; Newall, Chipperfield, & Bailis, 2013; Newall et al., 2009; Moore & Schulz, 1987; Nickolaisen & Thorsen, 2012; Suanet & Van Tilburg, 2019). The work by Newall and colleagues (2009) suggests that stronger beliefs in personal controllability over one's social circle have a significant negative association with loneliness in community-dwelling seniors who are 72 years of age and older. Similarly, in the study by Cohen-Mansfield and Parpura-Gill (2007), for independently living older people of lower incomes, having higher self-efficacy in social situations was also associated with decreased levels of loneliness. In a more recent study of nursing home residents, as well, PC over daily social routine was found to be significantly and negatively associated with loneliness (Andrew & Meeks, 2018). In these studies and a few others, the focus has been on the domain-specific PC—people's sense of control over their own social involvement and their personal ability to build a more fulfilling social life. Overall, it is

suggested that assuming personal responsibility for being lonely and taking actions to increase one's social engagement can serve as an effective means of overcoming loneliness in later life.

Although the importance of domain-specific PC (i.e., over social life) with respect to loneliness finds support in some research literature (e.g., Newall et al., 2009; Schoenmakers, Van Tilburg, & Fokkema, 2012), it may be as critical to consider the fact that for older adults, directly improving one's own social circumstance may not always be possible, especially when social challenges, resulting, for example, from children leaving home, widowhood, or friends dying are often comorbid with functional deficits, such as loss of hearing, high blood pressure, or other health difficulties. Hence, when thing unfortunate events happen, it may be more practical for older people to focus on retaining general controllability beliefs, and not a domain-specific sense of control, by shifting their control aspirations from areas where control is no longer achievable to areas where it can be upheld (Heckhausen, Wrosch, & Schulz, 2010). Nevertheless, depending on one's personal conditions and preferences, the areas of retained PC may differ across individuals, reflecting to some degree differences in personalities, and those areas may not always include social objectives. The question then follows, for older people, regardless of their abilities, personalities, or preferences for social mastery, would having a *general* sense of control (i.e., global PC) be instrumental in alleviating loneliness? This is the first question that I address in this study.

Previous research indicates that, indeed, global PC is negatively associated with loneliness. The study by Fry and Debats (2002) provides evidence for a strong predictive utility of both domain-specific (e.g., social, emotional, instrumental) self-efficacy as well as global self-efficacy with respect to loneliness measured four months later. And although a four-month term is a relatively short period of time, these effects of PC on loneliness are remarkable given they

were found similar to the effect of people' age and larger than the effects of several socioeconomic and health variables.

In terms of a long-run effect of PC, the research by Newall, Chipperfield, and Bailis (2013) showed that older adults with a higher score on the global control scale (a composite measure of PC over several aspects of life) were significantly less likely to report feeling lonely, either moderately or extremely lonely, than the seniors who were lower on this scale. And that relationship upheld over a five-year period supporting the long-term importance of PC in the lives of older people.

While the present analyses, too, consider the effect of global PC on loneliness measured five years later, they are intended to strengthen the evidence of the PC–loneliness longitudinal relationship by including the famous multi-item De Jong Gierveld Loneliness Scale—in contrast to Newall, Chipperfield, and Bailis' (2013) study that used a single-item loneliness variable. Hence, part of the present research represents a replication analysis of the study just mentioned but with a more reliable measure. I view this as a necessary undertaking that is consistent with proper, rigorous scientific practices (Hubbard, 2016).

In short, past research shows that general PC exhibits a significant effect on older adults' experience of loneliness over both short and long periods of time. Consequently, this variable is an important predictor of loneliness. Furthermore, being previously used as a dependent variable in cross-sectional analyses of loneliness (e.g., Andrew & Meeks, 2018), PC is also likely to mediate between loneliness and health outcomes in the older population. In other words, greater loneliness is likely to lead to reduced sense of general control, which, in turn, may jeopardize health of older people several years later. This is, in fact, the main research problem I investigate in this thesis, which goes beyond the published literature. Before testing the proposed mediation,

however, evidence needs to be provided for the effect of PC on health outcomes as well as for the effect of loneliness on health, all of which I review next.

**Perceived control as a predictor of health.** Being eminently coined as the "cornerstone of successful ageing" (Baltes & Baltes, 1990), PC signifies one of the strongest predictors of the quality of late life. A large body of research attests to the powerful impact PC exerts on people's overall health and its positive association with many health-related outcomes, including more favorable physical conditions (e.g., Menec & Chipperfield, 1997a, b), greater life satisfaction (Menec & Chipperfield, 1997a; Ruthig, Chipperfield, Perry, Newall, & Swift, 2007), and a less negative emotional profile (Ruthig & Chipperfield, 2007; Ruthig, Chipperfield, Perry, et al., 2007; Chipperfield et al., 2012).

The relevant studies demonstrate positive relationships between PC and better physical self-rated health (Bailis et al., 2001; Chipperfield et al., 2012; Latham-Mintus, Vowels, & Huskins, 2018; Menec & Chipperfield, 1997a; Ruthig, Chipperfield, Newall, et al., 2007) as well as between PC and reduced depression (e.g., Barlow, Turner, & Wright, 1998; Dulin, Hanson, & King, 2013; Gallagher & Mckinley, 2009; Maciejewski et al., 2000; Msetfi, Brosnan, & Cavus, 2016; Nicolaisen et al., 2018). Specifically, in the study by Chipperfield et al. (2012), older adults with a stronger sense of control reported having significantly better general physical health three years later than people with a weaker sense of control ($\beta = .22$). In turn, Dulin and colleagues (2013) found that in a large sample of older adults between 65 and 94 years of age, PC beliefs were related to fewer depressive symptoms one year later when the baseline depression levels and other relevant variables were controlled. Together, these studies present convincing evidence for the substantial positive effect that PC has with regard to seniors' physical and emotional self-assessed health. But, whereas PC evidently has a favorable impact,

loneliness, on the contrary, is known to be an extremely detrimental emotional experience that continuously receives attention in gerontological research.

**Loneliness and self-rated health.** Such a heightened interest to loneliness, and late-life loneliness in particular, is not surprising. As discussed earlier, considerable research attests to a great number of its deleterious health consequences such as undermined functional capacities (Perissinotto et al., 2012; Russell, Cutrona, de la Mora, & Wallace, 1997), impaired sleep (Cacioppo, Hawkley, Berntson, et al., 2002; Cacioppo, Hawkley, Crawford, et al., 2002; Segrin & Domschke, 2011), and compromised immunity (Hawkley, Bosch, Engeland, Marucha, & Cacioppo, 2007). Moreover, loneliness affects mortality to the extent comparable to the influence of smoking and even exceeding the impact of obesity or physical exercise (e.g., Holt-Lunstad et al., 2010; Luo et al., 2012; Newall, Chipperfield, Bailis, & Stewart, 2013; Stek et al., 2005; Shiovitz-Ezra & Ayalon, 2010). Importantly, all these effects of loneliness have been shown to manifest themselves independently of the effects of objective social isolation. That is, loneliness, as *perceived* (vs. objective) social isolation, is a paramount precondition to physical and emotional health.

Several studies report a negative relationship between loneliness and general self-assessed health in older adults (e.g., Chen, Holahan, & Li, 2018; Nummela, Seppänen, & Uutela, 2011; Segrin & Domschke, 2011; Stephens, Alpass, Towers, & Stevenson, 2011) with some other studies providing longitudinal evidence of this link (Cacioppo, Hawkley, Crawford, et al., 2002; Chen et al., 2018; Luo et al., 2012; Nummela et al., 2011). For example, in the research of over 2000 adults in three age groups (55-59, 65-59, and 75-79), loneliness predicted a significant decline in participants' self-rated health over a three-year term when the effects of other variables such as age, gender, marital status, education, income, social support, and baseline

health were controlled (Nummela et al., 2011). In particular, the researchers showed that people who often or occasionally felt lonely were nearly twice as likely to have poor self-rated heath as those who were seldom or never lonely. A more recent study by Chen and colleagues (2018) also found that after adjusting for several covariates, loneliness had a significant detrimental impact on general self-rated health in a sample of middle- and older-aged adults. These studies corroborate the negative effect of loneliness on seniors' physical health in a long run.

Additionally, loneliness has been documented to negatively affect older adults' emotional health, which is not unexpected. In this respect, evidence exists linking loneliness to cognitive and mental decline, including increased risk of Alzheimer's disease (e.g., Houtjes et al. 2014; Seeman, Lusignolo, Albert, Berkman, & Stone, 2001; Wilson et al., 2007), and some studies report the association between loneliness and personality disorders (Overholser, 1992; Richman & Sokolove, 1992) as well as between loneliness and schizophrenia (DeNiro, 1995).

A much greater focus, however, has been placed on the relationship between loneliness and depression (e.g., Cacioppo, Hughes, et al., 2006; Peplau, Russell, & Heim, 1979; Russell, 1982; Russell, Peplau, & Ferguson, 1978; Segrin, 1998; Weeks, Michela, Peplau, & Bragg, 1980). Such enhanced attention to the loneliness–depression linkage, to a large extent, comes from the fact that these two conditions are very often comorbid and they both have high prevalence rates among older adults (Ernst & Cacioppo, 1998; Golden et al., 2009). As noted above, chronic loneliness may be affecting as many as 30% of the U.S. seniors (Perissinotto et al., 2012), with perhaps the same percentage of Canadian seniors being affected. In turn, occurrence of depressive symptoms varies from around 7% in community-dwelling older adults to nearly 50% of those who have been institutionalized (Djernes, 2006). Some literature even

argues that depression is likely to be the most frequent and the most adverse mental condition that affects older people (Helvik et al., 2016).

In short, a continuously growing body of research indicates the presence of a temporal relationship between loneliness and physical health as well as between loneliness and emotional health. However, to better understand these relationships, mediation analyses are necessary to determine exactly how loneliness erodes physical and mental health in advanced age.

**Mediators of loneliness.** Many studies have now been dedicated to examining the mechanisms behind the impact of loneliness on people's health; however, an overwhelming majority of these studies, especially in the Western research, tend to take a biological or physiological approach (Cacioppo et al., 2015; Cacioppo, Hawkley, Berntson, et al., 2002; Cacioppo, Hawkley, Crawford, et al., 2002; Hawkley & Cacioppo, 2010; Jaremka et al., 2013; Lauder, Mummery, Jones, & Caperchione, 2006; Segrin & Domschke, 2011). For example, it has been found that loneliness is likely to exert a detrimental impact on older adults' physical health by reducing their autonomic cardiovascular activation or distorting their sleep (Cacioppo, Hawkley, Crawford, et al., 2002; Segrin & Domschke, 2011). Perhaps surprisingly, the research has *not* yet confirmed that either leisure activities or health-related behaviors, such as smoking or engaging in physical activity, play a mediating role between loneliness and health (Cacioppo, Hawkley, Crawford, et al., 2002; Segrin & Domschke, 2011).

But what about psychological variables? Overall, relatively few studies have examined possible psychological mediators of loneliness on self-rated physical health (Segrin & Domschke, 2011; Yusoff, Luhmannb, & Cacioppo; 2013). Additionally, these studies that have been conducted are predominantly cross-sectional and are not specific to seniors, while, of course, a better design would be to use longitudinal data gathered exclusively from older adults.

Compared to the loneliness–physical health link, there seems to be noticeably more research conducted on psychological mediators of the loneliness–depression association, with such analyses gaining greater momentum over the last few years (Bergman & Segel-Karpas, 2018; Ng & Lee, 2018; Zhao et al., 2018; Ypsilanti et al., 2019). However, the existing evidence that is most germane to the present study comes primary from the studies on Chinese older adults (Ng & Lee, 2018; Zhao et al., 2018) and hence is not generalizable to the Canadian population even though many Chinese people live in Canada. Among the literature reviewed, three studies are worth discussing at the moment as they have a close relation to the proposed role of PC.

First, in the analyses by Huang et al. (2017), perceived stress, which the researchers defined as one's psychological response to the *uncontrollability* of life situations, was found to partially mediate the temporal relationship between loneliness and depression in the sample of Chinese rural older adults. Further, the research on *resilience* (Zhao et al., 2018)—the concept that has a substantial theoretical overlap with perceived control (Chipperfield et al., 2017)—partially explained the effect of loneliness on depression in the sample of Chinese nursing home residents. Finally, as a follow-up of Zhao et al.'s (2018) study, the research by Ng and Lee (2018) also confirmed the mediating role of resilience between loneliness and depression by examining one specific component of resilience, a variable called "hardiness." Hardiness is a summative term which is conceptualized as three C's embodying people's ability 1) to engage with others—reflective of Commitment, 2) to regard difficulties as a learning experience—reflective of Challenge, and 3) to believe that personal efforts will bring desirable outcomes—reflective of *Control*. Although the researchers did not test individual mediating effects of either component of hardiness, it is very likely that each of these components, including Control, can play an independent role in explaining the effect of loneliness on depression. This realization,

along with the empirical evidence reviewed above, contributes to my argument that PC has a great potential to explain, at least in part, the relationship between loneliness and emotional health of older adults.

**The Research Questions**

Taken together, the existing research evidence suggests that PC is an important predictor of late-life loneliness and is likely to have a significant mediating, or at least partial mediating, effect on the relationship between loneliness and physical health and on the relationship between loneliness and emotional health. Four key questions for this study can thus be formulated:

1. Does PC predict Loneliness in older Canadians within a five-year period?
2. Can PC explain the effect of Loneliness on older adults' General Self-Rated Health?
3. Can PC explain the effect of Loneliness on older adults' Recent Physical Health?
4. Can PC explain the effect of Loneliness on older adults' Depression?

## Chapter 3. Methodology

The chapter opens with an examination of the sample followed by a thorough review of the variables used in this thesis. First, I talk about the variable that is the focus of this thesis—Loneliness—measured by the De Jong Gierveld Loneliness scale. Subsequently, the other key variables are examined in the following order: The 5-item scale of Perceived Control as the key predictor and mediating variable, the single-item General Self-Rated Health variable and the 3-item Recent Physical Health scale as two physical health outcomes in the study, and the Center for Epidemiologic Studies Depression scale as the emotional health outcome.

Then I briefly present the study variables that will be statistically controlled. This is done by drawing on the literature that has identified essential predictors of loneliness. These are demographic variables that include Age, Sex, Income Adequacy, and Education, the objective social isolation variables, that encompass Marital Status, Living Arrangement, and Frequency of Family Contact, and the health-related measures—the Independent Activities of Daily Living and Chronic Condition Count scales. I show how and explain why some of these variables have been re-coded for the analyses.

Further, I review the descriptive statistics for all the study variables after having modified some of the variables. I discuss the nominal variables in terms of their percentages and the ordinal and interval variables in terms of their skewness and kurtosis. Among the nominal control variables are Sex, Marital Status, and Living Arrangement, all of which are dichotomized. The continuous control variables include Age, Income Adequacy, Education, Frequency of Family Contact, as well as the Independent Activities of Daily Living and Chronic Condition Count scales. The descriptive statistics table for all the study variables are presented as a separate table. Finally, I briefly describe the analytical approach, incremental model building,

used in conducting the analyses. More details on how the analyses are performed are provided in Chapter 4 that takes readers, step by step, through the study's findings.

**The Sample**

The study uses a subset of data from one of the best existing datasets pertinent to ageing research—the Aging in Manitoba (AIM) Project. The complete database is a longitudinal study (1971–2006) comprising of responses to a large-scale interview that surveyed nearly 9000 Manitoban residents, aged 65 and older, who were living in either communities or institutions, in all parts of the province including remote areas. Among many other items, the interview included questions on participants' demographic information, their physical status, social aspects of their lives, as well as their cognitive states, such as perceived control, and their affective states, including loneliness. The AIM study participants were initially selected from the Manitoba Health Registry. Three cross-sectional samples were drawn (in 1971, 1976, and 1983), and these participants were followed over time and interviewed again in 1983-84, 1990, 1996, 1997, 2001, 2005, and 2006.A large sample, a rigorous tracking system, and a high response rate earned the AIM its reputation as an exceptional source of the ageing-related data that have an excellent representativeness of the older population, at least in the province of Manitoba (Chipperfield, Havens, & Doig, 1997).

The sample for the present study is limited to the participants who, in addition to the AIM, also completed the Successful Aging Study (SAS)—a satellite study of the AIM sample launched in 1996. The SAS contains the outcome health measures of interest (i.e., self-rated physical health measures and Depression). Overall, the SAS subsample was shown to be comparable to the AIM sample across many demographic and social interaction variables (i.e., Marital Status, Sex), although, due to excluding a rural portion of the population, the SAS

participants are generally younger than the AIM's sample and they have a slightly higher socioeconomic status (Chipperfield et al., 1997).

For the analyses in this study, I use the data from the AIM and SAS datasets collected in 1996, 2001, and 2003. The participants of these two cohorts are older adults ($N$ = 167), aged from 72 to 99 years, and are predominantly female (62.6%). In this sample, there is an approximately equal split between the people who are married (54.4%) and the people who are single (which includes divorced and widowed individuals), and between those who live with someone (51.1%) and those who live alone.

Ethical approval for using these data had been previously acquired from the University of Manitoba's Health Research Ethics Board. The participants were excluded from the analyses if they had not provided answers for the items used in the measurement of the variables.

## The Variables

**Loneliness.** The De Jong Gierveld Loneliness scale has been used in a great number of studies, including gerontological studies (e.g., De Jong Gierveld & Van Tilburg, 1999; Dykstra, 1990; Newall, Chipperfield, & Bailis, 2013; Newall, Chipperfield, Bailis, & Stewart, 2013; Newall et al., 2009). For such research, the De Jong Gierveld Loneliness scale is recognized as a valid and reliable psychological instrument being arguably better than another well-known scale, the UCLA Loneliness Scale (Penning, Liu, & Chou, 2014). The superiority of the De Jong Gierveld scale is partially explained by its ability to tap into two facets of loneliness, emotional (E) and social (S), whereas the UCLA scale addresses only the social aspect of the phenomenon, for which it has been criticized (Cramer & Barry 1999). While the De Jong Gierveld scale is more frequently used in Europe and Australia than in Canada or the US (Tomás, Pinazo-Hernandis, Donio-Bellegarde, & Hontangas, 2017), it seems to be gaining increasing popularity

in North America (e.g., Newall, Chipperfield, & Bailis, 2013; Newall, Chipperfield, Bailis, & Stewart, 2013; Newall et al., 2009).

Table 3.1
The De Jong Gierveld Loneliness scale: Inter-Item Correlations

| Item | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. There is someone I can talk to about my day-to-day problems (S) (R) | - | | | | | | | | | |
| 2. I miss having a really good friend (E) | .14 | - | | | | | | | | |
| 3. I experience a general sense of emptiness (E) | .16 | .30 | - | | | | | | | |
| 4. There are plenty of people I can rely on when I have problems (S) (R) | .40 | .13 | .23 | - | | | | | | |
| 5. I miss the pleasure of the company of others (E) | .21 | .52 | .44 | .24 | - | | | | | |
| 6. I find my circle of friends and acquaintances too limiting (E) | .32 | .49 | .40 | .35 | .62 | - | | | | |
| 7. There are many people I can trust completely (S) (R) | .43 | .30 | .23 | .63 | .24 | .32 | - | | | |
| 8. There are enough people I feel close to (S) (R) | .42 | .23 | .31 | .52 | .19 | .37 | .59 | - | | |
| 9. I miss having people around (E) | .16 | .44 | .45 | .23 | .62 | .51 | .30 | .27 | - | |
| 10. Often, I feel rejected (E) | .07 | .28 | .28 | .16 | .20 | .23 | .10 | .15 | .26 | - |
| 11. I can call on my friends whenever I need them (S) (R) | .31 | .20 | .16 | .34 | .21 | .32 | .40 | .31 | .19 | .20 |

*Note:* E = emotional loneliness; S = social loneliness; R = reverse-coded.

To clarify, in the De Jong Gierveld scale, *emotional* loneliness occurs in the absence of an intimate partner or a close emotional attachment and is represented by six negatively-valenced items (see Table 3.1, items 2, 3, 5, 6, 9, and 10). In contrast, *social* loneliness is believed to arise

when people feel they lack a supportive friendship circle and is framed as five positively-valenced reverse-coded items (1, 4, 7, 8, and 11). All questions are given on a 3-point Likert-type scale with the anchors 1 = *no*, 2 = *more or less*, and 3 = *yes*, so a higher score represents greater loneliness. Table 3.1 presents the scale's inter-item correlations for the sample in this thesis.

The distinction between emotional and social loneliness was proposed by Weiss (1973) whose recommendations lied in the formation of the De Jong Gierveld scale as a two-dimensional measure. Nevertheless, as De Jong Gierveld and Van Tilburg (2010) indicate, the scale can also be conceptualized as unidimensional, and it has been used this way in few previous studies (Newall, Chipperfield, & Bailis, 2013; Newall, Chipperfield, Bailis, & Stewart, 2013). In the present analyses, I, as well, use it as a unidimensional measure, making no conceptual distinction between emotional and social loneliness. Such use of the scale is justified as I focus on understanding loneliness as an encompassing *global* feeling of lacking connection with others, which is relevant to both people's broader social experiences and their intimate bonds with one or more other people.

Nevertheless, it is worth reviewing the face validity of the items in the De Jong Gierveld scale, that is, whether the items appear to measure loneliness as indented. Although some studies have confirmed the presence of two dimensions of the scale (e.g., Van Baarsen, Snijders, Smit, Van Duijn, 2001), one may question whether the items, indeed, differentially tap into the proposed two sub-constructs. Following the mainstream bi-dimensional conceptualization, all the following items should be reflective of one's lacking a close attachment figure: "I miss having a really close friend," "I experience a general sense of emptiness," "I miss the pleasure of the

company of others," "I find my circle of friends too limiting," "I miss having people around," and "Often, I feel rejected."

But, are they, in fact? Whereas the first item from the list appears to address people's close ties to others, the other items seem to be more descriptive of people's general social connections and not necessarily of their relationships with the attachment figures. Another way of explaining the difference between emotional and social loneliness was proposed by Van Baarsen et al. (2001). These researchers argue that emotional loneliness can be detected by the presence of such words as "miss," "experience," and "feel," which stand for a *qualitative* aspect of loneliness. This is juxtaposed to social loneliness that embodies a *quantitative* aspect of the experience represented by the words "plenty of people," "enough people," "many people," "my friends," and "always someone" (Van Baarsen et al., 2001).

However, the question still remains: How clear is the semantic distinction between "I find my circle of friends too limiting" (as part of the emotional loneliness subscale) and "There are enough people I feel close to" (as part of the social loneliness subscale)? Note that the former item does *not* contain the word "miss," "experience," or "feel" proposedly needed for being identified as emotional loneliness; nevertheless, it is conceptualized as such. As well, the latter item *does* contain the word "feel," although presumably reflecting social loneliness. These two examples clearly contradict Van Baarsen et al.'s (2001) premise and do not support a clear-cut distinction between emotional and social loneliness as the researchers suggest.

