Emotions in Later Life: The Role of Perceived Control and Subjective Health

by

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A Thesis submitted to the Faculty of Graduate Studies of

The University of Manitoba

in partial fulfilment of the requirements of the degree of

MASTER OF ARTS

Department of Psychology

University of Manitoba

Winnipeg, Manitoba CANADA

Acknowledgments

I would first like to express gratitude to all of those who participated in the Aging in Manitoba Studies. I also acknowledge support from the University of Manitoba's GET Program and from a CIHR operating grant provided to my advisor.

There are many individuals I have been grateful for during this educational pursuit. I first thank my advisor, Judy Chipperfield, whose irrefutable knowledge, patience, encouragement, dedication, and high standards have contributed to my professional development and the completion of this thesis. I am also thankful for my committee members Ray Perry and Michelle Lobchuk who have dedicated their time and thoughts to this project. The members of the Emotion, Motivation, and Control laboratory also deserve acknowledgment. Steve Hladkyj who, to this day, with his friendship, spirited energy and high expectations, has motivated me to excel in University. Tara Stewart also deserves thanks for the guidance she has provided me in all facets of graduate student life. Jeremy Hamm: I'm so glad our teamwork developed into a wonderful friendship. I also greatly appreciate Loring Chuchmach who would assist me day or night with statistics.

There are many individuals in my personal life who I am grateful for. First, to my parents, grandparents, and step-mum who have never doubted my capabilities for succeeding anything I put my mind to. Dad: thank you for your bittersweet "hard-working gene". To Kirsten and Sara, who were my designated sounding boards when I struggled to make sense of my own thoughts. A heartfelt thank you to Derek Newbury: your genuine interest, encouragement, and admiration in my education has meant so much to me. Last but not least, I dedicate this thesis to Benjamin Basarab who, in 2005, convinced me to enrol in university and hasn't left my side since.

Table of Contents

Abstract

It is well-documented that *perceived control (PC),* the degree to which individuals believe they have direct influence over events in their life, is an important psychological determinant of emotions among older adults. High PC is often found to be associated with frequent positive emotions; whereas low PC is associated with frequent negative emotions. However, few studies have investigated why PC relates to emotions. For over three decades, research has demonstrated that PC predicts health in a variety of important ways. PC appears to protect against declines in physical health and functional restriction, and even mortality in advanced age. The objective of the current study was to consider how the PC and emotion relationship can be better explained by considering the mediational role of health. A community-dwelling sample of older adults (n = 232) was examined via secondary data analysis from two established longitudinal databases: Aging in Manitoba (AIM) project and the Successful Aging Study (SAS). Multiple regression analysis was used to assess separate mediational models for two different health mediators, self-rated health and health-related restrictions, and for positive and negative emotions. Moreover, to further deepen our understanding, these models were tested separately for younger (79-84 yrs) and older adults (85-96 yrs) and also for discrete emotions, such as happiness. The findings are in keeping with previous research that suggests PC benefits both physical and emotional well-being. Notably, the evidence of mediation was most compelling in the prediction of negative versus positive emotions. A relative comparison of the meditational effects of the two disparate health measures suggests support for a mediational role of health-related restrictions, but less evidence for the role of self-rated health in the control and emotion relationship. Findings have implications for treatment interventions employing adaptive

cognitive strategies in hopes to foster PC which in turn, should promote health and enhance later life emotional well-being.

List of Tables

List of Figures

Emotions in Later Life: The Role of Perceived Control and Health

Having a perception of control over outcomes in life is in many ways fundamental to our sense of well-being (Skinner, 2007). The central ideas behind the perceived control and well-being relationship are exemplified well in the memoirs of Holocaust survivors. In *Man's Search for Meaning*, Viktor Frankl (1984) seeks to explain why Holocaust victims exposed to nearly-identical uncontrollable and dehumanizing environments drastically differed significantly in their psychological well-being. Frankl observed that many of the victims who did not survive the concentration camps had withdrawn to such an extent they had eventually stopped functioning by becoming non-communicative, not getting out of bed, and even losing control over bodily functions. Out of the individuals who survived, however, were those who found ways to exercise control during the experience. It was apparent to Frankl that for many survivors, their need to have control was so strong that attempts were exerted to influence almost anything. A poignant example is the sense of control a prisoner found in the menial routine of tending to a weed in a back alley.