The examination of the correlation table presented above (Table 3.1) gives little clarification on this issue. Although most of the social loneliness items seem to have consistent associations with the other items so they have higher correlations with the other social items than with the emotional items, some items obviously fall short of this pattern. For example, the item

"There is someone I can talk to about my day-to-day problems" (item 1), theoretically referring to social loneliness, has a correlation with an emotional loneliness item that is as strong as its correlation with a social loneliness item ($r_{1,6}$ = .31 vs. $r_{1,11}$ = .32). The same is true for the social loneliness item "There are enough people I feel close to" (item 8), which correlates with another social loneliness item and with an emotional loneliness item totally equally ($r_{8,11}$ = .31 and $r_{8,3}$ = .31). The correlation table also suggests that the emotional loneliness item "Often, I feel rejected" (item 10) may be problematic given its generally low correlations with all other items with some correlations being as low as $r_{10,1}$ = .07 and $r_{10,7}$ = .10.

Continuing the scale examination, I conduct an explanatory factor analysis in order to gain a better understanding of the scale's structure and its inter-item relationships. Specifically, Principal Components Analysis (PCA) is performed. PCA is the most commonly used method of factor extraction that can be considered as a special type of factor analysis (Nunnally & Berstein, 1994, p. 473). As any factor analysis, PCA allows condensing a large number of observable variables, or items, into fewer unobservable latent variables, or factors (or components—the term often used particularly in the reference to PCA), thereby optimizing the properties of the data (Nunnally & Berstein, 1994, p. 449, 468). In PCA, latent variables are generated in such a way so that the first factor, or component, explains most of the variance in the items and each subsequent factor explains the greatest amount of the variance remaining after the extraction of the previous factor or factors. Of course, if the number of factors extracted equals the number of items, then all the variance in the items would be explained. But since the goal of any factor analysis, including PCA, is data compression, generating the fewest number of coherent factors as possible naturally entails that some of the variance in the items will inevitably be left unexplained by the extracted factors.

In all factor analysis procedures, the items are conceptualized as weighted linear combinations of the factors, theoretically implying that variation in the factor (i.e., the unobservable variable) predicts variation in the items. These relationships are called factor loadings, and they are identical to standardized regression coefficients (Nunnally & Berstein, 1994, p. 454).

Because the two factors commonly extracted from the De Jong Loneliness Scale (emotional and social) are assumed to be correlated ($r$ = .55; Van Baarsen et al., 2001), I use an oblique Promax, but not an orthogonal, rotation. As an aside comment, an orthogonal procedure is used when researchers assume uncorrelated factors. However, in the construction of variables with two or more dimensions, it is more typically assumed that the dimensions are correlated than that they are uncorrelated. This makes an oblique rotation a more commonly used method than an orthogonal rotation.

Furthermore, working with multidimensional scales when there are more than one factor present, factor rotation is necessary to achieve both parsimony and simple structure—the two basic scientific principles. Consistent with these principles, I attempt to derive the least number of meaningful factors while explaining the most variance in the items with the factor loadings high on one factor but not on the other factor.

For this study's loneliness scale, PCA has produced two components with the inter-component correlation of .42, seemingly supporting the proposed distinction between emotional and social loneliness. However, not all the items load unequivocally on one of the two factors (see two columns under "Two-factor solution" in Table 3.2).

Table 3.2
The De Jong Gierveld Loneliness Scale: Factor Analysis

| Item | Two-factor solution | | One-factor solution | |
|---|---|---|---|---|
| | 11-item scale | | 11-item scale | 10-item scale |
| | Factor 1 | Factor 2 | | |
| 1. There is someone I can talk to about my day-to-day problems (R) | .24 | .69 | .53 | .54 |
| 2. I miss having a really good friend | .73 | .27 | .61 | .60 |
| 3. I experience a general sense of emptiness | .66 | .30 | .59 | .57 |
| 4. There are plenty of people I can rely on when I have problems (R) | .30 | .80 | .63 | .64 |
| 5. I miss the pleasure of the company of others | .84 | .29 | .70 | .69 |
| 6. I find my circle of friends and acquaintances too limiting | .77 | .45 | .76 | .76 |
| 7. There are many people I can trust completely (R) | .35 | .84 | .68 | .70 |
| 8. There are enough people I feel close to (R) | .35 | .78 | .65 | .66 |
| 9. I miss having people around | .79 | .31 | .68 | .67 |
| 10. Often, I feel rejected | .45 | .17 | .39 | - |
| 11. I can call on my friends whenever I need them (R) | .31 | .58 | .52 | .52 |
| % Total variance explained | 38.15 | 15.49 | 38.15 | 40.81 |
| Cronbach's alpha | .79 | .80 | .83 | .84 |

*Note:* R = reverse-coded. Factor 1 = social loneliness; Factor 2 = emotional loneliness. Principal Component Analysis. For the two-factor solution, Promax rotation with Kaiser normalization is used. Cross-loadings (including marginal) are underscored.

In fact, the following items—6, 7, and 8—have cross-loadings on two factors meaning that on more than one factor, these items loaded above .32, which is a conventional cut-off

(Costello & Osborne, 2005). As well, five items have a nearly marginal loading on the second, non-primary factor (.29 for item 5, .30 for items 3 and 4, and .31 for items 9 and 11) also revealing ambiguity. This goes contrary to some previous research showing a "cleaner" distinction of the two dimensions of loneliness.

For example, in a study with the older adults of a similar size, Penning et al. (2014) found only one item (item 6) cross-loading on the two factors. As well, those researchers reported higher Cronbach's alphas, .87 for Factor 1 and .86 for Factor 2, than what is evident from the present analyses (.79 and .80, respectively). These comparisons suggest that the distinction between emotional and social loneliness may not be consistent across all samples of older adults and that this two-factor conceptualization of loneliness may not be as explicit as the theory implies.

In short, both conceptual evidence and empirical evidence in the present analyses have shown that it is likely that emotional loneliness is *not* fully distinct from social loneliness, at least in the present sample of older Manitobans. This justifies the approach I have initially chosen in this thesis, which is to regard loneliness as a unidimensional rather than a bi-dimensional phenomenon.

Subsequently, as a result of the argument I advanced above, I conduct PCA with a one-factor solution (see column "One-factor solution 11-item scale" in Table 3.2). The items' loadings have a higher range in the one-factor model than in the two-factor model with only one item, "Often, I feel rejected" (item 10), loading considerably weaker on the factor than all other items. This means that the extracted factor explains only 1.5% ($.39^2$) of the variance in this item, which is substantially less than the variance explained in the other items.

Although the loading of .39 for item 10 exceeds the conventional cutoff of .32, taking into account the factor analysis and the correlation table prompts me to test the scale having this item excluded. Consequently, PCA is conducted once again to evaluate the reliability of the modified scale.

The new 10-item set (see column "One-factor solution 10-item scale" in Table 3.2) produces more consistent loadings (range = .52–.76), and the total explained variance is increased (40.8%) relative to the total variance explained by the original scale (37.1%). This suggests that the modified set of items is more reliable than the original 11-item scale.

Additionally, Cronbach's alpha reliability coefficients have been calculated. This analysis is meant to show how closely the items are correlated with each other reflecting the degree of a scale's uniformity (i.e., internal consistency). Cronbach's alpha for the 10-item scale is nearly identical to the alpha for the 11-item scale (.84 vs. .83, respectively). This attests to an apparent advantage of the shorter scale because Cronbach's alpha is directly affected by the number of items with fewer items typically resulting in lower alpha coefficients (Van Baarsen et al., 2001). Another obvious advantage of having 10 items in a scale rather than 11 items is adherence to the principle of parsimony: The shorter set of items is preferable.

From a conceptual point of view, it may be still unclear why the item "Often, I feel rejected" is different from the other items in the scale measuring loneliness. Readers may note that this item, at least semantically, appears to refer more to depression than to loneliness. I test this proposition by examining the correlation between this item and the depression scale (CES-D), which is also an important part of the model I develop in this study. The correlation is found relatively weak ($r$ = .29) and is comparable to the magnitude of the correlations between the

other items in the loneliness scale and the CES-D scale. This evidence refutes the argument of this item potentially belonging in the depression scale of depression.

Nonetheless, in the present sample, item 10 is problematic as the statistical procedures above have shown. Reviewing the available literature on the structure of the De Jong Gierveld Loneliness scale reveals that compared to the other items, this item may, indeed, have a lower association with the latent variable of loneliness. In support of this observation, Penning and colleagues (2014) found that in a similar sample of community-dwelling older Canadians, this item nearly cross-loaded on two factors while having the lowest loadings observed (.35 and .22). The researchers, however, provided no analytical rationale as to why it was the case.

Putting aside the unresolved conceptual ambiguity around item 10 of the loneliness scale, for this thesis, I choose to be guided by the empirical support gathered via PCA and Cronbach's alpha testing. Hence, I proceed with the main analyses having created the Loneliness variable by summing ten out of 11 items from the De Jong Gierveld scale.

**Perceived control.** The second multi-item variable included in this study is Perceived Control (PC). This variable, consisting of five items, asks about the amount of perceived influence one has in five different aspects domains, with the answers being provided on a Likert-type scale from 1 to 10, where 1 = *almost no control* and 10 = *almost total control*. The PC variable has previously been used in a number of studies with older adults (e.g., Chipperfield, Campbell, & Perry, 2004; Ruthig & Chipperfield, 2007) and, particularly, in research on loneliness (Newall, Chipperfield, & Bailis, 2013). In this thesis, I include the PC measure that was obtained at two different points in time, in 1996 and 2001. Hence, I examine two scales, one for each time period, on their psychometric properties. Tables 3.3 and 3.4 report the scales' items, inter-item correlations, factor loadings, and Cronbach's alpha coefficients.

First, the PC variable appears to measure what it is supposed to measure, that is, it measures a *global* sense of control encompassing five different life domains. Indeed, no items in the scale warrant caution from either empirical or logical standpoint. As well, the correlations show a consistent pattern, with *r* generally ranging from .33 to .46 for the 1996 scale and from .33 to .60 for the 2001 scale, although one correlation, between items 2 and 4 ("PC over thoughts and feeling" and "PC over managing tasks") is noticeably lower than the other correlations in both matrices (.24 in the 1996 matrix and .26 in the 2001 matrix).

Next, the scale's internal consistency (Kline, 2011) is very good as indicated by the Cronbach's alpha coefficients of .79 and .84 in 1996 and 2001, respectively. When comparing these statistics to the reliability parameters of a similar measure, for example, the 7-item Sense of Mastery scale (Pearlin & Schooler, 1978) that measures people's sense of control over important life events (e.g., "I can do just about anything I really set my mind to do"), readers can detect a slight advantage of the PC scale over the mastery scale. In fact, in addition to having more items

hence being less parsimonious than the PC scale, the mastery scale seems to also be slightly less reliable with Cronbach's alpha of about .76 (Beaudet, 1996) and even lower Cronbach's alpha in a Non-American sample (.69; Beaudet, 1996).

Table 3.3
Perceived Control 1996: Inter-Item Correlations and Factor Loadings

| Item | 1. | 2. | 3. | 4. | Factor loadings |
|---|---|---|---|---|---|
| 1. PC over physical health | - | | | | .66 |
| 2. PC over thoughts and feelings | .40 | - | | | .69 |
| 3. PC over the things that can do for fun and enjoyment | .48 | .35 | - | | .71 |
| 4. PC over managing tasks | .33 | .24 | .43 | - | .70 |
| 5. PC over life overall | .38 | .46 | .45 | .46 | .80 |
| | | | % Total variance explained | | 50.41 |
| | | | Cronbach's alpha | | .79 |

*Note:* PC = perceived control. Principal Components Analysis with a one-factor solution.

Table 3.4
Perceived Control 2001: Inter-Item Correlations and Factor Loadings

| Item | 1. | 2. | 3. | 4. | Factor loadings |
|---|---|---|---|---|---|
| 1. PC over physical health | - | | | | .73 |
| 2. PC over thoughts and feelings | .49 | - | | | .71 |
| 3. PC over the things that can do for fun and enjoyment | .49 | .48 | - | | .85 |
| 4. PC over managing tasks | .33 | .26 | .56 | - | .70 |
| 5. PC over life overall | .53 | .54 | .60 | .57 | .88 |
| | | | % Total variance explained | | 60.33 |
| | | | Cronbach's alpha | | .84 |

*Note:* PC = perceived control. Principal Components Analysis with a one-factor solution.

As Tables 3.3 and 3.4 also show, PCA extracting one factor from the matrices has produced high factor loadings for all the items, each substantially exceeding the accepted .32 cut-

off level. Note, however, nearly every factor loading for the 2001 PC scale is higher than the corresponding factor loading in the 1996 PC scale resulting in a higher reliability coefficient for the 2001 scale (.84 vs. .79). This suggests a greater internal consistency of the PC scale measured later in time compared to the PC scale measured five years earlier. In short, as these preliminary analyses indicate, the PC scale represents a psychometrically solid instrument that is suitable for this thesis, with the 2001 scale having a slight advantage over the 1996 scale.

**Physical health measures.** For the subsequent analyses, I use two measures of self-assessed physical health: the single-item General Self-Rated Health (GSRH) scale, which is a global, non-specific health-care measure, and the 3-item Recent Physical Health (RPH) variable that is a more specific, or more detailed, health measure.

The GSRH scale is a well-established tool assessing perceived global health that has been extensively used in clinical settings, psychological research, and general population surveys (Bombak, 2013; Idler & Kasl, 1991). Evidence indicates that the GSRH scale has a high predictive and concurrent validity, estimated by its associations with various health markers, including morbidity (e.g., Idler, Russell, & Davis, 1992), health service utilization (e.g., DeSalvo, Fan, McDonell, & Fihn, 2005; DeSalvo et al., 2009; Fylkesnes, 1993), and mortality (e.g., Brown, Thompson, Zack, Arnold, & Barlie, 2015; DeSalvo et al., 2005). With respect to the latter, specifically, it is worth mentioning the research by Mossey and Shapiro (1982), which was among the first studies to show the predictive utility of GSRH. Using a large sample of Canadian non-institutionalized older adults, the researchers found that GSRH predicted mortality independently of people's demographic characteristics and, more importantly, independently of several objective health indexes. Those older adults who reported their heath to be excellent were nearly three times more likely to stay alive six years later than their counterparts who reported their health as being poor (Mossey & Shapiro, 1982). A substantial number of studies that were published later have supported this finding (see review by Idler & Benyamini, 1997). Besides its high validity, GSRH was also shown to have a suitable alpha reliability ($r$ = .76) and good reproducibility as assessed by intraclass correlation coefficient (ICC = .69; Desalvo et al., 2005). All this attests to the scale's excellent psychometric properties, despite being a single-item variable.

For the present analyses, I modify the original GSRH variable, "For your age, would you say in general your health is…?" with five anchors (1 = *Excellent*, 2 =*Good*, 3 = *Fair*, 4 = *Poor*, 5 = *Bad*), first, by omitting the last group given there were no responses in this group, and, second, by coding the scale in reverse so that higher scores represent better health. In short, the GSRH scale used in this thesis has four anchors as follows: 1 = *poor*, 2 = *fair*, 3 = *good*, and 4 = *excellent*.

The second outcome variable of physical health is the RPH measure consisting of three items each presented on a 3-point scale, from 1 = *almost never true* to 3 = *almost always true*. In contrast to GSRH, the RPH variable is a more detailed measure given it refers to a few self-reported symptoms such as stomach upset, headaches, and dizziness. Note as well, this variable asks about the experiences that older adults had during the past month, while GSRH appears to capture a person's present state of health. See Table 3.5 for the RPH variable's inter-item correlations and factor loadings.

Table 3.5
Recent Physical Health: Inter-Item Correlations and Factor Loadings

| Item | 1. | 2. | Factor loadings |
|---|---|---|---|
| 1. Have felt physically unwell | - | | .77 |
| 2. Have had some physical symptoms, like stomach upset, headaches, or dizziness | .58 | - | .64 |
| 3. Wish have felt better | .61 | .45 | .67 |
| | | % Total variance explained | 69.66 |
| | | Cronbach's alpha | .78 |

*Note:* Principal Components Analysis with a one-factor solution.

As evident from the correlations and the results of PCA, all items have moderate to strong correlations with each other, and their factor loadings are above the established threshold

of .32. Overall, the extracted factor explains nearly 70% of the total variance in the items, and the Cronbach's alpha coefficient is .78, all of which shows that the scale has a good internal consistency.

**Depression.** In addition to two physical health outcome variables, I also use an emotional health measure, which is the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). This scale is among the most commonly used tools for screening the general population for symptoms of depression (Irwin, Artin, & Oxman, 1999; Radloff, 1977). It has also been used to assess depression in older adults both in its complete 20-item form (e.g., Carlson et al., 2011) and in a shorter 10-item version (CES-D-10; Ermer & Proulx, 2016), and it has been shown to have good psychometric characteristics. In fact, for the full-length scale, reliability was found to be very high, between .85 and .91 (Cosco, Prina, Stubbs, & Wu, 2017; Radloff, 1977; Schroevers et al., 2000), and for the shorter scale, the reported Cronbach's alpha ranged between .70 and .92 (Mohebbi et al., 2018; Irwin et al., 1999; Kohout, Berkman, Evans, & Cornoni-Huntley, 1993). As well, the 10-item scale was reported to have high sensitivity and specificity (97% and 84%, respectively) comparable to the 20-item scale (Irwin et al., 1999). For the analyses in this thesis, I use the short version of the scale, that is, the CES-D-10 variable.

As with the other multi-item variables in this study, I first examine CES-D-10 for its face validity, followed by the analyses of its factor structure and reliability. Note, the items are presented on a scale with the following anchors: 1 = *rarely or none of the time*, 2 = *some or a little of the time*, 3 = *occasionally*, and 4 = *most or all the time*. See Table 3.6 for the scale's items and the inter-item correlations. The factor loadings and reliability coefficient are presented in Table 3.7.

Table 3.6
The CES-D-10 Scale: Inter-Item Correlations

| Item | 1. | 2. | 3. | 4. | 5 | 6. | 7. | 8. | 9. |
|---|---|---|---|---|---|---|---|---|---|
| 1. I was bothered by things that don't usually bother me | - | | | | | | | | |
| 2. I had trouble keeping mind on what I'm doing | .30 | - | | | | | | | |
| 3. I felt depressed | .28 | .27 | - | | | | | | |
| 4. Everything I did was an effort | .37 | .27 | .35 | - | | | | | |
| 5. I felt hopeful about the future (R) | .10 | .24 | .28 | .13 | - | | | | |
| 6. I felt fearful | .21 | .25 | .33 | .21 | .23 | - | | | |
| 7. My sleep was restless | .18 | .19 | .19 | .26 | .14 | .23 | - | | |
| 8. I was happy (R) | .29 | .23 | .41 | .27 | .45 | .18 | .05 | - | |
| 9. I felt lonely | .21 | .16 | .50 | .14 | .23 | .16 | .12 | .29 | - |
| 10. I could not get going | .30 | .19 | .29 | .60 | .25 | .20 | 35 | .25 | .00 |

*Note:* R = reverse-coded.

In reading the scale's items, readers may notice that two items stand out as they may not fit the general pattern in the scale: "I felt hopeful about the future" (item 5) and "I was happy" (item 8). Reflecting positive affect, these are the only items that are reverse-coded in the scale. As previous analyses of both 10- and 20-item versions of the scale showed (e.g., Radloff, 1977; Schroevers et al., 2000), these positive affect items tend to load onto a factor that is substantially different from the other items, which, in contrast, depict negative affect. However, it is not obvious whether these items, even after being scored in reverse, in fact, reflect depressive symptomology. Schroevers and collegues (2000), for example, have raised this exact question: To what degree is feeling happy or hopeful related to being in a depressed mood or having no

interest in life, which are the principal characteristics of depression? Or, more broadly, can positive emotion items, even when reverse-scored, meaningfully reflect negative affectivity?

While the debate on the validity and internal structure of the CES-D scale continues (Carleton et al., 2013), some clarity can be gained from conducting a careful review of the literature on the effects of negative affect on health outcomes. In doing so, Pressman and Cohen (2005) concluded that positive and negative emotions do *not* cancel out each other's effects and hence are very likely to *not* be opposites of a unidimensional scale. Further, talking specifically about the CES-D scale, these researchers noted that the presence of positive emotion items in this scale actually contributes to a long-standing conceptual confusion between positive and negative affectivity (Pressman & Cohen, 2005). As the scientific community is working on reaching a clearer conceptual understanding of positive and negative affect as two separate dimensions, growing evidence suggests that the CES-D scale, either in its 10- or 20-item form, carries some invalidity, specifically with respect to its positive items (Schroevers et al., 2000; Stansbury, Ried, & Velozo, 2006). Additionally, some evidence now exists indicating that the positive emotion reverse-scored items tend to result in a subscale that has a significantly lower reliability coefficient than the subscale containing the negative-valence items. In fact, the alpha reliability coefficients were shown to increase when the positive-valence items were not included in the scale (Carlson et al., 2011).

Echoing the results of past research, the correlation matrix in the present study (Table 3.6) shows that the two positive items, items 5 and 8, even after being scored in reverse, do not have consistent associations with the other items. Indeed, these items have low correlations with some other items. Specifically, item 5 correlates poorly with item 1 ($r$ = .10) and item 4 ($r$ = .13), and item 8 has a very low correlation with item 7 ($r$ = .05). This evidence, along with the

argument I presented above, prompts me to drop these two items from further analyses and to subsequently test a modified 8-item scale in comparison with the original 10-item scale. Hence, PCA with a one-factor solution and Cronbach's alpha reliability test have been conducted comparing the two sets of the items, the results of which are shown in Table 3.7 (columns "Original 10-item scale" and "8-item scale").

Table 3.7
The CES-D-10 Scale: Factor Loadings

| Item | Original 10-item scale | 8-item scale | 7-item scale |
|---|---|---|---|
| 1. I was bothered by things that don't usually bother me | .57 | .61 | .61 |
| 2. I had trouble keeping mind on what I'm doing | .54 | .55 | .55 |
| 3. I felt depressed | .71 | .69 | .63 |
| 4. Everything I did was an effort | .66 | .72 | .75 |
| 5. I felt hopeful about the future (R) | .52 | - | - |
| 6. I felt fearful | .53 | .53 | .53 |
| 7. My sleep was restless | .46 | .52 | .53 |
| 8. I was happy (R) | .62 | - | - |
| 9. I felt lonely | .48 | .50 | - |
| 10. I could not get going | .62 | .66 | .71 |
| % Total variance explained | 33.10 | 35.46 | 38.64 |
| Cronbach's alpha | .77 | .73 | .73 |

*Note:* R = reverse-coded. Principal Components Analysis with one-factor solution.