Traumatic environments such as concentration camps are not a necessary context for exemplifying the imperative nature of control or well-being. More subtle yet practical venues are also found in environments facilitating health, wellness, and safety. Consider a high quality nursing home in which older adults whom, when given a plant to tend to, as well as responsibility over seemingly minute decisions (e.g., movie scheduling, furniture arrangements), were more active and happier overall, and generally lived longer compared to those who were not presented with such opportunities (Langer & Rodin, 1976; Rodin & Langer, 1977). While investigating factors that contribute to later life emotional well-being, examples such as these invite the provocative question: What are the consequences of *perceived control* (PC), the

degree to which an individual believes he or she has direct influence over events in their life, on later life emotions (Chipperfield, Perry, & Stewart, 2012)?

While there are various objective contributors to later life emotions, such as education and marriage status (Chipperfield, Perry, & Weiner, 2003; Tower & Kasl, 1996), it has been consistently demonstrated that phenomenological experiences are also critical (Isaacowitz & Smith, 2003). For example, PC and one's subjective evaluation of health are important factors to consider (Bailis, Segall, & Chipperfield, 2003). As will be discussed, there is mounting evidence showing that both PC and health are associated with emotions. However, few studies that examine PC as a predictor of emotions also include health, or subjective health, as a mediator. The current study is unique as it examines relationships between PC, subjective health, and emotions among older adults who face every day age-related challenges that could presumably undermine their control perceptions. Not only is the current study novel, but in a meta-analysis of the emotion and health relationship, Pressman and Cohen (2005) observe that few studies have investigated the effects of health on emotions compared to the effect that emotions have on health. To address this gap in the literature of emotions, the current study investigated two models, interchanging health and emotions as dependant variables of PC.

The current study is among only a few studies that have examined PC in relation to both positive and negative emotions (Lang & Heckhausen, 2001; Kunzmann, Little, & Smith, 2002). It also extends prior research by considering several discrete emotions that are paramount in later life, such as gratefulness, contentment, frustration, and regret. Moreover, it investigated the relationship between health and discrete positive emotions that has rarely been considered (Pressman & Cohen, 2005). Lastly, unlike a great deal of gerontological research that has sampled older institutionalized adults, the current study examined a community-dwelling

population, allowing for a direct assessment of resilient individuals who are functional enough to reside within the community. Studying a community-dwelling sample is important given that the majority of seniors in Canada reside in a home and are self-sustaining in terms of daily activities (Statistics Canada, 2007). As such, the current study conducted a secondary analysis on a community-dwelling sample of older residents of Manitoba. Before outlining the current study in more detail, a brief review of the literature is provided.

The following literature review will summarize a selection of hallmarked theories in the areas of gerontology, control, health, and emotions as frameworks for the current investigation. First, a backdrop regarding the theoretical and conceptual issues of PC will be provided, as well as PC's important role in later life emotions. This will be followed by a discussion of later life emotions. Theoretical and methodological considerations of emotions and their unique antecedents in later life, two of which are PC and health, will be emphasized. A review of the consequences of PC on later life health with a focus on subjective health measures will follow. Lastly, an overview of the health and emotion relationship will be provided in respect to both negative and positive emotions.