Although all the loadings in either the 10-item or the 8-item scale are above the cut-off of .32, the loadings in the 8-item group are slightly higher, ranging from .50 to 72, than in the 10-item group with the range between .46 and .71. Further, the total variance explained by the

extracted factor is somewhat higher for 8 items than for 10 items (35.46% vs. 33.10%, respectively). Finally, the alpha reliability coefficients show that the 8-item set, despite having two fewer items—which would typically result in a noticeably lower Cronbach's alpha—has nearly the same reliability as the original 10-item scale (Cronbach's alpha = .73 vs. Cronbach's alpha = .77). Following the principle of parsimony, this suggests that the 8-item scale has an advantage over the original 10-item scale.

I am arguing that the 8-item scale is evidently superior than the full measure, being both conceptually and statistically "cleaner." However, an additional problem exists with this shorter scale. It contains an item, "I felt lonely" (item 9), that has a direct reference to loneliness. To have loneliness measured simultaneously by a variable (the De Jong Gierveld Loneliness scale) and by an item in a different variable (the CES-D scale) is obviously problematic for both conceptual and empirical reasons. Because the goal of my study is to understand the relationship between loneliness and depression as two conceptually distinct emotional experiences, I need to ensure that the loneliness and depression scales are as empirically pure as possible. I, hence, choose to not include "I felt lonely" in the group of items normally considered to assess depression.

I subsequently conduct the factor analysis and the reliability test to evaluate this new 7-item scale. The results are reported in Table 3.7 (see column "7-item scale"). From this table, the new scale actually appears to be better than both the 10-item and the 8-item scales. In fact, in contrast to the latter scales, the 7-item scale has more total variance (38.6%) explained by the single factor than either the 8-item scale (35.5%) or the 10-item scale (33.1%). Table 3.7 also shows that the highest loading for the 7-item scale is slightly larger than the highest loadings for the 10-item and the 8-item scales (.75 vs. 71. and .72). Finally, the Cronbach's alpha coefficient

for the 7-item scale is very similar to the 8-item scale (.73). This argument and the empirical findings attest to a superior structure of this shorter, 7-item, version of the depression scale, which I choose to use in this thesis.

**Demographic and objective social isolation variables.** Among the control variables in this study there are four demographic single-item variables (Age, Sex, Income Adequacy, and Education), three single-item variables reflecting objective social isolation (Marital Status, Living Arrangement, and Frequency of Family Contact), and two health-related multi-item measures, functional independence (Independent Activities of Daily Living) and the number of chronic conditions (Chronic Condition Count). The inclusion of these variables is consistent with the "social epidemiology" model of loneliness (Victor et al., 2005), according to which social factors along with the physical environment and health conditions represent main causes of late-life loneliness, being arguably more potent than genetic or biological factors.

Focusing on demographic and objective social isolation variables, three of the variables have been recoded for the analyses. The original variable of Marital Status was presented on a nominal scale and had four anchors (1 = *single*, *n* = 27; 2 = *married*, *n* = 161; 3 = *widowed*, *n* = 152; 4 = *divorced/separated*, *n* = 13), with almost eight times more responses in the *married* and *widowed* categories than in the *single* and *divorced/separated* categories. Consequently, the recording was a necessary step, merging together the *widowed*, *single*, and *divorced/separated* categories, hence creating a simpler measure with a relatively equal dichotomy reflecting whether a person had a partner (45.6%) or was single (54.4%).

Next, Living Arrangement was originally measured by asking participants about the size of their household, and this variable was also made dichotomous to distinguish participants who, at the time of the interview, lived alone (48.9%) versus those who lived with one or more other people (51.1%). Finally, the variable Frequency of Family Contact assessing the number of family members a person saw during the previous week, had an outlier (*n* = 16), associated with a high skewness (2.14) and a very high kurtosis (8.82). To correct this problem, I, once again,

recoded this variable, this time by dropping the outlier, thereby reducing the scale's skewness to 1.38 and kurtosis to 2.11.

**Background health-related variables.** The Independent Activities of Daily Living (IADL) scale measures the degree to which older adults can function independently and approximates the scale introduced by Lawton and Brody in 1969. The original IADL scale spans eight domains of people's everyday life (i.e., ability to use a telephone, shopping, food preparation, housekeeping, laundry, mode of transportation, responsibility for own medications, and ability to handle finances). Theoretically, the activities within these domains require higher levels of cognitive functioning and self-maintenance than the more basic everyday activities (e.g., bathing, dressing, feeding) assessed by the Basic Activities of Daily Living (BADL) scale. Since their introduction in 1969, both the IADL and the BADL scales have been used extensively in research and clinical practice with older people (Coyne & Kluwer, 2019). However, in the analyses of this thesis, only the IADL scale in included to minimize the chance of having the regression model overspecified.

With regard to the IADL scale, several cross-cultural studies examined its psychometric properties concluding that the scale is, indeed, a reliable instrument, with excellent test-retest reliability coefficients ranging from .91 to .96 (Edwards, 1990; Siriwardhana, Walters, Rait, Bazo-Alvarez, & Weerasinghe, 2018) and a very good inter-rater reliability coefficient of .85, as was shown in a recent study (Coyne & Kluwer, 2019). Also, construct validity of the scale was confirmed based on the scale's high correlation with other physical independence measures, such as the Functional Independence Measure ($r$ = .70; Edwards, 1990). In fact, the recent review published by the Hartford Institute for Geriatric Nursing named this IADL scale "the best tool" for assessing independent living skills of older people (Coyne & Kluwer, 2019).

With respect to the version of the IADL scale used in this thesis, a word of caution needs to be noted. In contrast to the original Lawton's instrument measuring the degree of independence on an 8-point scale, the available data were previously reformulated into a dichotomized scale reflecting whether people have or do not have the capacity to perform independently each of the IADLs. The dichotomization was included in the questionnaire and it prevents me from performing factor analysis to assess the scale's internal structure because factor analysis is used for items that are at least ordinal (Nunnally & Berstein, 1994). Hence, the discussion of the IADL scale's statistical properties is reduced to the examination of the dichotomous splits on the items and the distribution of the summative scores in the variable. Finally, the variable is assessed on its reliability using Kuder-Richardson 20 (KR-20) test which is the appropriate test when dichotomous items are used to compose a scale (Cortina, 1993).

Matching the eight domains of Lawton's original IADL scale, nine items are initially chosen to form the IADL scale for this thesis (i.e., "Using the telephone," "Shopping," "Preparing hot meals," "Doing light housework," "Doing heavy housework," "Doing laundry," "Going outdoors," "Taking medication or treatment," and "Managing financial matters"), with two items ("Doing light housework" and "Doing heavy housework") representing a single domain of housekeeping. The examination of the frequency distributions for each of the nine items (not presented here) reveals that all but two of them have a split of less than 30%/ 70%, which means that the majority of the items have very little variance. Hence, not unexpectedly, the IADL variable, created by summing theses nine items, is considerably skewed (skewness = -1.76). Furthermore, in addition to having the lowest splits, three of the items ("Using the telephone," "Going outdoors," and "Taking medication or treatment") have a substantially smaller sample size ($n$ = 240) than the other items ($n$ = 352). To reduce the skewness of the

summative variable and to maintain a larger sample size, I have decided to drop these three items in the final IADL scale while retaining the other six items. As well, the internal reliability of the 6-item scale is found slightly higher than the reliability of the 9-item scale (KR-20 = .71 vs. .69, respectively) supporting my decision to use the former. See Table 3.8 for the list of the IADL items and their correlations.

Table 3.8
Independent Activities of Daily Living: Inter-Item Correlations

| Item | 1. | 2. | 3. | 4. | 5. |
|---|---|---|---|---|---|
| 1. Shopping | - | | | | |
| 2. Preparing hot meals | .36 | - | | | |
| 3. Doing light housework | .34 | .31 | - | | |
| 4. Doing heavy housework | .25 | .15 | .30 | - | |
| 5. Doing laundry | .33 | .55 | .38 | .21 | - |
| 6. Managing financial matters | .31 | .29 | .20 | .12 | .21 |

The second background physical health variable—and also the last measure to be included in my analyses—is Chronic Condition Count (CCC) assessed in 1996. This variable is the sum of 21 individual dichotomous items asking the participants whether or not (1 = *yes* and 0 = *no*) they have any of the following chronic health conditions: arthritis or rheumatism; palsy; problems with eyes, ears, teeth, stomach, feet, skin, and other areas; heart-related problems (e.g., hardening of the arteries, hypertension, heart attack); chest problems (e.g., emphysema, tuberculosis, breathing problems); stroke; kidney problems; and diabetes. Despite being self-assessed, CCC has previously been shown to be well consistent with the administrative health records of older people (e.g., Okura, Urban, Mahoney, Jacobsen, & Rodeheffer, 2004; Robinson,

Young, Roos, & Gelskey, 1997), and it has also been used in a number of health studies with senior citizens (e.g., Chipperfield, 1993; Hall, Chipperfield, Heckhausen, & Perry, 2010; Ruthig & Chipperfield, 2007). Particularly, the Kappa levels for the scale is about .49, on average, with the highest value being .72 (Robinson et al., 1997). As well, although sensitivity (i.e., correct identification given the disorder is present) may vary from condition to condition, the scale's specificity (i.e., correct identification given the disorder is absent) is consistently very high (Robinson et al., 1997).

**Descriptive Statistics**

Table 3.9 depicts percentage split for the nominal dichotomous variables (e.g., Sex, Marital Status, and Living Arrangement) and the parametric descriptive statistics (mean, mode, SD, range, skewness, and kurtosis) for the ordinal and interval (continuous) variables.

For the continuous variables, I specifically focus on skewness and kurtosis. Skewness (the measure of symmetry) and kurtosis (the measure of sharpness of the peak) are two measures reflecting how well a continuous variable approximates a normal bell-curve distribution, and they are important to consider if inferences are to be made from a sample to a population. If the distribution of a given variable in the sample follows a normal curve, it is more likely to accurately reflect the population distribution assuming the latter is also normal, which is, of course, typically the case. In regression analysis, as one of the inferential statistics methods, univariate normality is a basic assumption, with multivariate normality typically being assumed if univariate normality and bi-variate normality (assessed via scatter-plot, not presented here) are upheld.

For most of the variables, skewness and kurtosis fall within an acceptable range of (-1; 1) and (-2; 2), respectively (Gravetter & Wallnau, 2014), suggesting adherence to the principle of

normality. For the two variables, however, there is a slight deviation from the norm. These two variables are Loneliness (skewness = 1.17) and Depression (skewness = 1.27), both of which are right-skewed (i.e., with a longer tail to the right). However, this does not appear surprising given the sample consists of the non-institutionalized older adults who are generally healthy, socially imbedded, and are not clinically depressed. I imagine that a similar shaped distribution would be evident for other samples of older adults.

Further, Income Adequacy and Education have noticeably higher than the norm kurtosis values (1.28 and 2.78, respectively), meaning that these variables have a greater than usual number of the responses falling in the middle of their distributions. This is also evident by examining the variables' mean and mode values which are nearly identical for both Income Adequacy (mean = 1.90 vs. mode = 2) and Education (mean = 10.69 vs. mode = 11).

The observed deviation from normality does not necessarily pose a serious problem for the present analyses. Rather, it prompts me to further examine of the bi-variate relationships between the skewed independent variables (Loneliness, Education, and Frequency of Family Contact) and the outcome measures (GSRH, RPH, and Depression). Thus, I examined the bi-variate plots (not presented here) and found that the error terms for all six pairs of these variables is normally distributed allowing me to proceed with the regression analyses.

Table 3.9
Descriptive Statistics of the Study Variables

| Variable | | Scale anchors | No of items | Mean/ % | Mode | SD | Range | Skew | Kurtosis | N |
|---|---|---|---|---|---|---|---|---|---|---|
| | *1.* Loneliness, 2001 (modified) | 1 = *no*<br>2 = *more or less*<br>3 = *yes* | 10 | 14.42 | 10 | 4.67 | 10–30 | 1.17 | .79 | 233 |
| | *2.* Perceived Control, 1996 | 1 = *almost no control*<br>10 = *almost total control* | 5 | 39.10 | 50 | 8.06 | 5–50 | -.81 | .64 | 347 |
| | 3. Perceived Control, 2001 | 1 = *almost no control*<br>10 = *almost total control* | 5 | 37.23 | 50 | 9.23 | 5–50 | -.66 | .14 | 224 |
| Physical health | 4. Global Self-Rated Health, 2003 (modified) | 1 = *poor*<br>2 = *fair*<br>3 = *good*<br>4 = *excellent* | 1 | 2.38 | 2 | .66 | 1–4 | .27 | .00 | 167 |
| Physical health | 5. Recent Physical Health, 2003 | 1 = *almost always true*<br>3 = *almost never true* | 3 | 10.60 | 15 | 3.14 | 3–15 | -.36 | -.44 | 167 |
| Emotional health | 6. Depression, 2001 (modified) | 1 = *rarely or none of the time*<br>2 = *some or a little of the time*<br>3 = *occasionally or a moderate amount of time*<br>4 = *most or all the time* | 7 | 11.02 | 7 | 3.60 | 7–25 | 1.27 | 1.86 | 231 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Demographics | 7. Age, 1996 | years | 1 | 79.94 | 74 | 5.66 | 72–99 | .87 | .46 | 353 |
| | 8. Sex, 1996 | 1 = *male*<br>2 = *female* | 1 | (1) 37.4<br>(2) 62.6 | - | - | - | - | - | 353 |
| | 9. Income Adequacy, 1996 | 1 = *very well*<br>2 = *adequately*<br>3 = *with some difficulty*<br>4 = *not very well*<br>5 = *totally inadequately* | 1 | 1.90 | 2 | .72 | 1–5 | .76 | 1.28 | 350 |
| | 10. Education, 1996 | years | 1 | 10.69 | 11 | 2.83 | 2–25 | .65 | 2.76 | 351 |
| Objective social isolation | 11. Marital Status, 1996 (modified) | 1 = *single*<br>2 = *married* | 1 | (1) 54.4<br>(2) 45.6 | - | - | - | - | - | 353 |
| | 12. Living Arrangement, 1996 (modified) | 1 = *living alone*<br>2 = *living with other(s)* | 1 | (1) 48.9<br>(2) 51.1 | - | - | - | - | - | 352 |
| | 13. Frequency of Family Contact, 1998 (modified) | number of relatives seen per week | 1 | 1.77 | 0 | 1.84 | 0–10 | 1.38 | 2.11 | 351 |
| Health-Related Measures | 14. Independent Activities of Daily Living, 1996 (modified) | 1 = *need help*<br>2 = *independent* | 6 | 10.53 | 12 | 1.71 | 6–12 | -1.14 | .69 | 352 |
| | 15. Chronic Condition Count, 1996 | number of chronic conditions | 1 | 4.02 | 3.00 | 2.64 | 0–21 | .67 | .45 | 353 |

*Note:* For the dichotomous variables, percentage split (%) is reported in the column Mean/%.

**The Analytical Approach**

In my thesis, I use an incremental model building strategy (Kline, 2011) to examine, in a step-by-step process, the four questions pertinent to two distinct roles PC has in the health and well-being of older people. In Question 1, I use PC as the key long-term predictor of Loneliness. In the subsequent three questions, I examine PC as a partial mediator between Loneliness and General Self-Rated Health (GSRH; Question 2), between Loneliness and Recent Physical Health (RPH; Question 3), and between Loneliness and Depression as the indicator of emotional health (Question 4).

These are the main questions; however, given the nature of incremental model building, I allow myself to conduct a number of additional analyses to further explore the issues that arise during the model building. Seemingly distracting from the main argument, these analyses, nevertheless, provide some necessary and interesting insights into the relationships between the study variables adding to our understanding of the psychological processes apparent in later life.

As the principal statistical approach, Ordinary Least Squares (OLS) multiple regression method is used. To examine the presence of mediation analyses inherent in answering Questions 2–4, I follow Baron's and Kenny's (1986) guidelines according to which I test the significance of the following relationships: 1) between the predictor and the outcome variable (the total causal effect); 2) between the predictor and the mediating variable; 3) between the mediating variable and the outcome variable; and 4) between the predictor and the outcome variable after the mediating variable is added (the direct effect). I supplement these analyses by the bootstrap procedure (Shrout & Bolger, 2002) to estimate confidence intervals and to determine whether the mediation effects are, in fact, statistically significant.

## Chapter 4. Findings

I begin this chapter by presenting the correlation matrix, which includes the zero-order relationships between all the variables that are included in the analyses, and discuss the most important correlations relevant to this study. I then outline the results of Question 1 testing the effect of perceived control (PC) in 1996 on Loneliness measured five years later, in 2001, while controlling for the relevant sociodemographic, social isolation, and health-related variables presented in the methodology chapter.

In addressing Question 2, I use PC 2001 as a potential mediator between Loneliness 2001 and the self-rated global physical health variable, General Self-Rated Health (GSRH), assessed in 2003. Note that in contrast to the first set of the analyses, the analyses pertaining to this and the remaining questions include Loneliness as the main *predictor* of health while the same background variables that were used previously are also included. Such design helps better understand the role of the control variables known to precipitate Loneliness, some of which, however, as will become evident in the analyses to follow, also affect the self-rated health outcomes. Hence, it can be argued that in conducting analyses of seniors' self-assessed health, it is important to also include variables associated with loneliness.

In Question 3, I test the effect of PC 2001 as the intervening variable between Loneliness and the self-assessed focused physical health variable, Recent Physical Health (RPH), also measured in 2003. Finally, in Question 4, I examine the mediating effect of PC 2001 on the relationship between Loneliness and Depression. Depression is assessed in the same year as PC 2001, which, although being an obvious limitation in this study, allows me to conduct supplementary analyses of PC and Depression as two simultaneous intervening variables between Loneliness 2001 and the physical health outcomes of 2003 (i.e., GSRH and RPH). This

specific supplementary analysis serves to strengthen the evidence of the role of PC as the mediator between late-life loneliness and health while also comparing its effect to the effect of another important variable related to physical health in older people, Depression.

Table 4.1
Inter-Variable Correlations

| Variable | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Loneliness, 2001 | - | | | | | | | | | | | | | |
| 2. Perceived Control, 1996 | -.20** | - | | | | | | | | | | | | |
| 3. Perceived Control, 2001 | -.30** | .31** | - | | | | | | | | | | | |
| 4. Global Self-Rated Health, 2003 | -.18* | .08 | .26** | - | | | | | | | | | | |
| 5. Recent Physical Health, 2003 | -.27** | .12 | .33** | .47** | - | | | | | | | | | |
| 6. Depression, 2001 | .40** | -.33** | -.38** | -.19* | -.39** | - | | | | | | | | |
| 7. Age, 1996 | .20** | -.03 | -.11 | .05 | .06 | .02 | - | | | | | | | |
| 8. Sex, 1996 | -.01 | -.01 | -.02 | .01 | -.18* | .14* | .05 | - | | | | | | |
| 9. Income Adequacy, 1996 | .08 | .21** | .07 | -.02 | .00 | .13 | -.04 | .03 | - | | | | | |
| 10. Education, 1996 | -.15* | .01 | .21** | .10 | .05 | -.19** | -.13 | -.06 | -.11 | - | | | | |
| 11. Marital Status, 1996 | -.07 | -.05 | -.00 | .06 | .13 | -.13* | -.36** | -.44** | -.07 | .13 | - | | | |
| 12. Living Arrangement, 1996 | -.10 | -.08 | .00 | .02 | .10 | -.17* | -.37** | -.38** | -.01 | .13 | .85** | - | | |
| 13. Frequency of Family Contact, 1996 | -.10 | .04 | .05 | .01 | .02 | -.10 | .00 | .03 | -.06 | .02 | .02 | .02 | - | |
| 14. Independent Activities of Daily Living, 1996 | -.07 | .31** | .12 | .18* | .03 | -.02 | -.21** | .20** | -.13* | -.05 | -.11* | -.09 | -.02 | - |
| 15. Chronic Condition Count, 1996 | .18** | -.39** | -.24** | .34** | -.37** | .25** | .17** | .11* | .14** | -.08 | -.10 | -.08 | -.02 | -.24** |

*Note:* Pairwise deletion. $^{**}p < .01$; $^{*}p < .05$.

**Correlations**

Prior to conducting the main regression analyses, the table of correlations for all the variables has been created (see Table 4.1). In calculating these correlations, as well as all subsequent analyses, I use a pairwise procedure because I have a considerable amount of missing data. In fact, more than 50 percent of the subjects are missing, particularly for the outcome variables in 2003. If a listwise deletion procedure was used, the correlations would include only those cases for which all the data are available (i.e., 161 cases)—a rather small sample size that would seriously limit the possibility of obtaining statistically significant effect parameters.

Neither pairwise nor listwise analyses are exempt from limitations. While listwise deletion procedure may result in a substantive amount of data loss, which would be the case in this study, a pairwise deletion procedure may prevent one from making reasonable inferences from the sample to the population. However, previous research that specifically examined characteristics of the missing data in the AIM and SAS datasets found that participants who did *not* have the completed data in 2003 (most likely due to death) were not significantly different from the participants who had complete data from 1996 to 2003, at least with respect to their sociodemographic characteristics (Chipperfield et al., 1997).

Further, the correlations obtained using a listwise deletion (reviewed but not reported) had very few differences from the correlations obtained via a pairwise deletion procedure. However, it is worth mentioning that only one variable, Independent Activities of Daily Living (IADL), showed a distinct pattern of correlations with three other variables for the listwise procedure versus the pairwise procedure. Specifically, for listwise in comparison with pairwise deleted cases, IADL had higher correlations with Loneliness (-.16 vs. -.07) and Sex (.30 vs. .20), and a lower correlation with PC 1996 (.14 vs. .31). This suggests that for a subsample of the

older adults who participated in this study in 2003, higher functional independence was associated more strongly with being a woman and being less lonely but to a lesser degree with perceptions of controllability seven years earlier. Nevertheless, the correlations between IADL and PC 2001 are found identical for both the listwise and pairwise deletion analyses.

Examination of the correlation matrix is the first critical step because it helps to explain how variables are related providing some preliminary support, or refutation, of the four questions that guide this study. As well, if the correlations are found to be reasonably consistent with correlations that have been published previously in other studies, this increases the confidence readers will have in this study.

From Table 4.1, there are several correlations that are worth mentioning. First, Loneliness, as the major variable in the analyses, is negatively correlated with the two physical outcome measures, GSRH (-.18) and RPH (-.27), both of which fall within the range of coefficients reported in previous studies (e.g., Segrin & Domschke, 2011; Yusoff et al., 2013). As well, Loneliness correlates positively and moderately strongly with Depression ($r$ = .40), which also agrees with previous research involving middle- and older-aged populations (e.g., Cacioppo, Hughes, et al., 2006). Hence, while arguably having some conceptual overlap (Cacioppo, Hughes, et al., 2006), loneliness and depression are, nevertheless, two separate psychological concepts.

Further, Loneliness has a modest correlation with PC (for 1996, $r$ = -.20 and for 2001, $r$ = -.30) that is consistent with the range of coefficients found in the literature (e.g., Fry & Debats, 2002); and PC 2001 is associated with GSRH 2003 ($r$ = .26) and RPH 2003 ($r$ = .33), which is comparable to the correlations also reported in the literature ($r$ = .21 and $r$ = .26, respectively; Chipperfield et al., 2012; Ruthig, Chipperfield, Newall, et al., 2007). Finally, PC has a

predictably negative correlation with Depression ($r$ = -.33 in 1996 and $r$ = -.38 in 2001). In short, all three bi-variate associations—Loneliness–health outcomes, Loneliness–PC, and PC–health outcomes, which are the associations that are of primary relevance to this study—are evident in the correlation matrix and are similar to the correlations in other studies.

Nevertheless, it should be noted that substantially lower correlations between PC 1996 and the physical health measures ($r$ = .08 with GSRH, $r$ = .12 with RPH) are observed than the correlations between PC 2001 and those same variables ($r$ = .26 with GSRH, $r$ = .33 with RPH). Also, compared to PC 2001, PC 1996 has a stronger association with the functional independence variable (IADL) measured in 1996 ($r$ = .12 vs. $r$ = .31, respectively) and a stronger association with Chronic Condition Count (CCC) also measured in 1996 ($r$ = .24 vs. $r$ = .39, respectively). All this suggests that PC may be associated with physical health more saliently when it is assessed closer (vs. further) in time to those measures. Finally, a rather low correlation between PC 1996 and PC 2001 ($r$ = .31) is observed, indicating that this variable is, in fact, malleable and is likely to change with time, as was suggested in previous research by Newall, Chipperfield, and Bailis (2013).

Next, the outcome variables, GSRH and RPH, correlate at .47, which is a relatively strong correlation that can be expected theoretically given both variables tap into the same latent construct of perceived physical health. As well, Depression correlates with both GSRH and RPH, although the correlation with RPH is noticeably stronger ($r$ = -.39) than the correlation with GSRH ($r$ = -.19). From this evidence, it appears that people's psychological health (Depression) is more associated with RPH than with GSRH. Recall, the same pattern of the stronger associations has been observed for Loneliness–RPH and PC–RPH versus the weaker associations for Loneliness–GSRH and PC–GSRH.

The last set of correlations in this discussion includes the variables of objective social isolation. Both Marital Status and Living Arrangement have the strongest correlations with Age ($r$ = -.36 and $r$ = -.37, respectively) and Sex ($r$ = -.44 and $r$ = -.38, respectively) as two important demographic variables, confirming the general description of the population where females are more likely to be single and live alone (Savikko, Routasalo, Tilvis, Strandberg, & Pitkälä, 2005). It is also noted that Marital Status and Living Arrangement correlate with Depression ($r$ = -.13 and $r$ = -.17, respectively) slightly stronger than with Loneliness ($r$ = -.07 and $r$ = -.10, respectively), suggesting that these variables are especially important to control in depression models. As well, Marital Status and Living Arrangement have a remarkably high correlation with each other ($r$ = .85).[1] Nevertheless, as I will be able to show in the analyses, the collinearity of these two variables, being theoretically largely distinct, does not pose a problem for the main argument of this thesis.

Finally, Frequency of Family Contact has a pattern of generally low correlations with virtually all the other variables of this study, but it is associated with Loneliness and Depression to a reasonable extent ($r$ = -.10). This supports the need to include Frequency of Family Contact in the models predicting Loneliness and Depression along with the two other variables measuring objective social isolation (i.e., Marital Status and Living Arrangement).

I now turn to answering the four main questions I have posed for this study. As readers will see, the regression analyses that follow echo some of the correlations noted above strengthening the conclusions that will be made later.

[1] It is more technically correct to obtain Point Biserial correlation for dichotomous variables. However, a Pearson Product Moment correlation procedure is typically used because it produces a coefficient identical to a Point Biserial correlation coefficient (Linacre, 2008).

## Main Analyses

**Question 1: Does PC predict Loneliness in older Canadians within a five-year period?** In contrast to how regression analyses are typically set up in published research, where background variables are incorporated into models before predictor variables are added, I opt to develop my model starting with the main relationship of interest (i.e., PC affecting Loneliness over a five-year period). At this first step, the PC–Loneliness relationship, of course, is confounded by other variables; subsequent analyses "clean up" this relationship when the control variables are added.

The proposition that PC should have a long-term effect on Canadian seniors' experience of loneliness is substantiated by previous studies showing that amongst North American older adults, general self-efficacy was predictive of loneliness over at least a 4-month term (Fry & Debats, 2002). For the longer time period, such as five years, global perceptions of controllability have also been shown to have a significant predictive capacity, as in the study by Newall, Chipperfield, and Bailis (2013). Recall, however, that these researchers used a single-item Loneliness variable whereas in this thesis, I use a multi-item scale—a scale that is likely to be more reliable. Likewise, the study by Nicolaisen and Thorsen (2012) is also suggestive that PC has a significant role in prospective loneliness, but that study's sample was limited to Norwegian adults and only to those aged from 67 to 79. I now conduct the replication analysis of this previously published research examining global PC as the predictor of the multi-item variable of Loneliness five years later in the representative sample of Manitobans of 72 years of age and older.

As Table 4.2 shows, in Model 4.2.1, when no other predictors are added, PC significantly predicts Loneliness (β = .20), and this regression coefficient is of course equal to the correlation coefficient reported earlier.

However, the feeling of loneliness is recognized to emerge from a wide range of causal variables (e.g., Coşan, 2014; Theeke, 2009; Victor et al., 2005). This necessitates their addition as the background variables into the model so the true temporal association between PC and Loneliness can be revealed. In Table 4.2, sociodemographic variables (1–4), objective social isolation variables (5–7), and health-related variables (8–9) are progressively added, as three groups, in Models 4.2.2 to 4.2.4.

Table 4.2
Baseline Predictors of Loneliness 2001

| Variable | Model 4.2.1 | Model 4.2.2 | Model 4.2.3 | Model 4.2.4 |
|---|---|---|---|---|
| 1. PC | -.20** | -.19** | -.19** | -.17* |
| 2. Age | | .19** | .18* | .18* |
| 3. Sex (Female) | | -.01 | -.01 | -.03 |
| 4. Income Adequacy | | .04 | .05 | .05 |
| 5. Education | | -.12 | -.12 | -.11 |
| 6. Marital Status (Married) | | | -.10 | -.10 |
| 7. Living Arrangement (With others) | | | -.12 | -.13 |
| 8. Frequency of Family Contact | | | -.09 | -.09 |
| 9. IADL | | | | -.05 |
| 10. CCC | | | | .09 |
| *R* square | .04 | .10 | .11 | .12 |

*Note:* PC = Perceived Control. IADL = Independent Activities of Daily Living. CCC = Chronic Condition Count. All variables are measured in 1996. Beta coefficients are standardized.
*$p \leq .05$, **$p \leq .01$.

Being older, a female, and having less income and less education has been previously shown to be associated with greater loneliness (Mullins, Elston, & Gutkowski, 1996; Savikko et al., 2005), hence Age, Sex, Income Adequacy, and Education are added to the model. This results in the substantial increase in *R* square, by 2.5–fold, from 4% in Model 4.2.1 to 10% in

Model 4.2.2. At this step, it is evident, however, that not all the sociodemographic variables are equally important in predicting Loneliness five years later. Age has a significant and the strongest effect (β = .19) followed by Education (β = -.12), while Sex and Income Adequacy have much smaller and non-significant effects. Note that the absolute size of the effect of PC (β = .19) is the same as that of Age, and it remains nearly unchanged compared to Model 4.2.1 (β = .20), which suggests that this variable may be as important in predicting Loneliness as Age. The subsequent model development will provide the necessary insight supporting or disconfirming these initial observations.

Before proceeding to Step 3, an important remark needs to be made regarding the variable of Age. Conflicting evidence exists in the literature regarding the association between Age and Loneliness with some literature suggesting a bi-variate non-linear relationship (Qualter et al., 2015). However, as one of recent studies examining loneliness across the lifespan, the research by Luhmann and Hawkley (2016) presents coherent evidence showing a positive *linear* association between these two variables, specifically in the older age cohort. The researchers showed that, although the estimation of the average level of loneliness loses its precision because of the increased variability in loneliness among the elderly, loneliness seems to continuously increase from age 75 and beyond, reaching the highest pick for the oldest adults (Luhmann & Hawkley, 2016).

While accepting this research paper as a credible source, I, nevertheless, opt to briefly test if the proposed linear relationship holds for the present sample by generating a Q-Q plot (see Figure 4.1). From this plot, there is, in fact, a suitable approximation of a linear positive association between Age and Loneliness thereby confirming Luhmann and Hawkley's (2016)

conclusion and justifying the use of a regression method in the analyses that include this variable.

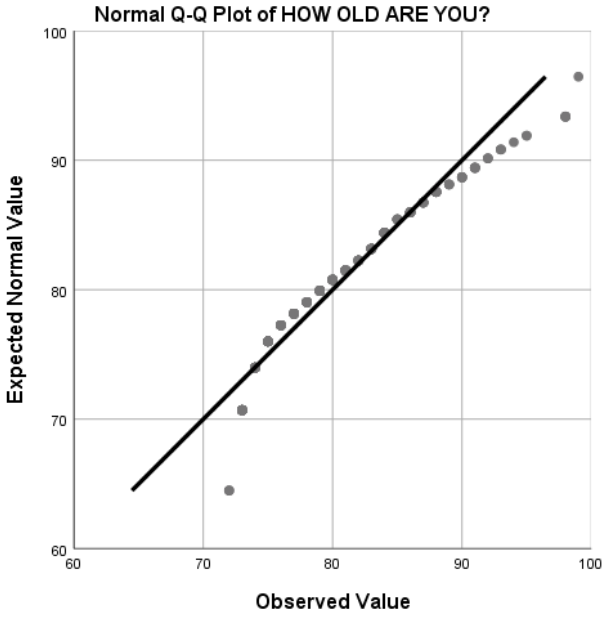


*Figure 4.1.* Q-Q plot for Age and Loneliness showing an acceptable approximation of a straight line.

Returning to the main focus of the analyses, the three variables of objective social isolation are added in Model 4.2.3: Marital Status, Living Arrangement, and Frequency of Family Contact. This addition is consistent with the literature showing that environmental factors of social integration are largely associated with people's experience of loneliness as those who are single, live alone, and have fewer contacts with family or friends are more likely to feel lonely than those who are married, live with others, and have frequent interactions with their significant social ties (e.g., Savikko et al., 2005). As well, including these variables in the model allows me to ensure that in this study, loneliness, as *perceived* social isolation, is clearly differentiated from structural elements in a person's social environment. As I mentioned before, surprisingly, not all studies have clearly drawn a difference between loneliness and social isolation (Cattan et al., 2005; Zavaleta et al., 2017), while it is critical to do so because to

overcome loneliness and social isolation in our society will likely entail finding solutions to address each of these phenomena independently.

The addition of the social isolation variables in Model 4.2.3 leads to a small increase in *R* square (from .10 to .11) and none of these variables that have been added at this step appear to be significant. However, the absolute size of their effect, on average, ($\beta = .10$) is comparable to that of Education ($\beta = -.12$) with the direction of these associations being consistent with what is expected from the research literature: Being married, living with others, and frequently seeing one's own family and relatives predicts lower levels of loneliness (Savikko et al., 2005; Victor et al., 2005). Note that the effects of Age and, more importantly, PC, do not change from Model 4.2.2 to Model 4.2.3, showing that these variables are not jointly mediated by the variables entered into the analyses at this step. In other words, both Age and PC evidently have an effect on Loneliness independent of each other and independent of the other variables.

Sociodemographic and objective social isolation variables, together with PC, are all important predictors of late-life loneliness but they do not provide a complete picture of what precipitates this disheartening emotion. Health-related variables, specifically, functional independence and the number of chronic conditions, were previously shown to have considerable effects on loneliness experienced by in older adults (Prieto-Flores et al., 2011). By logic, being functionally restricted and enduring multiple chronic problems can naturally limit the older adults' ability to stay connected with others hence contributing to their feeling of loneliness.

However, neither the relationship between functional independence and loneliness nor the relationship between chronic conditions and loneliness seem to have a consistent support in the literature. While some studies report a very small association between functional independence and loneliness in non-institutionalized older adults (Prieto-Flores et al., 2011;

Victor & Yang, 2012), other studies suggest a greater predictive utility of functional independence with respect to loneliness. In fact, the association was found to be negative in some studies (i.e., higher functional independence—less loneliness; Cohen-Mansfield et al., 2013; Luo et al., 2012; Russell, 2009) and, surprisingly, positive in other studies (i.e., higher functional independence—higher loneliness; Dykstra et al., 2005). Similarly, both negative (Alpass & Neville, 2003) and positive (Prieto-Flores et al., 2011; Segrin & Domschke, 2011) associations have been reported for chronic health problems and loneliness. I now examine the effects of the two variables, IADL and CCC, on Loneliness in the present sample of older adults.

As I add IADL and CCC to Model 4.2.4, none of these variables turn out to be significant in predicting Loneliness. However, the effect of CCC is stronger than the effect of IADL ($\beta$ =.09 vs. $\beta$ = -.05) and is comparable to the effects of the objective social isolation variables. As well, the associated increase in *R* square (9% in Model 4.2.4) is similar to the increase in *R* square when the social isolation variables have been included (10% in Model 4.2.3). This suggests that, although having no significant effect, IADL and CCC are, nonetheless, important variables to control in the loneliness model I am testing.

Let me now comment on the role of the key variable, PC. After adding the health-related variables, with all other variables being included, a slight drop in its effect size occurs (from $\beta$ = .19, $p$ = .004, to $\beta$ = .17, $p$ = .019) remaining significant, nevertheless, and arguably unchanged. This effect is still as large as the effect of Age in Model 4.2.4 ($\beta$ = .18, $p$ = .016). In fact, independently of all other predictors, the increase of one standard deviation in PC produces close to one-fifth of a standard deviation decrease in Loneliness. Note that Age has nearly the same effect on Loneliness but with the opposite sign having a positive association with the latter.

From Table 4.2, a few other important observations can be made. First, there has been nearly no change in the beta weights for any of the predictors throughout the four steps of the analyses. This signifies that all these predictors are largely independent of each other, and they explain some portion of the variance in Loneliness that is unique. Related to this is the fact that Marital Status and Living Arrangement show no sign of a "bouncing" beta even though these two variables correlate at .85 and could, theoretically, cause collinearity which typically manifests in "bouncing" betas (Maruyama, 1998). However, there seems to be no collinearity problem with using these variables in the analyses.

Finally, when all the predictors are included, it may seem that they explain only a small amount of the variance in Loneliness (12%). However, this is similar to the amount of variance explained in other studies that often have at least a third more variables than what is used in this thesis (i.e., Luhmann & Hawkley, 2016). Thus, despite the apparent limitation in the predictive power, the final model, Model 4.2.4, appears to be, in fact, properly specified while also adhering to the principle of parsimony.

In short, as implied to Question 1, older Canadians with stronger general perceptions of controllability have been shown to experience significantly lower levels of loneliness five years later, even when their sociodemographic backgrounds, objective social isolation, and their health-related characteristics have been controlled. This association is found to be as strong as the association between Age and Loneliness attesting to the importance of the psychological variable of global PC in predicting Loneliness as distantly as five years later—to the degree equivalent to the role of one of the people's objective demographic characteristics, their chronological age.

**Question 2: Can PC explain the effect of Loneliness on older adults' General Self-Rated Health?** The results of the analyses of the first question sets the stage for addressing the remaining three questions, which pertain to the relationship between loneliness and the self-reported health outcomes, physical and psychological, in later life. In contrast with some studies that report the effect of Loneliness as an independent variable on self-rated health but do not control for the background variables associated with the former (e.g., Segrin & Domschke, 2011), I start by including the predictors of Loneliness that have been discussed previously and expand the model by adding the first health variable, GSRH, as the outcome of Loneliness measured two years later. This analytical design helps reveal whether the relationship of interest (i.e., the effect of loneliness on health) exists independently of the background variables, which may, in fact, have an effect on the health measures. Table 4.3 presents the results of the regression analyses addressing this question.

From this table (Model 4.3.1[2]), it is evident that the regression coefficient for Loneliness 2001 and GSRH 2003 ($\beta = -.16$, $p = .035$) is somewhat smaller than the correlation between these variables ($r = -.18$), and it is even smaller than the association between Loneliness and GSRH reported in a couple of other studies (e.g., $\beta = .30$, Alpass & Neville, 2003; $\beta = .21$, Segrin & Domschke, 2011). This means that even though Loneliness may have a unique association with GSRH, other variables, especially Age, Marital Status, IADL, and CCC, are likely to confound this relationship, and thus it is essential to control for the effects of the latter.

[2] In this model and the subsequent models, Loneliness is set up at the same level as the background variables, which are exogenous. I recognize, however, that given Loneliness is measured at a later point in time, it would be more accurate to consider it as an endogenous variable which associations with the outcome variables are confounded by the background variables. However, this is merely a conceptual subtlety, and no difference in the regression results would emerge if the models were set with Loneliness as an endogenous variable. I chose the current way of presenting the models to allow the focus on mediation.

In the Model 4.3.1, it is also observed that while the effect of PC 1996 on GSRH is moderate but non-significant (β = -.12, $p$ = .165), the effect of Loneliness is somewhat larger and significant (β = -.16, $p$ = .035). Then, the effect of Loneliness is lower than the effect of Age (β = .23, $p$ = .008) and is even lower than the effect of Marital Status, which is also moderate although non-significant (β = .22, $p$ = .121). There are two other significant predictors in the model: IADL (β = .19, $p$ = .022) and CCC (β = -.34, $p$ = .000). Note that the signs of the IADL and CCC effects are opposite due to the conceptual difference in these measures, with the higher scores on the IADL scale reflecting one's better health (i.e., greater functional independence), in contrast to the higher scores on the CCC scale reflecting a person's worse health state (i.e., a larger number of chronic conditions). Also note that the observed importance of the IADL and CCC variables is expected because both functional status and chronic conditions, as objective health-related measures, have been recognized in the research literature as being among the strongest predictors of self-assessed health (Pinquart, 2001). Additionally, the fact that CCC has a larger regression weight than IADL is congruent with past research which identified physical health as playing a more prominent role than functional health in predicting GSRH (Pinquart, 2001).

What appears surprising, however, is the moderately *positive* relationship between Age and GSRH (β = .23, $p$ = .008) suggesting that the older seniors perceive they have better general health than their younger counterparts—quite a contraintuitive finding. It also contradicts evidence in Pinquart's (2001) meta-analysis of 31 studies on this relationship that showed that the strength of the causal association between people's age and their subjective health is generally negative but weak for both the younger old people (-.02) and the older old people (-.03). In fact, according to that study, people's age is not a direct determinant of their own health

perceptions. Rather, chronological age represents a proxy of the age-associated decline in people's functional and objective health, with the latter two factors being recognized as the most important predictors of self-reported health (Pinquart, 2001).

Table 4.3
Predicting General Self-Rated Health 2003

| Variable | Model 4.3.1 | Model 4.3.2 | Model 4.3.3 |
|---|---|---|---|
| 1. Loneliness 2001 | -.16* | -.18* | -.12 |
| 2. PC | -.12 | .06 | -.16 |
| 3. Age | .23** | .10 | .23** |
| 4. Sex (Female) | .05 | .05 | .06 |
| 5. Income Adequacy | .07 | .04 | .07 |
| 6. Education | .08 | .08 | .05 |
| 7. Marital Status (Married) | .22 | .21 | .23 |
| 8. Living Arrangement (With others) | -.10 | -.11 | -.11 |
| 9. Frequency of Family Contact | -.01 | .02 | -.02 |
| 10. IADL | .19* | | .19* |
| 11. CCC | -.34*** | | -.31*** |
| 12. PC 2001 | | | .20* |
| *R* square | .20 | .06 | .23 |

*Note:* PC = Perceived Control. IADL = Independent Activities of Daily Living. CCC = Chronic Condition Count. All variables are measured in 1996 unless otherwise indicated. Beta coefficients are standardized.
*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

Consistent with this line of reasoning, both IADL and CCC are likely to have a joint *suppressor* effect on Age predicting GSRH. Thus, excluding these variables in the next step (Model 4.3.2) should result in the *reduced* beta coefficient for Age (Conger, 1974). I test this proposition now by including all the predictors except for IADL and CCC.

In Model 4.3.2, the effect of Age on GSRH, indeed, becomes smaller and non-significant ($\beta = .10$, $p = .144$). As well, the associated *R* square is approximately one-third as large in Model 4.3.2 as it is in Model 4.3.1 (.06 vs. .20) emphasizing the great importance of both IADL and CCC for predicting self-rated health. This evidence confirms the suggestion I made about the possibility of the joint suppressor effects of IADL and CCC on the relationship between Age and

GSRH. It also helps clarify the interplay between these three predictors. In fact, it seems that as people grow older, they are more likely to report their health becoming better insofar as the objective criteria of their health are taken into account. When people's health problems, as they are reflected by their scores on the IADL and CCC scales, are controlled, it is not health but other aspects of their lives—perhaps their mindset, their emotional, or their social health—that contribute to their perceptions of their own health. Also, the moderate positive association between Age and GSRH (when IADL and CCC are controlled) reveals that, at least in this sample, people grow increasingly more optimistic about their general state of living, especially if objective health does not pose a serious issue. This is, indeed, likely because the people in the sample are living independently, and those people with worse health had probably moved into a care home or died by the time these follow-up measures were obtained. This probably meant that only those old people with better health and better positive perceptions of their health were still included in the dataset. These speculations align well with the argument by Pinquart (2001) that people at older age tend to base their own health assessment on the evaluations of their lives overall and not simply on the presence or absence of health problems per se.

Having clarified this unexpected Age–GSRH relationship, I now focus on one of the central questions in this thesis. What is the role of PC in understanding how loneliness can lead to poorer self-reported health? For the last decade, there has been considerable literature on biological explanations of this link, and this literature has been steadily growing (e.g., Cacioppo et al., 2015; Cacioppo, Hawkley, Crawford, et al., 2002; Segrin & Domschke, 2011; Shankar et al., 2011), while the studies examining psychological explanations are still quite limited in the Western research (e.g., Fry & Debats, 2002; Newall et al., 2009; Newall, Chipperfield, & Bailis, 2013; Moore & Schulz, 1987). As discussed in the introduction to this thesis, PC has a great

potential of providing at least partial explanation of how loneliness is related to self-assessed physical health in later life. I now test the mediating effect of PC on GSRH.

To do so, I follow the four-step method proposed by Baron and Kenny (1986). The following criteria are to be satisfied to support the hypothesis of mediation: 1) the predictor is associated with the outcome variable; 2) the predictor is associated with the mediating variable; 3) the mediating variable is associated with the outcome variable; and 4) upon addition of the mediating variable, the association between the predictor and the outcome variable becomes smaller and possibly loses its significance.

In addition, consistent with the common practice (e.g., Andrew & Meek, 2018), I use a bootstrapping estimation procedure (Bollen & Stine, 1990; Shrout & Bolger, 2002), utilizing 1000 samples with the 95% confidence interval (CI), to test the significance of the indirect effect. If the value zero is *present* within the CI, an indirect effect is said to be *non-significant*. The analyses are conducted with IBM SPSS Statistics for Windows (Version 25.0), supplemented with the Hayes' PROCESS-macro package (Version 3).

As shown in Model 4.3.1, Loneliness (the predictor) is significantly and temporarily related to GSRH (the outcome variable), $\beta = -.16$, $p = .035$, satisfying the first requirement. In the additional set of analyses (not presented here) with Loneliness predicting PC 2001 (the mediating variable) and the background variables being controlled, it is also revealed that Loneliness significantly predicts PC 2001 in the expected direction, $\beta = -.20$, $p = .002$, hence satisfying the second criterion. Then, as shown in Model 4.3.3, when PC 2001 is added, it plays a moderate and significant role in predicting GSRH, $\beta = .20$, $p = .014$, fulfilling the third requirement. Finally, the effect of Loneliness on GSRH drops from being significant ($\beta = -.16$, $p = .035$) to being non-significant ($\beta = -.12$, $p = .115$), and the corresponding $R$ square increases by

15%, from .20 in Model 4.3.1 to .23 in Model 4.3.3. Hence, Baron and Kenny's criteria are fully satisfied.

The subsequent test of significance, however, has not supported the proposed mediation effect. In fact, with the standardized[3] indirect effect of .011 (*SE* = .02), the 95% CI ranges between -.0084 and .0804, which, given it contains the zero value, indicates a non-significant mediation by PC 2001 when all the background variables, including PC 1996, are controlled.

Before coming to any conclusions, however, let me draw your attention to an interesting and perhaps bizarre effect of PC 1996 on GSRH. Being negative and statistically non-significant in both Model 4.3.1 and Model 4.3.3 ($\beta$ = -.12, $p$ = .165, and $\beta$ = -.16, $p$ = .068, respectively), this effect also makes no conceptual sense suggesting that PC 1996 has a poor predictive capacity for GSRH measured seven years later. Nonetheless, readers may question whether this is due to a gap in the assessment time between PC 1996 and GSRH 2003. In this case, given the PC 1996–GSRH 2003 correlation is noticeably lower than the PC 2001–GSRH 2003 correlation (see Table 4.1), PC 2001 may be a better predictor than either PC 1996 alone or the *change* in people's perceptions of controllability. It is this change in PC, from 1996 to 2001, that is essentially captured in Model 4.3.3 because both PC 1996 and PC 2001 have been included.

Indeed, the analyses conducted so far have evidently reflected the mediating effect of the change in PC and not the effect of PC as a single-time variable. Why would the former be relevant in the model of loneliness and health? In the previous study of older Canadians, Newall, Chipperfield, and Bailis (2013) found that both PC measured at a single point in time as well as the change in people's perceptions of controllability had significant effects on their experience of

[3] The standardized effect in the Hayes mediation procedure has been obtained by having all the variables converted into the corresponding Z scores.

loneliness. This finding has opened a possibility of including the change in PC as a mediating variable between Loneliness and the health outcome variables. Although not initially hypothesized, I have now obtained evidence that the change in perceptions of controllability may *not* be a significant mediator of the Loneliness–GSRH association.

Another way to test the effect of the change in PC is to create a variable that is an actual change score between PC 1996 and PC 2001. I now create this variable[4] and use it to either reject or confirm the tentative conclusions from the previous results (Model 4.4.2). Following these analyses, with PC 1996 *excluded*, I subsequently include only PC 2001 to obtain a "cleaner" effect of PC measured closer in time with GSRH 2003 (Model 4.4.3). This last model is now fully consistent with Question 2 in this thesis.

Model 4.4.1 shows the effects of the predictors on GSRH when PC 1996 is excluded. Note that comparing to Model 4.3.1 which includes PC 1996, only a slight drop in *R* square, from .20 to .19, is observed suggesting that PC 1996 is not likely to be important for these analyses. This, in turn, confirms my earlier suggestion that PC 1996 may be a poor predictor of GSRH 2003 likely because it was measured too far in the past.

With the addition of PC Change and PC 2001, *R* square increases by 15.7% and 10.5% in Model 4.4.2 and Model 4.4.3, respectively, and, in both of these models, significance of the effect of Loneliness is no longer evident thereby satisfying Baron and Kenny's (1986) fourth criterion. But, although these models may be predicting GSRH similarly (*R* square = .22; .21), the additional tests of mediation, the results of which are described immediately below, show

[4] The PC Change variable is created by subtracting PC 2001 from PC 1996. The correlation between PC 1996 and PC Change is $r = -.49$, and the correlation between PC 2001 and PC Change is $r = .68$.

that only PC 2001, and *not* PC Change, has a significant partial mediating effect between Loneliness and GSRH.

Table 4.4
Predicting General Self-Rated Health 2003: Excluding PC 1996

| Variable | Model 4.4.1 | Model 4.4.2 | Model 4.4.3 |
|---|---|---|---|
| 1. Loneliness 2001 | -.15* | -.12 | -.11 |
| 2. Age | .22* | .23* | .22* |
| 3. Sex (Female) | .06 | .07 | .07 |
| 4. Income Adequacy | .09 | .08 | .09 |
| 5. Education | .09 | .05 | .06 |
| 6. Marital Status (Married) | .22 | .23 | .23 |
| 7. Living Arrangement (With others) | -.10 | -.10 | -.09 |
| 8. Frequency of Family Contact | -.02 | -.02 | -.02 |
| 9. IADL | .16* | .18* | .15* |
| 10. CCC | -.30** | -.32** | -.28** |
| 11. PC 2001 | | - | .17* |
| 12. PC Change | | .20* | - |
| *R* square | .19 | .22 | .21 |

*Note:* PC = Perceived Control. IADL = Independent Activities of Daily Living. CCC = Chronic Condition Count. All variables are measured in 1996 unless otherwise indicated. Beta coefficients are standardized.
PC Change = PC 1996 – PC 2001. $^{*}p \leq .05$, $^{**}p \leq .01$.

Indeed, when PC Change is used, the Loneliness has a small and non-significant effect on PC change failing to meet Baron and Kenny's (1986) second criterion. Further, the indirect standardized effect of the change score corresponds to the 95% CI between -.0643 and .0164 hence indicating a non-significant mediation.

In contrast, when PC 2001 is used, there is a significant association between Loneliness and PC 2001 as the mediating variable, $\beta = -.24$, $p = .000$, and the total standardized indirect effect of Loneliness through PC 2001 is $\beta = -.15 – (.11) = -.04$, $SE = .02$, with the 95% CI ranging from -.0931 to -.0076. A visual representation of this effect is shown in Figure 4.2. To restate these findings, a one standard deviation increase in Loneliness is associated with a 15% of

a standard deviation decrease in GSRH, 4% of which can be attributed to the way Loneliness is mediated by PC 2001. This may appear like a very small, nearly negligible effect; however, it is very meaningful as I will argue in the concluding chapter of this thesis.

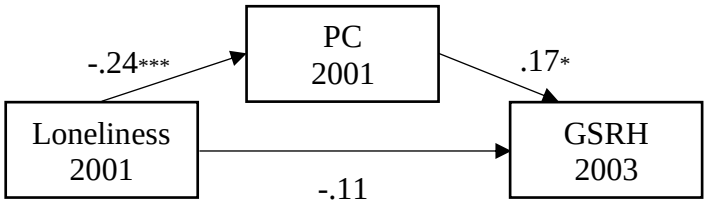


*Figure 4.2.* A mediating effect of PC 2001 between Loneliness 2001 and GSRH 2003. All the background variables but PC 1996 are included. $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$.

In summary of the analyses conducted to address Question 2, while PC measured seven years prior to GSRH has had a non-significant indirect effect on GSRH, the change in people's perceptions of controllability within a five-year period, although being a significant predictor of GSRH, has not helped to explain the effect of Loneliness on GSRH. In contrast, PC measured in 2001, as a single-time measure, has been found to have a significant mediating effect partially explaining the temporal association between Loneliness and GSRH, thus confirming the proposed mediation. As well, the supplementary analyses in this question have suggested that the role of PC with regard to perceived health is likely to be limited to a particular time frame, meaning that the effect of this variable changes over time, and the measure that is the best predictor is the one that is closest to the measurement of the health variable. This finding, while unique, seems to make eminent sense. Perhaps one of the principles of psychology is that dispositions that are close in time to actual behavioral outcomes have stronger relationships than psychological variables that were measured earlier.

**Question 3: Can PC explain the effect of Loneliness on older adults' Recent Physical Health?** Using the second indicator of people's physical health, I now test the mediating effect

of PC 2001 on the association between Loneliness 2001 and Recent Physical Health (RPH) measured two years later. I apply the same strategy of incremental model building as before and report the results of the regression analyses in Table 4.5. Model 4.5.1 predicts RPH when only the background variables, but not PC 1996, are included, and Model 4.5.2 shows the regression of RPH on all the variables plus the mediating PC 2001 variable.

Table 4.5
Predicting Recent Physical Health 2003

| Variable | Model 4.5.1 | Model 4.5.2 |
|---|---|---|
| 1. Loneliness 2001 | -.24*** | -.19* |
| 2. Age | .23* | .24** |
| 3. Sex (Male) | -.11 | -.10 |
| 4. Income Adequacy | .10 | .10 |
| 5. Education | .03 | -.01 |
| 6. Marital Status (Married) | .16 | .17 |
| 7. Living Arrangement (With others) | -.06 | -.04 |
| 8. Frequency of Family Contact | -.02 | -.02 |
| 9. IADL | .03 | .00 |
| 10. CCC | -.42*** | -.36*** |
| 11. PC 2001 | | .23*** |
| *R* square | .28 | .32 |

*Note:* PC = Perceived Control. IADL = Independent Activities of Daily Living. CCC = Chronic Condition Count. All variables are measured in 1996 unless otherwise indicated. Beta coefficients are standardized.
$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$.

Before addressing the actual mediation outcomes, let me make two general observations evident from Table 4.5. These analyses, with RPH as the outcome variable, have an overall higher *R* square (.28 and .32) compared to the previous analyses with GSRH as the outcome (.19 and .21). This indicates that the variables used in this study may be slightly more effective in predicting RPH than GSRH, thus justifying the model being tested on these two health indicators separately. Further, in contrast to the analyses with GSRH, Loneliness continues to significantly predict RPH when PC 2001 is added as the mediating variable. There is, however, a substantial

drop in both size and significance of the effect of Loneliness from Model 4.5.1 (β = -.24, *p* = .001) to Model 4.5.2 (β = -.19, *p* = .011). Thus, Baron and Kenny's (1986) fourth criterion of mediation is still technically upheld. Therefore, PC 2001 is likely to have the proposed mediating effect between Loneliness and RPH.

To confirm the significance of this effect, the mediation analyses are then carried out revealing that PC 2001, indeed, is as a significant partial mediator between Loneliness and RPH. Specifically, in addition to PC significantly predicting RPH (β = -.23, *p* = .001), Loneliness negatively and significantly predicts PC 2001 (β = -.24, *p* = .000), and the indirect standardized effect of Loneliness 2001 through PC 2001 is β = -.24 – (.19) = -.05, *SE* = .02, with the 95% CI falling between -.1111 and -.0135, which, therefore, is significant (see Figure 4.3).

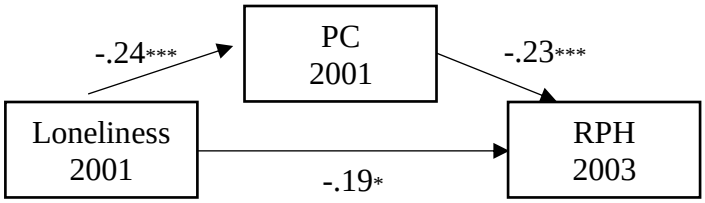


*Figure 4.3.* A mediating effect of PC 2001 between Loneliness 2001 and RPH 2003. All the background variables but PC 1996 are included. $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$.

Thus, from the analyses so far, a consistent pattern of the partial mediating effect, of a relatively similar size, of PC on the association between Loneliness and the two perceived physical health measures (β = -.04 for GSRH, β = -.05 for RPH) has emerged. Because the results are largely uniform for these two health outcomes, readers can have greater confidence that PC is, indeed, likely to partially explain the negative impact loneliness has on self-assessed physical health in older people. However, some difference between the general physical health

measure and the more detailed recent physical health measure has also become evident, the discussion of which I leave for the discussion in the next chapter.

Let me now pause for a moment and address a potential empirical ambiguity in my analyses. In psychology, researchers often deal with concepts that do not have an objective tangible representation since most of psychological variables occur solely in one's own mind. The feeling of loneliness and perceptions of controllability represent such concepts, which arguably makes it challenging to set these variables as distinct affective-cognitive experiences and to model their relationship in a causal pattern. How clear, therefore, can the temporal order of their occurrence be, especially if both of them are measured at the same time? Indeed, because in these analyses, Loneliness and PC are assessed in the same year (2001), this allows a possibility for these two variables to have the reversed roles, that is, for PC to be the main predictor of physical health (e.g., RPH) and for Loneliness to be a mediator between PC and this health measure. To test this proposition, I now conduct two more analyses, the results of which are shown in Table 4.6.

From this table, it may seem plausible for Loneliness to have a partial mediating effect of the PC–RPH link given a reduction in the beta weight when Loneliness is added as the mediating variable ($\beta = .27$, $p = .000$ in Model 4.6.1, vs. $\beta = .22$, $p = .002$ in Model 4.6.2). However, the mediation is not supported when the significance of this effect is tested, 95% CI = [-.0057; .1043]. This means that the hypothesis of the alternative pattern of the complex relationship between PC, Loneliness, and physical health has not found its support. Hence, at least for this sample of seniors, Loneliness does not significantly mediate between the people's perceptions of controllability and their physical health, whereas PC has, in fact, a mediating effect between Loneliness and RPH that is statistically significant.

To summarize, the analyses in this question have provided evidence for a partial mediation of PC 2001 between Loneliness 2001 and RPH 2003. This special role of PC in the model of loneliness and health is emphasized by the supplementary analyses that have shown no significant mediation by Loneliness of the PC–RPH relationship—a possible alternative pattern of the variable relationship considered in the light of Loneliness and PC having been measured at the same time.

Table 4.6
Testing the Alternative Mediation: Loneliness as a Mediator of the PC–Recent Physical Health Association

| Variable | Model 4.6.1 | Model 4.6.2 |
|---|---|---|
| 1. PC 2001 | .27*** | .22** |
| 2. Age | .21** | .24** |
| 3. Sex (Male) | -.10 | -.10 |
| 4. Income Adequacy | .09 | .09 |
| 5. Education | .00 | .02 |
| 6. Marital Status (Married) | .15 | .17 |
| 7. Living Arrangement (With others) | -.02 | -.04 |
| 8. Frequency of Family Contact | -.01 | -.02 |
| 9. IADL | -.01 | -.01 |
| 10. CCC | -.38*** | -.36*** |
| 11. Loneliness 2001 | | -.19* |
| *R* square | .29 | .32 |

*Note:* PC = Perceived Control. IADL = Independent Activities of Daily Living. CCC = Chronic Condition Count. All variables are assessed in 1996 unless otherwise indicated. Beta coefficients are standardized. $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$.

**Question 4: Can PC explain the effect of Loneliness on older adults' Depression?** In the last question of this study, I examine PC as a mediator of the Loneliness–Depression association. In these analyses, presented in Table 4.7, Depression is assessed in 2001 using the CES-D scale. As argued previously, PC 1996 is not included in the model given PC 2001 is used.

Table 4.7
Predicting Depression 2001

| Variable | Model 4.7.1 | Model 4.7.2 |
|---|---|---|
| 1. Loneliness 2001 | .36*** | .30*** |
| 2. Age | -.14* | -.15* |
| 3. Sex (Female) | .11 | .09 |
| 4. Income Adequacy | .06 | .05 |
| 5. Education | -.14* | -.09 |
| 6. Marital Status (Married) | .08 | .06 |
| 7. Living Arrangement (With others) | -.19 | -.20 |
| 8. Frequency of Family Contact | .02 | -.02 |
| 9. IADL | -.01 | -.01 |
| 10. CCC | .17** | .13* |
| 11. PC 2001 | | -.26*** |
| *R* square | .26 | .31 |

*Note:* PC = Perceived Control. IADL = Independent Activities of Daily Living. CCC = Chronic Condition Count. All variables are measured in 1996 unless otherwise indicated. Beta coefficients are standardized. $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$.

First, it is noted that in Model 4.7.1, when PC 2001 is not yet added, the size of the effect of Loneliness on Depression is larger than the effects of Loneliness on the physical health variables observed earlier (β = .36 for Depression vs. β = -.15 for GSRH and β = -.25 for RPH). This is expected given that Loneliness and Depression are undoubtedly regarded as the highly related phenomena with Depression frequently occurring within the context of Loneliness (e.g., Golden et al., 2009). Further, the size of this effect is slightly lower than the correlation (β = .36 vs. $r$ = .40) attesting to the role of the covariates, and it is somewhat lower than the effect reported in a couple of other research studies on seniors (β = .39; Cacioppo, Hughes, et al., 2006) perhaps due to the inclusion of the Chronic Condition Count variable—the critical physical health covariate, which, however, is not always controlled in the research on loneliness and depression (Cacioppo, Hughes, et al., 2006; Golden et al., 2009). Readers may also notice the effect of Education, β = -.14, $p$ = .026, being larger in this model than in the models predicting

either GSRH (β = .09, $p > .05$) or RPH (β = .03, $p > .05$), which is suggestive of its protective role against depressive symptoms in the older population. It is likely that people with higher education have more active minds, reading and engaging in conversations about abstract or complex issues hence being less likely to be depressed than those with less education. Of the comparable effect is the effect of Age, which is also negative, β = -.13, $p = .035$. This temporal association between Age and Depression supports my proposition that, at least in this particular sample of older adults, as people advance in years, they seem to become more psychologically adapt and generally more optimistic about their health status and less depressed about their lives.

Off note is that in the relevant research literature, there appears to be no consistency regarding the association between chronological age and depression. While some studies report a positive trend of depression increasing with age (Rothermund & Brandstädter, 2003), other studies suggest either a very weak association or a negative association—similar to what I have found in my analyses—specifically when variables such as functional ability and social network are included (Alpass & Neville, 2003; Bailis et al., 2001; Blazer, Burchett, Service, & George, 1991; Luppa et al., 2012). The effect of Gender (β = .11), however, with females being more likely to report depressive symptoms than males, is largely in line with previous studies (Cacioppo, Hughes, et al., 2006; also see review by Girgus, Yang, & Ferri, 2017), although in my study, this effect is non-significant likely because of the relatively small sample size and the number of the independent variables included in the analyses.

Next, in Model 4.7.2, PC significantly predicts Depression with the effect of Loneliness dropping in size, but not significance, β = .30, $p = .000$, in comparison to its effect in Model 3.7.1, β = .36, $p = .000$. Further, the mediation analyses confirm that, in fact, this indirect effect, β = .36 – .30 = .06, $SE = .02$, is significant with 95% CI = [.0184; .1154]. In other words, a one

standard deviation increase in Loneliness has resulted in 36% of a standard deviation increase in Depression, with 6% of the change being attributed to PC.

Provided Depression, Loneliness, and PC are all measured in 2001, which technically weakens my argument for a potential mediation, I find it necessary to perform supplemental analyses to examine the reverse relationship between Depression and Loneliness and whether PC can explain this association as well. Loneliness is often viewed as a precursor for depressive symptoms, especially in the older population (Cacioppo et al., 2010; Russell, 1982); however, evidence of the reverse effect also exists (Prieto-Flores et al., 2011). Recall that loneliness and depression are regarded as largely comorbid conditions (Ernst & Cacioppo, 1998; Golden et al., 2009) explaining why items measuring loneliness are often present in the scales that assess depression (e.g., CES-D, Radloff, 1977).

Based on this evidence, I therefore expected to find a significant total causal effect of Depression on Loneliness, even after controlling for the background variables. This significant effect has, indeed, lent support to my thoughts about this relationship ($\beta = .38$, $p = .000$). Further, the indirect standardized effect of PC 2001 is also significant, $\beta = .05$, $SE = .03$, 95% CI = [.0092; .1224], and it is evidently similar in size to the indirect effect of PC when Loneliness has been included as a predictor. Thus, in contrast to Cacioppo and colleagues (2010), who found a unidirectional relationship between Loneliness and Depression, I now have obtained some evidence for the reverse relationship between these two variables, which, in turn, can also be partially explained by the mediating effect of PC.

An apparent limitation of having Depression measured in 2001 and not at a later time can be turned into an advantage by making one extra step in these series of analyses. Evidence exists that depression plays a mediating role between loneliness and such health-related outcomes as

people's cognitive performance and mental conditions (Jaya, Hillmann, Reininger, Gollwitzer, & Lincoln, 2017; McHugh Power, Tang, Kenny, Lawlor, & Kee, 2019), and several studies point at the detrimental effect of depression on older adults' general self-reported health (Callahan, Hui, Nienaber, Musick, & Tierney, 1994; Han, 2002). Given this past evidence along with the present findings of PC having significantly mediated the effect of Loneliness on Depression, I am now inclined to ask which variable, PC or Depression, has a larger mediating effect on the link between Loneliness and the physical health outcomes. Figures 4.4 and 4.5 depict the results of these supplementary analyses when both variables, PC and Depression, are simultaneously included in the models predicting GSRH and RPH.

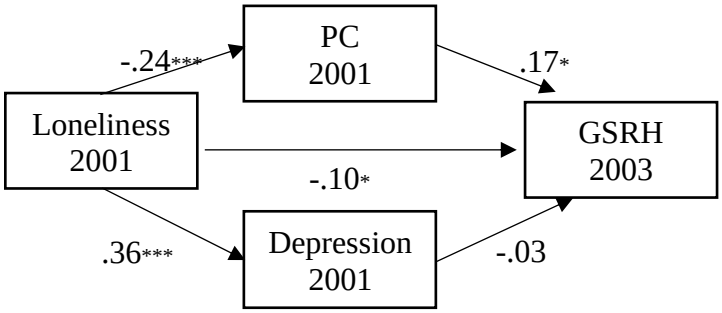


*Figure 4.4.* Mediating effects of both PC 2001 and Depression 2001 between Loneliness 2001 and GSRH 2003. $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$.

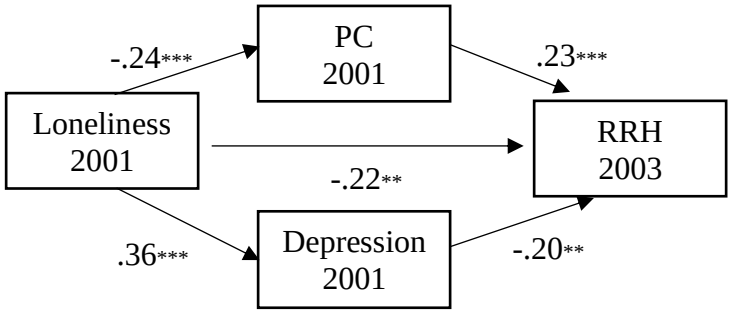


*Figure 4.5.* Mediating effects of both PC 2001 and Depression 2001 between Loneliness 2001 and RPH 2003. $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$.

In Figure 4.4, the direct effect of Loneliness on GSRH, when both PC 2001 and Depression 2001 are included, is β = -.10, $p$ = .050, and the *total* indirect effect through PC and Depression is β = -.05 = (-.24)(.17) + (.36)(-.03). The indirect effect of Loneliness through PC 2001 is found to be significant, β = -.04, *SE* = .02, 95% CI = [-.0895; -.0017], while the indirect effect through Depression is non-significant, β = -.01, *SE* = .04, 95% CI = [-.1091; .0740]. Hence, only the effect of PC appears to be large enough to help explain the association between Loneliness and GSRH, while Depression does not seem to account for any effect of Loneliness on GSRH. Finally, in the model of RPH (Figure 4.5), the direct effect of Loneliness on RPH is β = -.22, $p$ = .010, and the *total* mediating effect of PC and Depression is β = -.13 = (-.24)(.23) + (.36)(-.20). While the indirect effect of PC is β = -.05, *SE* = .03, 95% CI = [-.0946; -.0065], the indirect effect of Depression is more than 60% larger, β = -.08, *SE* = .04, 95% CI = [-.1625; -.0023], with both effects being significant.

Overall, these supplementary analyses confirm that PC plays a substantial mediating role in the association between late-life loneliness and self-rated health. In the Loneliness–GSRH association, PC has emerged to be a stronger mediator than Depression, and, although in the RPH model, its mediating effect is evidently smaller than the effect of Depression, it is, nevertheless, significant. Furthermore, the analyses highlight the apparent difference between GSRH and RPH as two measures of self-assessed physical health that is consistent with my previous observations. In fact, Depression, as a psychological variable, is more closely related to RPH than to GSRH. This may be surprising given RPH, as a more detailed health measure, includes specific physical symptoms (i.e., stomach upset, headache, and dizziness) while GSRH represents a global health measure presumably capturing a more psychological, versus physical,

aspect of health. Before I start the discussion and address this intriguing finding in detail, I provide a summary of this chapter.

**Summary of the Findings**

The first set of the analyses (Question 1) has confirmed previous studies showing that in the given representative sample of older Canadians, people's general perceptions of controllability significantly has predicted their experience of loneliness as prospectively as five years later, and that effect is comparable to the effect of the seniors' chronological age. Then, Questions 2 and 3 have revealed the presence of significant partial mediation by general PC on the relationship between Loneliness and the self-assessed physical health variables, GSRH and RPH, measured two years later. In Question 4, a significant mediating effect of PC between Loneliness and Depression emerged, and a similar partial mediation of PC explaining the reverse relationship between these two variables has been obtained in the supplementary analyses. Finally, in the advanced Loneliness–GSRH model that included PC and Depression as the two simultaneous mediators, PC has played a noticeable and significant mediating role while the effect of Depression has been found non-significant. For the Loneliness–RPH association, the mediating effect of PC, although being smaller than the effect of Depression, has, nevertheless, once again, emerged as significant.

# Chapter 5. Conclusion

The concluding chapter of this thesis reviews the major results and situates them within the existing research literature on loneliness in general and within the literature on loneliness among older people specifically. Given a few parts of this thesis being exploratory in nature, some of the arguments and ideas presented here appear for the first time having not been introduced in other chapters. Following this discussion, which also includes recommendations regarding future research directions, I state the major strengths and limitations of this study. The chapter ends with a few concluding remarks in the epilogue.

## Is There a Loneliness Epidemic?

Despite the popular claim about the existence of a "loneliness epidemic," the research literature shows no strong evidence for this devastating emotion being more prevalent currently than in previous decades (Suanet & Van Tilburg, 2019). Nevertheless, for older adults, who are among the most vulnerable members of our society, loneliness continues to pose a common and serious problem, jeopardizing their health and their emotional well-being.

The difficulty of studying loneliness, with the ultimate goal of finding ways of combating its severe effects, comes in part from its subjectivity. We may appear socially embedded, living in big communities and being surrounded by friends and family members; nevertheless, we may still feel lonely. Hence, loneliness is not the same as social isolation as it is generally understood by researchers today (De Jong Gierveld & Havens, 2004; Fakoya, McCorry & Donnelly, 2020). Of course, objective factors of social isolation have an effect on people's experience of loneliness, but, because of the idiosyncratic, subjective nature of this phenomenon, there may be especial significance and practical utility in trying to understand the underlying psychological processes of loneliness. This thesis has been devoted to examining the contribution of what

appears to be the most important psychological variable discussed by far in the literature on loneliness (Suanet & Van Tilburg, 2019)—that is, the variable of perceived control (PC).

**Perceived Control as the Predictor of Loneliness**

As stated in the introduction chapter, PC represents a significant predictor of loneliness (e.g., Andrew & Meeks, 2018; Fry & Debats, 2002; Newall, Chipperfield, & Bailis, 2013; Newall et al., 2009; Moore & Schulz, 1987). However, most of the germane literature appears to persistently highlight other causes of this emotional state—sociodemographic, environmental, and health variables (e.g., Theeke, 2009; Victor et al., 2005) —while paying significantly less attention to the psychological variables such as PC. And, it was not until very recently when the significance of controllability beliefs, and, specifically, general controllability beliefs, in the relationship to loneliness has finally been demonstrated in large–scale research. In the very recent longitudinal study (Suanet & Van Tilburg, 2019) involving nearly 4,500 participants—published at the time when the work on this thesis has already begun—personal beliefs in being able to control the outcomes of one's own behavior were found to explain the differences in loneliness between the earlier-born (1908-1917) and later-born (1948-1957) middle-aged and older adults across a 100-year span of time. Furthermore, in all these cohorts, people's beliefs in personal control over their lives were consistently associated with their experiences of loneliness to a substantially greater degree than a large array of sociodemographic and health variables. Remarkably, the effect of age, with older seniors being more likely to feel lonely than younger seniors, was also evident across the cohorts.

These findings echo the results of the analyses I conducted in addressing the first question of this thesis that among older Canadians, general PC has an effect on loneliness that is as strong as the effect of age. Furthermore, similarly to the research by Suanet and Van Tilburg

(2019), my results show that it is *general* PC that substantially contributes to the older adults' experience of loneliness. Readers may recall that a significant effect of domain-specific PC was also demonstrated in past research (e.g., Fry & Debats, 2002; Newall et al., 2009). However, it is general perceptions of controllability that may arguably be of a greater importance than domain-specific PC—the idea that is parallel to one of the propositions in Heckhausen et al.'s (2010) theory of life-span development. Consistent with that theory, as people grow older and face increasing age-related challenges, they seek ways to preserve their overall sense of control. More specifically, the theory postulates that throughout individuals' lifespan and progressively in the later life, people undergo various shifts in their controllability aspirations, transferring their attention from one domain to another so that their sense of control in general is maintained.

This argument supports my initial choice to focus on global PC, and not on domain-specific PC. My work has further confirmed the results of several previous studies (e.g., Newall, Chipperfield, & Bailis, 2013; Newall et al., 2009; Nicolaisen & Thorsen, 2012) showing that general controllability beliefs have a substantial effect on perceived social involvement of Canadian seniors, alleviating their feelings of loneliness, although not fully but to a considerable degree, as prospectively as five years later. This effect, in fact, was found equivalent in size to the effect of chronological age being significantly larger than the effects of other important variables included in the analyses which all have been previously recognized as fundamental in understanding loneliness.

In the subsequent analyses, I went beyond replication of previous studies by examining PC as a potential mediator of the detrimental effect of loneliness on older adults' physical and emotional health. These analyses undoubtedly present a novel contribution to the research literature. Before I discuss the findings of these mediation analyses, I will comment on some of

the outcomes of the supplementary analyses that were conducted as part of the incremental model building process I used in this thesis. Understanding these outcomes is necessary because they substantially add to our knowledge of the relationship among the variables that have been used in this thesis and they deepen our understanding of the topic of loneliness in the older population.

**Results from the Supplementary Analyses**

The first major supplemental finding was that PC, being a malleable psychological variable (Newall, Chipperfield, & Bailis, 2013), has varying associations with different health measures that are in part determined by *when* the variables are measured. It is perhaps not surprising that controllability beliefs seem to be most germane to the physical and emotional health outcomes of seniors—and have most predictive capacity on these outcomes—at the time closer to when these health variables are assessed. This means that older people seem to be affected by their more recent sense of control and not their sense of control they had in the past, showing that control is a perception that can change rather rapidly as people grow older.

This evidence has implications for both researchers and healthcare practitioners when assessing older people's experience of loneliness and making relevant decisions and health projections. Given that perceptions of control can change over time, efforts should be made to help older adults feel more in control *in the present* as these subjective perceptions are likely to be associated with their physical and emotional health now and in the near future. Taking into consideration the consistently growing cost of medical care, the importance of making accurate health predictions, in addition to having effective low-cost interventions, can hardly be overstated, and control-based interventions have, in fact, a great potential to offer such economic and effective solutions (Hamm et al., 2020; Sarkisian, Prohaska, Davis, & Weiner, 2007).

The time-determined effect of PC is not unexpected in part due to subjectivity of both concepts, PC and self-assessed health, which means they both occur in one's own mind. In contrast, research on the association between PC and some objective health outcomes suggests the importance of a long-term, in comparison to a short-term, impact of PC on people's health, for example, on their longevity measured up to 12-year years later (Chipperfield, 1993). By including objective markers of health along with subjective health measures, future research may take the next step in clarifying the question: Does PC have a differential relevance predicting objective versus subjective health outcomes depending on when the variables are assessed?

The second important supplementary finding concerns the difference between General Self-Rated Health (GSRH), a global health assessment, and Recent Physical Health (RPH), a more detailed, symptom-oriented measure. Both of these variables are self-reported; thus, they inherently reflect considerable subjective, psychological aspects of an individual's health condition. Guided by logic, readers might have expected that the psychological variables in this study, specifically, Loneliness, PC, and Depression, would have a stronger relationship with the global measure of GSRH than with the more specific measure of RPH. Indeed, because of its reference to some physical symptoms (i.e., stomach upset, headache, and dizziness), RPH may be conceived as being more "objective" than GSRH, which, in contrast, is supposedly a less concrete, marker of health. However, this is not what the analyses showed. All the key psychological variables—Loneliness, PC, and Depression—have had a consistent pattern of stronger relationships with RPH than with GSRH.

This may appear like a puzzling and contraintuitive finding. In the attempt to explain it, I turned to the existing literature comparing various forms of health assessment. In one study, for example, it was found that the questionnaires that address older people's *present* and/or *future*

health states, tend to be more congruent with seniors' *objective* health outcomes (for example, their mortality) than the health questionnaires referring to their past heath conditions (Ferraro & Wilkinson, 2015). Given RPH is a time-specific measure referring to the *past month*, it is reasonable to think that RPH represents, in fact, a less "objective" measure of health than GSRH. The GSRH variable, in turn, has no time reference arguably capturing seniors' present health states, hence likely being a better indicator of their objective health assessed at that time than RPH. This evidence appears congruent with previous research on how overall, perception of time speeds up as we advance in age (Wittmann & Lehnhoff, 2005). This conception of time may make people, as they grow older, become more attentive to the present health conditions than to their past conditions.

Following this line of thought, it seems quite reasonable that RPH, as the variable addressing less "objective" and more "subjective" aspects of health than GSRH, would have stronger associations with the psychological—subjective—variables of PC, Loneliness, and Depression. This new theoretical reasoning, in fact, helps interpret a number of observations that have been made in this study. Essentially, the evidence suggests that subjectivity of self-rated health measures may partially arise because of the differences in the time reference inherent in the measures. Of course, this does not mean to imply that in future research or clinical practice, RPH should be discarded in favor of the present- and future-oriented measures such as GSRH. Instead, these results suggest that different self-assessments may be associated with different health outcomes. More research is needed to further explore the differences in various forms of self-rated health, including the ones used in this study, GSRH and RPH, and the time frame embedded in those measures, so that we can better understand why, seemingly measuring the

same concept, that is, self-assessed physical health, these assessments are, nevertheless, quite distinct.

The third observation emanating from the supplementary analyses is related to the possible bi-directional relationship between Loneliness and Depression. Although I did not test the simultaneous reciprocal Loneliness–Depression relationship—which would require an access to a program for solving simultaneous equations, —nonetheless, my analyses, in which I interchangeably used Loneliness and Depression as the model mediator, suggest that Loneliness affects Depression as much as Depression affects Loneliness. This suggestion contradicts the recent research by Cacioppo et al. (2010) who argued for the unidirectionality of the relationship between these two variables. In contrast, my analyses support other research (Prieto-Flores et al., 2011) that has showed that, as two closely related yet distinct phenomena, loneliness and depression are likely to have a bi-directional association, which would, in turn, explain their frequent clinical comorbidity (Golden et al., 2009). Further research on the reciprocal association between loneliness and depression will help identify where and how to intervene and what impact such interventions are likely to have for older adults. It probably makes a difference if an intervention focuses on loneliness or on depression or on both at the same time. Thus, the causal relationship between these two variables is necessary to be clarified by future studies.

I now begin the discussion of the results that address the key research questions of this study, that is, the intervening role of PC in the relationship between Loneliness and the self-assessed health variables. Starting with the review of PC as a single mediator, I will then comment on the last set of the supplementary analyses where both PC and Depression were used as the mediators of the loneliness–health relationship.

**Perceived Control as the Mediator of the Loneliness–Health Relationship**

Throughout all three sets of mediation analyses conducted in this study, global PC was repeatedly shown to have a significant partial mediating effect on the relationship between seniors' experience of loneliness and their health self-assessments. Specifically, loneliness partially eroded the general sense of control in older Canadians, which, in turn, negatively affected their physical health, measured on both the global and focused instruments, as well as their emotional health. Hence, it seems that global PC is a critical psychological variable in the loneliness–health relationship in the older population, which not only prospectively predicts loneliness, as was discussed previously, but is also capable of mediating the negative effect loneliness has on the physical and emotional health of senior citizens.

The consistency in the findings across the three outcome variables reinforces the main conclusion that can be drawn from this thesis. Indeed, despite addressing distinct aspects of self-assessed health, the variables of GSRH, RPH, and Depression—all being important indicators of the older adults' health—had similar effect patterns with the seniors' controllability beliefs: PC partially mediated the effects of Loneliness on all these health variables to a significant and nearly equal degree.

How significant is this mediation effect of PC? Simply commenting on the statistical significance of a coefficient is rarely the best way to understand the role of a given mediator. However, comparing the degree of mediation exhibited by other variables may allow researchers gain more insight into the importance of the mediator. Hence, in evaluating the results of this study, I refer to a similar study that has obtained comparable mediation effects.

In their examination of potential mechanisms behind the loneliness–health link, Segrin and Domschke (2011) considered sleep quality as a mediating variable between loneliness and

health problems as well as between loneliness and health-related quality of life. Without a doubt, sleep is one of the strongest health behavioral indicators associated with the body's restorative processes (Zee & Turek, 2006). And, in the study by Segrin and Domschke (2011), it was identified as an important partial mediator. That is, loneliness was shown to cause the reduction in the people's quality of sleep which further undermined their own health perceptions. In statistical terms, the indirect effect of loneliness through sleep accounted for 2% and 4% of the variance in the outcome variables of health problems and health quality of life (Segrin & Domschke, 2011).

This mediating effect of sleep is highly comparable to the effect of PC that emerged in my study. In fact, in my analyses, the indirect effect of Loneliness through PC constituted 4% and 5% of the change in GSRH and RPH, respectively, and it was 6% of the change in Depression. This suggests that PC is likely to be at least as important as, or even more important than, sleep in explaining the variation in the health of older people. This finding is far from trivial implying that the effect of PC is, in fact, crucial.

With respect to GSRH, the results seem to be especially remarkable given other proposed mechanisms for the Loneliness–GSRH link, especially those with more tangible, behavioral mediators—for example, leisure activities (Segrin & Domschke, 2011), alcohol and tobacco consumption, medical compliance, and physical exercise (Cacioppo, Hawkley, Crawford, et al., 2002)—have *not* found empirical support in the research literature. Indeed, it is very likely that the role of PC is greater than the role of a majority of the proposed behavioral mediators in explaining the impact of loneliness on health. With this finding, the present study makes a substantial and important contribution to the research literature.

In terms of the effects of PC on depression, the results of my analyses are congruent with several recent non-Western studies that highlight a similar mediating impact of the concepts closely related to PC, resilience and hardiness (Ng & Lee, 2018; Zhao et al., 2018). Having studied a Canadian representative sample of older adults, my research contributes to the existing literature suggesting that global perceived controllability is likely to be a ubiquitous concept that significantly adds to our understanding of how loneliness affects emotional well-being of older adults in different countries.

Finally, this study is among the first that has assessed several psychological mediators of loneliness on self-assessed physical health. These analyses were conducted out of my scientific curiosity, having not been originally formulated in the hypotheses strictly derived from the research literature; nevertheless, the results of these supplementary analyses help make use of the study's obvious limitation of having the emotional health outcome, Depression, measured at the same time as the mediator, PC.

Given that the association between Loneliness and Depression ($r$ = .40) was found to be greater than the association between Loneliness and PC ($r$ = -.30), it might have been expected to find a stronger mediating effect of Depression compared with PC. In fact, this was true for RPH as the outcome variable. Readers may recall, however, that with regards to GSRH, no significant mediating effect of Depression emerged, and only PC was a significant mediator of the Loneliness–GSRH association.

What do these results suggest? Two conclusions come to mind. First, loneliness has a complicated mechanism of negative effects on older peoples' physical health. At least for the global measure of self-rated health, loneliness jeopardizes seniors' health both by exacerbating their depression and, more importantly, by eroding their sense of control. This is a novel finding

which is worth further investigation. But, to have obtained more than one simultaneous significant mediator between loneliness and health appears consistent with the loneliness model proposed by Cacioppo and Hawkley (2009, 2013). This model acknowledges comorbid effects of various mediators and places special focus on physiological and biological variables, some of which I have already mentioned: anti-inflammatory functioning, glucocorticoid resistance, and sleep. However, while the effects of a few psychological variables (e.g., attention biases, threat perception) are also considered (Cacioppo & Hawkley, 2009), it seems that PC has not yet received the attention it deserves. Thus, my study underscores the vital role of PC for the health of older adults. Supposedly, it also has the potential to spark interest in conducting mediation studies with several psychological variables so researchers and clinicians will gain better understanding of the relevant role of these variables.

Second, largely consistent with my previous observations, both the GSRH and RPH variables were, once again, found as two distinct forms of health assessment despite addressing the same underlying concept of physical self-rated health. Readers may recall the inference I made earlier about RPH reflecting a more "subjective" aspect of people's health in contrast to GSRH being a more "objective" measure. This inference can now be used to explain why both PC and Depression, as psychological variables, significantly contributed to the Loneliness–RPH linkage, whereas their contribution to the Loneliness–GSRH association was noticeably smaller. Indeed, the analyses showed that overall, PC, Depression, and Loneliness had a stronger association with the more "subjective" indicator of physical health, RPH, than with the more "objective" indicator, GSRH. But even so, PC still significantly mediated the effect of Loneliness on GSRH, which attests to its especially important contribution explaining the

association between these two variables. And this effect became evident even when another strong predictor of GSRH, Depression (Han, 2002), was included in the model.

This completes the discussion of the analyses that were conducted in this thesis. I now briefly outline a few most important strengths and limitations of the study.

**Strengths and Limitations**

There are three key strengths to this research. First, I used a reliable longitudinal dataset that contained a large pool of relevant and reliable psychosocial and health variables initially collected from a well-representative sample of community-dwelling older adults in the province of Manitoba, Canada. The use of this high-quality dataset is an undisputable advantage, which allowed me to make inferences about the temporal nature of the relationships between the most important variables in the study: the predictor variable of Loneliness, the mediator variable of PC, and the health outcome variables, specifically, the variables obtained two years later—the self-assessed physical health measures (i.e., GSRH and RPH). Notably, a considerable number of previous studies that have examined mediators of loneliness, including psychological mediators, were limited by using a cross-sectional design (e.g., Alpass & Neville, 2003; Andrew & Meeks, 2018, Segrin & Domschke, 2011; Yusoff et al., 2013). Consequently, the conclusions drawn from those studies are likely to be not as strong as the conclusions I am able to make from this research having had access to the data over a seven-year period.

Second, by using an incremental model building approach to analyzing the relationships between the study variables, I went far beyond examining the main research questions. The inclusion of a number of supplemental analyses, in fact, provided considerable breadth to this thesis. Overall, the way this study was conducted was much less rigid than most of other theses

or research papers. I view this way of presenting a scientific argument—using an incremental model building strategy—as an unusual and creative approach to exploring research questions.

Finally, the study included three health outcomes across which the partial mediating effect of PC on the loneliness–health association emerged. Thus, the study provided converging evidence for the posited mediation increasing one's confidence in the importance of PC as the partial mediator of loneliness. As well, some of the analyses replicated the results of other studies, which is timely given there have recently been increased calls for replication studies in social and behavioral sciences (e.g. Hantula, 2019).

As with all research, this study has a few limitations. First, the sample was constrained to older adults who reside in Manitoba, a relatively small prairie province in Canada. Consequently, the sample may not be generalizable to other populations in different regions of Canada or to older people in other countries.

Second, as mentioned previously, the variable of Depression, the health outcome, was assessed at the same time as PC, the mediator, was assessed. That confined my analysis of the Loneliness–Depression relationship to cross-sectional data, which did not rule out a possibility of reciprocal effects. If Depression was measured later in time, that would provide an opportunity to examine the true temporal relationship between Loneliness and Depression.

Nevertheless, as readers will remember, this apparent shortcoming of having PC and Depression both measured in 2001 was used as the platform for asking one of the supplementary research questions: What variable, PC or Depression, have a stronger mediating role for the relationship between loneliness and physical health? As the result of conducting these supplementary analyses, I was actually able to offer even more convincing evidence for the role PC plays in the loneliness–health relationship while also shedding some light on the difference

between PC and Depression as two simultaneous mediators. Related to this finding, my thesis appears to be among the first studies to consider several psychological mediators in a model examining the relationship between loneliness and health in older adults. The findings and the reasoning behind these findings remain preliminary of course; thus, more research is needed to either confirm or disproof them.

Finally, although the AIM and SAS databases that were used in this study contain a great number of demographic and psychosocial variables, no data on genetic and/or personalities differences between the people in the sample were available. Nevertheless, a recent meta-analysis by Buecker, Maes, Denissen, and Luhmann (2020) has suggested that the four “Big” personality traits, neuroticism, conscientiousness, extraversion, and agreeableness, have strong associations with loneliness. Further research is needed to consider personality traits and genetic differences in the relationships examined in this thesis.

## Epilogue

As the effectiveness of the majority of interventions aimed at reducing loneliness remains very weak (Fakoya, McCorry, & Donnelly, 2020; Gardiner, Geldenhuys, & Gott, 2018), researchers and program evaluators increasingly advocate for a tailored approach to addressing the problem (Fakoya, McCorry, & Donnelly, 2020). To deliver a tailored intervention to individuals or specific groups of individuals, we need to understand their psychology and emotional needs. Acquiring such knowledge—that is, knowledge of what psychological factors are associated with loneliness and its effects on health—lies in the foundation of creating successful interventions to overcome such disheartening, and unfortunately rather common, emotional experience, especially for people of the advanced age.

The accumulated scientific evidence convincingly points to the role of people's subjective perceptions affecting their lives. By and large, loneliness itself is a subjective evaluation of how well a person is embedded socially. But the lack of objectivity of this phenomenon must not make one skeptical about its importance. In fact, as it has been consistently argued in the relevant literature as well as in this thesis, loneliness is highly detrimental, especially for older persons, having "tangible" impacts on their health and well-being. Unfortunately, the importance of emotional experiences, and psychological factors in general, is not yet fully appreciated in the medical practice and is often overlooked by those working in the medical system.

However, it appears that if we can help older adults maintain a *subjective* perception of controllability, especially in the face of objective difficulties they experience, these people would be less likely to feel lonely. Feeling less lonely would then help seniors feel more in control thereby protecting them from experiencing health problems associated with loneliness.

Subsequently, to develop effective psychological tools fostering general sense of control in older adults becomes the endeavor which at the time of the unprecedented COVID-19 crisis in the Spring and Summer 2020, and the associated shutdown of the economy and the imposed social distancing rules, gains its exceptional relevance with each passing day. If not addressed urgently, loneliness, considered alongside the present pandemic, may very likely, in fact, become a true epidemic.

References

Adam, E. K., Hawkley, L. C., Kudielka, B. M., & Cacioppo, J. T. (2006). Day-to-day dynamics of experience–cortisol associations in a population-based sample of older adults. *Proceedings of the National Academy of Sciences of the USA, 103*(45), 17058–17063. doi:10.1073/pnas.0605053103

Alpass, F. M., & Neville, S. (2003). Loneliness, health and depression in older males. *Aging and Mental Health*. doi:10.1080/1360786031000101193

Anderson, C. A., & Riger, A. L. (1991). A controllability attribution model of problems in living: Dimensional and situational interactions in the prediction of depression and loneliness. *Social Cognition, 9*, 149–181.

Andrew, N., & Meeks, S. (2018). Fulfilled preferences, perceived control, life satisfaction, and loneliness in elderly long-term care residents. *Aging and Mental Health*, *22*(2), 183–189. doi:10.1080/13607863.2016.1244804

Andrews, J. A., Brown, L. J., Hawley, M. S., & Astell, A. J. (2019). Older adults' perspectives on using digital technology to maintain good mental health: Interactive group study. *Journal of Medical Internet Research*, *21*(2), e11694. doi:10.2196/11694

Bailis, D. S., Segall, A., Mahon, M. J., Chipperfield, J. G., & Dunn, E. M. (2001). Perceived control in relation to socioeconomic and behavioral resources for health. *Social Science and Medicine, 52*(11), 1661–1676. doi:10.1016/S0277-9536(00)00280-X

Baltes, P. B., & Baltes, M. M. (Eds.). (1990). *Successful aging: Perspectives from the behavioral sciences.* New York, NY, US: Cambridge University Press. doi:10.1017/CBO9780511665684

Barlow, J., Turner, A., & Wright, C. (1998). Sharing, caring and learning to take control: Self-management training for people with arthritis. *Psychology, Health & Medicine, 3*(4), 387–393.

Baron, R.M., & Kenny, D.A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173–1182.

Baron-Epel, O., & Kaplan, G. (2001). General subjective health status or age-related subjective health status: Does it make a difference? *Social Science & Medicine*, *53*(10), 1373–1381. doi:10.1016/S0277-9536(00)00426-3

Beaudet, M.P. (1996). Depression. *Health Reports, 7*(4), 11–24.

Benyamini, Y., & Idler, H. (1999): Community studies reporting association between self-rated health and mortality—additional studies 1995 to 1998. *Research on Aging, 21*, 392.

Bergman, Y., & Segel-Karpas, D. (2018). Future time perspective, loneliness, and depressive symptoms among middle-aged adults: A mediation model. *Journal of Affective Disorders, 241*, 173–175. doi:10.1016/j.jad.2018.08.019

Bjorner, J. B., & Kristensen, T. A. (1999). Multi-item scales for measuring global self-rated health. *Research on Aging, 2*(1), 417–439.

Blazer, D., Burchett, B., Service, C., & George, L. K. (1991). The association of age and depression among the elderly: An epidemiologic exploration. *Journal of Gerontology: Medical Sciences, 46*, M210–M215. doi:10.1093/geronj/46.6.M210

Bombak, A. E. (2013). Self-rated health and public health: A critical perspective. *Frontiers in Public Health, 1*(15), 1–4. doi:10.3389/fpubh.2013.00015

Bollen, K. A., & Stine, R. (1990). Direct and indirect effects: Classical and bootstrap estimates of variability. *Sociological Methodology, 20,* 115–140.

Brown, D. S., Thompson, W. W., Zack, M. M., Arnold, S. E., & Barile, J. P. (2015). Associations between health-related quality of life and mortality in older adults. *Prevention science: The official journal of the Society for Prevention Research, 16*(1), 21–30. doi:10.1007/s11121-013-0437-z

Buecker, S., Maes, M., Denissen, J. J. A., & Luhmann, M. (2020). Loneliness and the Big Five personality traits: A meta-analysis. *European Journal of Personality,* 34(1). doi:10.1002/per.2229

Cacioppo, J. T., Cacioppo, S., Capitanio, J. P., & Cole, S. W. (2015). The neuroendocrinology of social isolation. *Annual Review of Psychology, 66,* 733–767. doi:10.1146/annurev-psych-010814-015240

Cacioppo, J. T., & Hawkley, L. C. (2009). Perceived social isolation and cognition. *Trends in Cognitive Sciences, 13*(10), 447–454. doi:10.1016/j.tics.2009.06.005

Cacioppo, J. T., & Hawkley, L. C. (2013). Perceived isolation. In D. Cervone, M. W. Eysenck, M. Fajkowska, & T. Marszewski (Eds.), *Personality dynamics: Meaning construction, the social world, and the embodied mind. Warsaw Lectures in Personality and Social Psychology, Vol. 3* (pp. 91-106). Clinton Corners, NY: Eliot Werner Publications.

Cacioppo, J., Hawkley, L., Berntson, G., Ernst, J., Gibbs, A., Stickgold, R., & Hobson, J. (2002). Do lonely days invade the nights? Potential social modulation of sleep efficiency. *Psychological Science, 13*(4), 384–387. doi:10.1111/1467-9280.00469

Cacioppo, T., Hawkley, C., Crawford, E., Ernst, M., Burleson, H., Kowalewski, B., … Berntson, G. (2002). Loneliness and health: Potential mechanisms. *Psychosomatic Medicine, 64*(3), 407–417.

Cacioppo, J. T., Hawkley, L. C., Ernst, J. M., Burleson, M., Berntson, G. G., Nouriani, B., & Spiegel, D. (2006). Loneliness within a nomological net: An evolutionary perspective. *Journal of Research in Personality, 40*, 1054–1085. doi:10.1016/j.jrp.2005.11.007

Cacioppo, J., Hawkley, L., & Thisted, R. (2010). Perceived social isolation makes me sad: 5-Year cross-lagged analyses of loneliness and depressive symptomatology in the Chicago Health, Aging, and Social Relations Study. *Psychology and Aging, 25*(2), 453–463. doi:10.1037/a0017216

Cacioppo, J. T., Hughes, M. E., Waite, L. J., Hawkley, L. C., & Thisted, R. A. (2006). Loneliness as a specific risk factor for depressive symptoms: Cross-sectional and longitudinal analyses. *Psychology and Aging, 21*, 140–151. doi:10.1037/0882-7974.21.1.140

Callahan, C., Hui, S., Nienaber, N., Musick, B., & Tierney, W. (1994). Longitudinal study of depression and health services use among elderly primary care patients. *Journal of the American Geriatrics Society, 42*(8), 833–838. doi:10.1111/j.1532-5415.1994.tb06554.x

Cattan, M., White, M., Bond, J., & Learmouth, A. (2005). Preventing social isolation and loneliness among older people: A systematic review of health promotion interventions. *Ageing & Society, 25*(1), 41–67. doi:10.1017/S0144686X04002594

Carleton, R. N., Thibodeau, M. A., Teale, M. J. N., Welch, P.G., Abrams, M. P., Robinson, T., & Asmundson, G. J. G. (2013). The Center for Epidemiologic Studies Depression Scale: A

review with a theoretical and empirical examination of item content and factor structure. *PLOS ONE, 8*(3), e58067. doi:10.1371/journal.pone.0058067

Carlson, E. B., Smith, S. R., Palmieri, P. A., Dalenberg, C., Ruzek, J. I., Kimerling, R., Burling, T. A., & Spain, D. A. (2011). Development and validation of a brief self-report measure of trauma exposure: The Trauma History Screen. *Psychological assessment, 23*(2), 463–477. doi:10.1037/a0022294

Chen, Y., Holahan, C., & Li, X. (2018). Loneliness, physical activity, and self-rated health in middle-aged and older adults. *Innovation in Aging, 2*(Suppl 1), 967. doi:10.1093/geroni/igy031.3582

Chipperfield, J. G. (1993). Perceived barriers in coping with health problems. *Journal of Aging and Health, 5*(1), 123–139. doi:10.1177/089826439300500106

Chipperfield, J. G., Campbell, D. W., & Perry, R. P. (2004). Stability in perceived control: Implications for health among very old community-dwelling adults. *Journal of Aging and Health, 16*(1), 116–147. doi:10.1177/0898264303260447

Chipperfield, J. G., Hamm, J. M., Perry, R. P., & Ruthig, J. C. (2017). Perspectives on studying perceived control in the twenty-first century. In M. D. Robinson & M. Eid (Eds.), *The happy mind: Cognitive contributions to well-being* (pp. 215–233). New York, NY: Springer. doi:10.1007/978-3-319-58763-9_12

Chipperfield, J. G., Havens, B., & Doig, W. D. (1997). Methods and description of the Aging in Manitoba Project: A 20-year longitudinal study. *Canadian Journal on Aging, 16*(4), 606–625. doi:10.1017/S0714980800010990

Chipperfield, J. G., Newall, N. E., Perry, R. P., Bailis, D. S., Stewart, T. L., & Ruthig, J. C. (2012). Sense of control in late life: Health and survival implications. *Personality and Social Psychology Bulletin, 38*, 1081–1092. doi:10.1177/0146167212444758

Chipps, J., Jarvis, M., & Ramlall, S. (2017). The effectiveness of e-Interventions on reducing social isolation in older persons: A systematic review of systematic reviews. *Journal of Telemedicine and Telecare, 23*(10), 817–827. doi:10.1177/1357633X17733773

Cislaghi, B., & Cislaghi, C. (2019). Self-rated health as a valid indicator for health-equity analyses: Evidence from the Italian health interview survey. *BMC Public Health, 19*(1), 1–13. doi:10.1186/s12889-019-6839-5

Cohen-Mansfield, J., & Parpura-Gill, A. (2007). Loneliness in older persons: A theoretical model and empirical findings. *International Psychogeriatrics, 19*, 279–294. doi:10.1017/S1041610206004200

Cohen-Mansfield, J., Shmotkin, D., Blumstein, Z., Shorek, A., Eyal, N., & Hazan, H. (2013). The old, old-old, and the oldest old: Continuation or distinct categories? An examination of the relationship between age and changes in health, function, and wellbeing. *International Journal of Aging & Human Development, 77*, 37–57.

Cole, S. W. (2008). Social regulation of leukocyte homeostasis: The role of glucocorticoid sensitivity. *Brain, Behavior, & Immunity, 22*, 1049–1055. doi:10.1016/j.bbi.2008.02.006

Cole, S. W., Hawkley, L. C., Arevalo, J. M., Sung, C. Y., Rose, R. M., & Cacioppo, J. T. (2007). Social regulation of gene expression in human leukocytes. *Genome Biology*, *8*(9), R189. doi:10.1186/gb-2007-8-9-r189

Conger, A. J. (1974). A revised definition for suppressor variables: A guide to their identification and interpretation. *Educational Psychological Measurement, 34*, 35–46.

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology, 78*(1), 98–104.

Coşan, D. (2014). An evaluation of loneliness. *The European Proceedings of Social & Behavioural Sciences, 103–110*. doi:10.15405/epsbs.2014.05.13

Cosco, T. D., Prina, M., Stubbs, B., & Wu, Y. T. (2017). Reliability and validity of the Center for Epidemiologic Studies Depression Scale in a population-based cohort of middle-aged US adults. *Journal of Nursing Measurement, 25*(3), 476–485. doi:10.1891/1061-3749.25.3.476

Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation, 10*, 1–9.

Coyne, R., & Kluwer, W. (2019). The Lawton Instrumental Activities of Daily Living (IADL) Scale. *Try This: Best Practices in Nursing Care to Older Adults, 23*. Retrieved from https://consultgeri.org/try-this/general-assessment/issue-23.pdf

Cramer, K. M., & Barry, J. E. (1999). Conceptualizations and measures of loneliness: A comparison of subscales. *Personality and Individual Differences, 27*(3), 491–502. doi:10.1016/S0191-8869(98)00257-8

De Jong Gierveld, J., & Havens, B. (2004). Cross-national comparisons of social isolation and loneliness: Introduction and overview. *Canadian Journal on Aging/ La Revue canadienne du vieillissement*, *23*(2), 109–113. doi:10.1353/cja.2004.0021

De Jong Gierveld, J., & Van Tilburg, T. (1999). *Manual of the loneliness scale.* Amsterdam, the Netherlands: Vrije Universiteit. Retrieved from http://home.fsw.vu.nl/tg.van.tilburg/manual_loneliness_scale_1999.html

DeNiro, D. A. (1995). Perceived alienation in individuals with residual-type schizophrenia. *Issues in Mental Health Nursing, 16,* 185–200.

DeSalvo, K. B., Fan, V. S., McDonell, M. B., & Fihn, S. D. (2005). Predicting mortality and healthcare utilization with a single question. *Health Services Research, 40*(4), 1234–1246. doi:10.1111/j.1475-6773.2005.00404.x

DeSalvo, K. B., Jones, M., Peabody, J., McDonald, J., Fihn, S., Fan, V., He, J., & Muntner, P. (2009). Health care expenditure prediction with a single item, self-rated health measure. *Medical Care, 47*(4), 440–447. doi:10.1097/MLR.0b013e318190b716

Djernes, J. K. (2006). Prevalence and predictors of depression in populations of elderly: A review. *Acta Psychiatrica Scandinavica, 113,* 372–387. doi:10.1111/j.1600-0447.2006.00770.x

Dulin, P., Hanson, B., & King, D. (2013). Perceived control as a longitudinal moderator of late-life stressors on depressive symptoms. *Aging & Mental Health, 17*(6), 718–723. doi:10.1080/13607863.2013.784956

Dykstra, P. A., Van Tilburg, T. G., & Gierveld, J. D. J. (2005). Changes in older adult loneliness: Results from a seven-year longitudinal study. *Research on Aging, 27*(6), 725–747. doi:10.1177/0164027505279712

Edwards, M. M. (1990). The reliability and validity of self-report Activities of Daily Living Scales. *Canadian Journal of Occupational Therapy, 57*(5), 273–278.

Ermer, A. E., & Proulx, C. M. (2016). Unforgiveness, depression, and health in later life: The protective factor of forgivingness. *Aging & Mental Health, 20*(10), 1021–1034. doi:10.1080/13607863.2015.1060942

Ernst, J. M., & Cacioppo, J. T. (1998). *Lonely hearts: psychological perspectives.* USA: Cambridge University Press.

Fakoya, O. A., McCorry, N. K., & Donnelly, M. (2020). Loneliness and social isolation interventions for older adults: A scoping review of reviews. *BMC Public Health 20*, 129. doi:10.1186/s12889-020-8251-6

Ferraro, K. F., & Wilkinson, L. R. (2015). Alternative measures of self-rated health for predicting mortality among older people: Is past or future orientation more important? *Gerontologist, 55*(5), 836–844. doi:10.1093/geront/gnt098

Fry, P. S., & Debats, D. L. (2002). Self-efficacy beliefs as predictors of loneliness and psychological distress in older adults. *International Journal of Aging and Human Development, 55*, 233–269.

Fylkesnes, K. (1993). Determinants of health care utilization, visits and referrals. *Scandinavian Journal of Social Medicine, 21*, 40–50.

Gallagher, R., & Mckinley, S. (2009). Anxiety, depression and perceived control in patients having coronary artery bypass grafts. *Journal of Advanced Nursing*, *65*(11), 2386–2396. doi:10.1111/j.1365-2648.2009.05101.x

Gardiner, C., Geldenhuys, G., & Gott, M. (2018). Interventions to reduce social isolation and loneliness among older people: An integrative review. *Health & Social Care in the Community, 26*(2), 147–157. doi:10.1111/hsc.12367

Girgus, J. S., Yang, K., & Ferri, C. V. (2017). The gender difference in depression: Are elderly women at greater risk for depression than elderly men? *Geriatrics, 2*(4), 35. doi:10.3390/geriatrics2040035

Golden, J., Conroy, R. M., Bruce, I., Denihan, A., Greene, E., Kirby, M., & Lawlor, B. A. (2009). Loneliness, social support networks, mood and wellbeing in community-dwelling elderly. *International Journal of Geriatric Psychiatry, 24*(7), 694–700. doi:10.1002/gps.2181

Gow, A. J., Pattie, A., Whiteman, M. C., Whalley, L. J., & Deary, I. J. (2007). Social support and successful aging: Investigating the relationships between lifetime cognitive change and life satisfaction. *Journal of Individual Differences, 28*(3), 103–115. doi:10.1027/1614-0001.28.3.103

Gravetter, F., & Wallnau, L. (2014). *Essentials of statistics for the behavioral sciences* (8th ed.). Belmont, CA: Wadsworth.

Griffiths, P., Ullman, R., & Harris, R. (2005). *Self-assessment of health and social care needs by older people: A multi-methods systematic review of practices, accuracy, effectiveness and experience.* London, England: NCCSDO.

Hall, N. C., Chipperfield, J. G., Heckhausen, J., & Perry, R. P. (2010). Control striving in older adults with serious health problems: A 9-year longitudinal study of survival, health, and well-being. *Psychology and Aging*, *25*(2), 432–445. doi:10.1037/a0019278

Hamm, J., Perry, R., Chipperfield, J., Hladkyj, S., Parker, P., & Weiner, B. (2020). Reframing achievement setbacks: A motivation intervention to improve eight-year graduation rates for students in STEM fields. *Psychological Science*.

Han, B. (2002). Depressive symptoms and self-rated health in community-dwelling older adults: A longitudinal study. *Journal of the American Geriatrics Society, 50,* 1549–1556. doi:10.1046/j.1532-5415.2002.50411.x

Hantula, D.A. (2019). Editorial: Replication and reliability in behavior science and behavior analysis: A call for a conversation. *Perspectives on Behavior Science, 42*, 1–11. doi:10.1007/s40614-019-00194-2

Hawkley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine, 40*(2), 218–227. doi:10.1007/s12160-010-9210-8.

Hawkley, L. C., Bosch, J. A., Engeland, C. G., Marucha, P. T., & Cacioppo, J. T. (2007). Loneliness, dysphoria, stress, and immunity: A role for cytokines. In N. P. Plotnikoff (Ed.), *Cytokines: Stress and immunity* (pp. 67–85). Boca Raton, Florida: CRC Press.

Hawkley, L. C., Masi, C. M., Berry, J. D., & Cacioppo, J. T. (2006). Loneliness is a unique predictor of age-related differences in systolic blood pressure. *Psychology and Aging, 21*, 152–164. doi:10.1037/0882-7974.21.1.152

Heckhausen, J., Wrosch, C., & Schulz, R. (2010). A motivational theory of life-span development. *Psychological Review, 117*(1), 32–60. doi:10.1037/a0017668

Heidrich, J., Liese, A., Löwel, H., & Keil, U. (2002). Self-rated health and its relation to all-cause and cardiovascular mortality in Southern Germany. Results from the MONICA Augsburg cohort study 1984–1995. *Annals of Epidemiology, 12*(5), 338–345. doi:10.1016/S1047-2797(01)00300-3

Heistaro, S., Jousilahti, P., Lahelma, E., Vartiainen, E., & Puska, P. M. (2001): Self-rated health and mortality: A long-term prospective study in Eastern Finland. *Journal of Epidemiology & Community Health, 55*, 227.

Helvik, A., Corazzini, K., Selbk, G., Bjorklof, G. H., Laks, J., Benth, J. S., Ostbye, T., & Engedal, K. (2016). Health-related quality of life in older depressed psychogeriatric patients: One year follow-up. *BMC Geriatrics, 16*, 1–9. doi:10.1186/s12877-016-0310-6

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine, 7*, e1000316. doi:10.1371/journal.pmed.1000316

Houtjes, W., Meijel, B., Ven, P. M., Deeg, D., Tilburg, T., & Beekman, A. (2014). The impact of an unfavorable depression course on network size and loneliness in older people: A longitudinal study in the community. *International Journal of Geriatric Psychiatry, 29*(10), 1010–1017. doi:10.1002/gps.4091

Howe, N. (2019, May). Millennials and the loneliness epidemic. *Forbes*. Retrieved from https://www.forbes.com/sites/neilhowe/2019/05/03/millennials-and-the-loneliness-epidemic/#1ea1f5e77676

Huang, H., Zhang, S., Chen, X., Sun, S., Fang, Y., & Guo, Y. (2017). Loneliness and its risk factors among 597 retired elderly in Shenzhen city. *Chinese Journal of Convalescent Medicine, 26*, 1003–1006. doi:10.13517/j.cnki.ccm.2017.09.049

Hubbard, R. (2016). *Corrupt research: The case of reconceptualizing empirical management and social science*. Thousand Oaks, CA: Sage.

Idler, E. L., & Benyamini, Y. (1997). Self-rated health and mortality: A review of twenty-seven community studies. *Journal of Health and Social Behavior, 38*, 21.

Idler, E. L, & Kasl, S. V. (1991). Health perceptions and survival: Do global evaluations of health status really predict mortality? *Journal of Gerontology, 46*(2), S55–65.

Idler, E. I., Russell, L. B. & Davis, D. (2000). Survival, functional limitations, and self-rated health in the NHANES I Epidemiologic Follow-up Study, 1992. *American Journal of Epidemiology, 152*(9), 874–883. doi:10.1093/aje/152.9.874

Irwin, M., Artin, K. H., & Oxman, M. N. (1999). Screening for depression in the older adult: Criterion validity of the 10-item Center for Epidemiological Studies Depression Scale (CES-D). *Archives of Internal Medicine, 159*(15), 1701–1704. doi:10.1001/archinte.159.15.1701

Jaremka, L. M., Fagundes, C. P., Glaser, R., Bennett, J. M., Malarkey, W. B., & Kiecolt-Glaser, J. K. (2013). Loneliness predicts pain, depression, and fatigue: Understanding the role of immune dysregulation. *Psychoneuroendocrinology, 38*(8), 1310–1317.

Jaya, E. S., Hillmann, T. E., Reininger, K. M., Gollwitzer, A., & Lincoln, T. M. (2017). Loneliness and psychotic symptoms: The mediating role of depression. *Cognitive Therapy and Research, 41*(1), 106–116. doi:10.1007/s10608-016-9799-4

Kline, R. B. (2011). *Methodology in the Social Sciences. Principles and practice of structural equation modeling* (3rd ed.). New York, NY: Guilford Press.

Kohout, F. J., Berkman, L. F., Evans, D. A., & Cornoni-Huntley, J. (1993). Two shorter forms of the CES-D Depression symptoms index. *Journal of Aging and Health, 5*(2), 179–193. doi:10.1177/089826439300500202

Kramer, S. E., Kapteyn, T. S., Kuik, D. J., & Deeg, D. J. H. (2002). The association of hearing impairment and chronic diseases with psychosocial health status in older age. *Journal of Aging and Health, 14*, 122–137. doi:10.1177/089826430201400107

Latham-Mintus, K., Vowels, A., & Huskins, K. (2018). Healthy aging among older Black and White men: What is the role of mastery? *Journals of Gerontology: Series B Psychological Sciences and Social Sciences, 73*(2), 248–257. doi:10.1093/geronb/gbx105

Lauder, W., Mummery, K., Jones, M., & Caperchione, C. (2006). A comparison of health behaviors in lonely and non-lonely populations. *Psychology, Health, & Medicine, 11*, 233–245. doi:10.1080/13548500500266607

Lawton, M. P., & Brody, E. M. (1969). Assessment of older people: Self-maintaining and instrumental activities of daily living. *The Gerontologist, 9*(3), 179–186.

Linacre, J.M. (2008). The expected value of a point-biserial (or similar) correlation. *Rasch Measurement Transactions, 22*(1), 1154.

Loneliness: A new public health challenge emerges. (n.d.). Retrieved from https://www.vichealth.vic.gov.au/letter/articles/vh-letter-47-loneliness

Luhmann, M., & Hawkley, L. C. (2016). Age differences in loneliness from late adolescence to oldest old. *Developmental Psychology, 52*(6), 943–959. doi:10.1037/dev0000117.supp

Luo, Y., Hawkley, L. C., Waite, L. J., & Cacioppo, J. T. (2012). Loneliness, health, and mortality in old age: A national longitudinal study. *Society of Science Medicine, 74*(6), 907–914. doi:10.1016/j.socscimed.2011.11.028

Luppa, M., Sikorski, C., Luck, T., Weyerer, S., Villringer, A., König, H.-H., & Riedel-Heller, S. G. (2012). Prevalence and risk factors of depressive symptoms in latest life—Results of the Leipzig Longitudinal Study of the Aged (LEILA 75+). *International Journal of Geriatric Psychiatry, 27*, 286–295. doi:10.1093/ geronj/46.6.M210

Maciejewski, P., Prigerson, H., & Mazure, C. (2000). Self-efficacy as a mediator between stressful life events and depressive symptoms: Differences based on history of prior depression. *British Journal of Psychiatry, 176*(4), 373–378. doi:10.1192/bjp.176.4.373

Maruyama, G. (1998). *Basics of structural equation modeling*. Thousand Oaks, California: Sage Publications.

McHugh Power, J., Tang, J., Kenny, R. A., Lawlor, B. A., & Kee, F. (2019). Mediating the relationship between loneliness and cognitive function: The role of depressive and anxiety symptoms. *Aging and Mental Health,* 1–8. doi:10.1080/13607863.2019.1599816

Menec, V. H., & Chipperfield, J. G. (1997a). Remaining active in later life: The role of locus of control in seniors' leisure activity participation, health, and life satisfaction. *Journal of Aging and Health, 9*(1), 105–125. doi:10.1177/089826439700900106

Menec, V. H., & Chipperfield, J. G. (1997b). The interactive effects of perceived control and functional status on health and mortality among the young-old and the old-old. *Journals of Gerontology, Series B: Psychological Sciences, 52B*(3), 118–126.

Mohebbi, M., Nguyen, V., McNeil, J. J., Woods, R. L., Nelson, M. R., Shah, R. C., … ASPREE Investigator Group. (2018). Psychometric properties of a short form of the Center for Epidemiologic Studies Depression (CES-D-10) scale for screening depressive symptoms in healthy community dwelling older adults. *General hospital psychiatry, 51*, 118–125. doi:10.1016/j.genhosppsych.2017.08.002

Mossey, J. M., & Shapiro, E. (1982). Self-rated health: A predictor of mortality among the elderly. *American Journal of Public Health, 72*(8), 800–8.

Moore, D., & Schulz, N. R. (1987). Loneliness among the elderly: The role of perceived responsibility and control. *Journal of Social Behavior and Personality, 2*, 215–224.

Msetfi, R., Brosnan, L., & Cavus, H. (2016). Enhanced attention to context: An intervention which increases perceived control in mild depression. *The Quarterly Journal of Experimental Psychology, 69*(6), 1–42. doi:10.1080/17470218.2016.1138134

Mullins, L., Elston, C., & Gutkowski, S. (1996). Social determinants of loneliness among older Americans. *Genetic, Social, and General Psychology Monographs, 122*(4), 453–473.

Newall, N. E. G., Chipperfield, J. G., & Bailis, D. S. (2013). Predicting stability and change in loneliness in later life. *Journal of Social and Personal Relationships, 31*(3), 335–351. doi:10.1177/0265407513494951

Newall, N. E. G., Chipperfield, J. G., Bailis, D. S., & Stewart, T. L. (2013). Consequences of loneliness on physical activity and mortality in older adults and the power of positive emotions. *Health Psychology, 32*(8), 921–924. doi:10.1037/a0029413

Newall, N. E. G., Chipperfield, J. G., Clifton, R. A., Perry, R. P., Swift, A., & Ruthig, J. C. (2009). Causal beliefs, social participation, and loneliness among older adults: A longitudinal study. *Journal of Social and Personal Relationships, 26*, 273–290. doi:10.1177/0265407509106718

Ng, S. M., & Lee, T. M. C. (2019). The mediating role of hardiness in the relationship between perceived loneliness and depressive symptoms among older. *Aging & Mental Health*, 1–6. doi:10.1080/13607863.2018.1550629

Nicolaisen, M., Moum, T., & Thorsen, K. (2018). Mastery and depressive symptoms: How does mastery influence the impact of stressors from middle life to old age? *Journal of Aging and Health, 30*(7), 1084–1107. doi:10.1177/0898264317705782

Nicolaisen, M., & Thorsen, K. (2012). Impairments, mastery, and loneliness. A prospective study of loneliness among older adults. *Norsk Epidemiologi, 22*(2). doi:10.5324/nje.v22i2.1560

Nummela, O., Seppänen, M., & Uutela, A. (2011). The effect of loneliness and change in loneliness on self-rated health (SRH): A longitudinal study among aging people. *Archives of Gerontology and Geriatrics, 53*(2), 163–167. doi:10.1016/j.archger.2010.10.023

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York, NY: McGraw-Hill, Inc.

Okura, Y., Urban, L. H., Mahoney, D. W., Jacobsen, S. J., & Rodeheffer, R. J. (2004). Agreement between self-report questionnaires and medical record data was substantial for diabetes, hypertension, myocardial infarction and stroke but not for heart failure. *Journal of Clinical Epidemiology, 57*(10), 1096–1103. doi:10.1016/j.jclinepi.2004.04.005

Overholser, J. C. (1992). Sense of humor when coping with life stress. *Personality and Individual Differences, 13*, 799–804.

Patterson, A. C., & Veenstra, G. (2010). Loneliness and risk of mortality: A longitudinal investigation in Alameda county, California. *Social Science & Medicine, 71*(1), 181e186.

Penning, M. J., Liu, G., & Chou, P. H. B. (2014). Measuring loneliness among middle-aged and older adults: The UCLA and de Jong Gierveld Loneliness scales. *Social Indicators Research, 118*, 1147–1166. doi:10.1007/s11205-013-0461-1

Peplau, L., Russell, D., & Heim, M. (1979). The experience of loneliness. In I. H. Frieze, D. Bar-Tal, & J. S. Carroll (Eds.), *New approaches to social problems: Applications of attribution theory* (pp. 53–78). San Francisco: Jossey–Bass.

Pearlin, L. I., & Schooler, C. (1978). The structure of coping. *Journal of Health and Social Behavior, 19,* 2–21.

Perlman, D., & Peplau, L. A. (1981). Toward a social psychology of loneliness. *Personal Relationships, 3,* 31–56.

Perissinotto, C., Stijacic Cenzer, I., & Covinsky, K. (2012). Loneliness in older persons: A predictor of functional decline and death. *Archives of Internal Medicine, 172*(14), 1078–1084. doi:10.1001/archinternmed.2012.1993

Pinquart, M. (2001). Correlates of subjective health in older adults: A meta-analysis. *Psychology and Aging,16*(3), 414–426. doi:10.1037/0882-7974.16.3.414

Pressman, S. D., & Cohen, S. (2005). Does positive affect influence health? *Psychological Bulletin, 131*(6), 925–971. doi:10.1037/0033-2909.131.6.925

Prieto-Flores, M. E., Forjaz, M. J., Fernandez-Mayoralas, G., Rojo-Perez, F., & Martinez-Martin, P. (2011). Factors associated with loneliness of noninstitutionalized and institutionalized older adults. *Journal of Aging and Health, 23*(1), 177–194. doi:10.1177/0898264310382658

Prince, M. J., Harwood, R. H., Blizard, R. A., & Thomas, A. (1997). Social support deficits, loneliness and life events as risk factors for depression in old age: The Gospel Oak Project VI. *Psychological Medicine, 27,* 323–332.

Psych Congress keynote: Sharing our inner lives in public spaces can bring people together. (2019, October). *Healio Psychiatry.* Retrieved from https://www.healio.com/psychiatry/practice-management/news/online/%7Bf479a25c-2b26-4b43-b56b-c9fa71ce12cb%7D/psych-congress-keynote-sharing-our-inner-lives-in-public-spaces-can-bring-people-together

Qualter, P., Vanhalst, J., Harris, R., Van Roekel, E., Lodder, G., Bangee, M.,... Verhagen, M. (2015). Loneliness across the life span. *Perspectives on Psychological Science, 10*, 250–264. doi:10.1177/ 1745691615568999

Radloff, L. S. (1977). CES-D scale: A self-report depression scale for research in the general populations. *Applied Psychological Measurement, 1*, 385–401.

Richman, N. E., & Sokolove, R. L. (1992). The experience of aloneness, object representation, and evocative memory in borderline and neurotic patients. *Psychoanalytic Psychology, 9*, 77–91.

Robinson, J. R., Young, T. K., Roos, L. L., & Gelskey, D. E. (1997). Estimating the burden of disease: Comparing administrative data and self-reports. *Medical Care, 35*(9), 932–947. doi:10.1097/00005650-199709000-00006

Rothermund, K., & Brandstädter, J. (2003). Depression in later life: Cross-sequential patterns and possible determinants. *Psychology and Aging, 18*, 80–90.

Ruthig, J. C., & Chipperfield, J. G. (2007). Health incongruence in later life: Implications for subsequent well-being and health care. *Health Psychology*, *26*(6), 753–761. doi:10.1037/0278-6133.26.6.753

Ruthig, J. C., Chipperfield, J. G., Newall, N. E., Perry, R. P., & Hall, N. C. (2007). Detrimental effects of falling on health and well-being in later life: The mediating roles of perceived control and optimism. *Journal of Health Psychology, 12*(2), 231–248. doi:10.1177/1359105307074250

Ruthig, J. C., Chipperfield, J. G., & Payne, B. J. (2011). A five-year study of older adults' health incongruence: Consistency, functional changes and subsequent survival. *Psychology and Health*, *26*(11), 1463–1478. doi:10.1080/08870446.2010.515307

Ruthig, J. C., Chipperfield, J. G., Perry, R. P., Newall, N. E., & Swift, A. (2007). Comparative risk and perceived control: Implications for health and well-being among older adults. *Journal of Social Psychology, 147*(4), 345–369. doi:10.3200/SOCP.147.4.345-369

Russell, D. W. (1982). The measurement of loneliness. In L. A. Peplau & D. Perlman (Eds.), *Loneliness: A sourcebook of current theory, research, and therapy* (pp. 81–104). New York: Wiley.

Russell, D. (2009). Living arrangements, social integration, and loneliness in later life: The case of physical disability. *Journal of Health and Social Behavior, 50*(4), 460–475. Retrieved from http://www.jstor.org/stable/20617655

Russell, D. W., Cutrona, C. E., de la Mora, A., & Wallace, R. B. (1997) Loneliness and nursing home admission among rural older adults. *Psychology and Aging, 12*, 574–589. doi:10.1037/0882-7974.12.4.574

Russell, D. W., Peplau, L. A., & Ferguson, M. L. (1978). Developing a measure of loneliness. *Journal of Personality Assessment, 42*, 290–294.

Sarkisian, C., Prohaska, T., Davis, C., & Weiner, B. (2007). Pilot test of an attribution retraining intervention to raise walking levels in sedentary older adults. *Journal of the American Geriatrics Society, 55*(11), 1842–1846. doi:10.1111/j.1532-5415.2007.01427.x

Savikko, N., Routasalo, P., Tilvis, R., Strandberg, T., & Pitkälä, K. (2005). Predictors and subjective causes of loneliness in an aged population. *Archives of Gerontology and Geriatrics, 41*(3), 223–233. doi:10.1016/j.archger.2005.03.002

Schoenmakers, E. C., Van Tilburg, T. G., & Fokkema, T. (2012). Coping with loneliness: What do older adults suggest? *Aging & Mental Health, 16*, 353–360. doi:10.1080/13607863.2011.630373

Schroevers, M. J., Sanderman, R., Van Sonderen, E., & Ranchor, A. V. (2000). The evaluation of the Center for Epidemiologic Studies Depression (CES-D) scale: Depressed and positive affect in cancer patients and healthy reference subjects. *Quality of Life Research, 9*(9), 1015–1029. doi:10.1023/A:1016673003237

Seeman, T., Lusignolo, T., Albert, M., Berkman, L., & Stone, A. (2001). Social relationships, social support, and patterns of cognitive aging in healthy, high-functioning older adults: MacArthur studies of successful aging. *Health Psychology, 20*(4), 243–255. doi:10.1037/0278-6133.20.4.243

Segrin, C. (1998). Interpersonal communication problems associated with depression and loneliness. In P. A. Andersen & L. A. Guerrero (Eds.), *Handbook of communication and emotion: Research, theory, applications, and contexts* (pp. 215–242). San Diego, CA: Academic Press.

Segrin, C., & Domschke, T. (2011). Social support, loneliness, recuperative processes, and their direct and indirect effects on health. *Health Communication,* 26, 221–232. doi:10.1080/10410236.2010.546771

Shankar, A., McMunn, A., Banks, J., & Steptoe, A. (2011). Loneliness, social isolation, and behavioral and biological health indicators in older adults. *Health Psychology, 30,* 377–385. doi:10.1037/a0022826

Shiovitz-Ezra, S., & Ayalon, L. (2010). Situational versus chronic loneliness as risk factors for all-cause mortality. *International Psychogeriatrics*, *22*, 455–462. doi:10.1017/S1041610209991426

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods, 7*, 422–445.

Siriwardhana, D. D., Walters, K., Rait, G., Bazo-Alvarez, J. C., & Weerasinghe, M. C. (2018). Cross-cultural adaptation and psychometric evaluation of the Sinhala version of Lawton Instrumental Activities of Daily Living Scale. *PLoS ONE, 13*(6), e0199820.

Smith, J., & Baltes, P. B. (1996). Altern aus psychologischer perspektive: Trends und profile im hohen alter [Aging from a psychological perspective: Trends and profiles in old age]. In K. U. Mayer & P. B. Baltes (Eds.), *Die Berliner altersstudie* (pp. 221–250). Berlin, Germany: Akademieverlag.

Stansbury, J. P., Ried, L. D., & Velozo, C. A. (2006). Unidimensionality and bandwidth in the Center for Epidemiologic Studies Depression (CES-D) Scale. *Journal of Personality Assessment, 86*, 10–22.

Stek, M. L., Vinkers, D. J., Gussekloo, J., Beekman, A. T. F., Van der Mast, R. C., & Westendorp, R. G. J. (2005). Is depression in old age fatal only when people feel lonely? *The American Journal of Psychiatry, 162*, 178–180. doi:10.1176/appi.ajp.162.1.178

Stephens, C., Alpass, F., Towers, A., & Stevenson, B. (2011). The effects of types of social networks, perceived social support, and loneliness on the health of older people: Accounting for the social context. *Journal of Aging & Health, 23*, 887–911. doi:10.1177/0898264311400189

Suanet, B., & Van Tilburg, T. G. (2019). Loneliness declines across birth cohorts: The impact of mastery and self-efficacy. *Psychology and Aging*, *34*(8), 1134–1143. doi:10.1037/pag000035

Tomás, J. M., Pinazo-Hernandis, S., Donio-Bellegarde, M., & Hontangas, P. M. (2017). Validity of the de Jong Gierveld Loneliness Scale in Spanish older population: Competitive

structural models and item response theory. *European Journal of Ageing, 14*(4), 429–437. doi:10.1007/s10433-017-0417-4

Toronto HomeShare Program. (n.d.). Retrieved from https://www.torontohomeshare.com

The facts on loneliness. (n.d.). *Campaign to End Loneliness*. Retrieved from https://www.campaigntoendloneliness.org/the-facts-on-loneliness/

Theeke, L. A. (2009). Predictors of loneliness in U.S. adults over age sixty-five. *Archives of Psychiatric Nursing, 23*, 387–396. doi:10.1016/j.apnu.2008.11.002

Van Baarsen, B., Snijders, T. A. B., Smit, J. H., & Van Duijn, M. A. J. (2001). Lonely but not alone: Emotional isolation and social isolation as two distinct dimensions of loneliness in older people. *Educational and Psychological Measurement, 61*(1), 119–135.

Van Doorn, C. (1999). A qualitative approach to studying health optimism, realism, and pessimism. *Research on Aging, 21*, 440–457.

Victor, C., Scambler, S., Bowling, A., & Bond, J. (2005). The prevalence of, and risk factors for, loneliness in later life: A survey of older people in Great Britain. *Ageing and Society, 25*(6), 357–375. doi:10.1017/S0144686X04003332

Victor, C., & Yang, K. (2012). The prevalence of loneliness among adults: A case study of the United Kingdom. *The Journal of Psychology: Interdisciplinary and Applied, 146*(1-2), 85–104. doi:10.1080/00223980.2011.613875

Weeks, D. G., Michela, J. L., Peplau, L. A., & Bragg, M. E. (1980). Relation between loneliness and depression: A structural equation analysis. *Journal of Personality and Social Psychology, 39*, 1238–1244.

Weiss, R. S. (1973). *Loneliness: The experience of emotional and social isolation.* Cambridge, MA: MIT Press.

Wilson, R. S., Krueger, K. R., Arnold, S. E., Schneider, J. A., Kelly, J. F., Barnes, L. L., … Bennett, D. A. (2007). Loneliness and risk of Alzheimer disease. *Archives of General Psychiatry, 64*(2), 234–240. doi:10.1001/archpsyc.64.2

Wittmann, M., & Lehnhoff, S. (2005). Age effects in perception of time. *Psychological Reports, 97*(3), 921–935. doi:10.2466/pr0.97.3.921-935

Ypsilanti, A., Lazuras, L., Powell, P., & Overton, P. (2019). Self-disgust as a potential mechanism explaining the association between loneliness and depression. *Journal of Affective Disorders, 243*, 108–115. doi:10.1016/j.jad.2018.09.056

Yusoff, N., Luhmann, M., & Cacioppo, J. T. (2013). Explaining the link between loneliness and self-rated health with hedonic regulation as a mediator. *Procedia— Social and Behavioral Sciences, 97,* 156–159. doi:10.1016/j.sbspro.2013.10.216

Zavaleta, D., Samuel, K. & Mills, C. T. (2017). Measures of social isolation. *Social Indicators Research, 131,* 367–391. doi:10.1007/s11205-016-1252-2

Zee, P. C., & Turek, F. W. (2006). Sleep and health: Everywhere and in both directions. *Archives of Internal Medicine, 166*(16), 1686–1688. doi:10.1001/archinte.166.16.1686

Zhao, X., Zhang, D., Wu, M., Yang, Y., Xie, H., Li, Y., … Su, Y. (2018). Loneliness and depression symptoms among the elderly in nursing homes: A moderated mediation model of resilience and social support. *Psychiatry Research, 268,* 143–151. doi:10.1016/j.psychres.2018.07.011