A Brief History of Control Theory

Amongst control researchers it is generally agreed that Rotter's (1954) Social Learning Theory of a Locus of Control, Seligman's (1972) Learned Helplessness Theory, and Bandura's (1982) Social Cognitive Theory of Self-Efficacy have provided a theoretical groundwork for much of the understanding of PC we have today. Rotter (1954) proposed that a control belief has two dimensions or, two *loci of control*. An *internal locus of control* is when an individual believes he or she can influence the outcome of some event (e.g., effort), whereas an *external locus of control* is a belief that the occurrence of an event is due to some force independent from

the self (e.g., luck). Individuals with an internal locus of control can be thought of as being *agentic* or, in other words, having a sense of *mastery* over life events. Agentic individuals may be expected to execute initiations of behaviour directed towards some desired outcome more often than someone with an external locus of control.

Bandura's (1982) Social Cognitive Theory of self-efficacy expanded on Rotter's (1954) Social Learning Theory by suggesting that a high internal locus of control, or simply a perceived opportunity to influence some event, does not necessarily result in more frequent goal-oriented actions. One's *self-efficacy*, the belief of having the capabilities or resources to successfully produce a desired outcome, Bandura suggests, is also a necessary antecedent for the motivation to expend effort towards attaining a goal. In contrast, an individual who has an external locus of control would likely have low self-efficacy. Bandura's notion of self-efficacy is an important construct to consider when defining control in that it offers a greater understanding of an agentic individual's perceived sense of mastery. Complimentary to Rotter's (1954) and Bandura's (1982) theories of control is Seligman's (1972) Learned Helplessness Theory which revealed the important consequences that follow an erosion of control.

Experimenting with dogs under a behaviorist paradigm, Seligman (1972 & 1975) examined the repercussions of avoidance and escape behaviour contingencies given various aversive stimuli. After repeated presentations of inescapable aversive stimuli, many of the dogs became submissive and ceased attempts to escape (referred to as "withdrawn" or "inward behaviours"). Seligman coined this maladaptive behaviour *learned helplessness*, whereby given enough instances in which action-outcome non-contingencies are perceived, subsequent feelings of helplessness will follow. In a human population, the withdrawn behaviours observed in Holocaust victims by Frankl (1984) epitomize the manifestation of helplessness following an

erosion of control forced by the German soldiers. To date, many empirical studies investigating the implications of PC maintenance and erosion on the emotional well-being of humans have been primarily catalyzed by Rotter (1954), Bandura (1982), as well as Seligman's (1972 & 1975) discussions of control and helplessness. Yet, there remains much deliberation over the operationalization of control.

Defining Control

Much of the divergences apparent in the literature of control regard the semantics of what exactly constitutes control. Some researchers posit that the psychological state of control arises from an *objective* appraisal of outcomes that are directly dependent on an individual's behaviour, whereas others stress the *subjective* experience of the mastery an individual believes he or she has over outcomes in their environment (Heckhausen & Schulz, 1998; Skinner & Greene, 2008). In the current study, control is understood to be a phenomenological experience that corresponds to the degree to which an individual perceives he or she has direct influence over events in their life (Chipperfield et al., 2012). Individuals who are high in PC are considered to have an internal locus of control which conforms to other concepts such as self-efficacy, agency, and mastery.

For over half a century, accumulating control-related studies have instigated in-depth psychological research which has provided vital information that explains a variety of behaviours. To date, control-related theories have provided a greater understanding of psychological factors associated with human learning, particularly in respect to student achievement (Hall, Perry, Ruthig, Hladkyj, & Chipperfield, 2006), psychological well-being (Seligman, 1975), and health (Chipperfield & Perry, 2006). Before turning to a review of the empirical literature that links PC to outcomes relevant to the current study, a brief overview of the role of PC across the lifespan, particularly its relevance in later life, is provided.

Perceived Control Trends in Later Life

PC has been found to be an important factor in human development over the lifespan. Longitudinal studies pertaining to the trends of PC have found age-related patterns. In their Life-Span Theory of Control, Heckhausen and Schulz (1998) depict a hypothetical distribution of PC over the lifespan (Schulz & Heckhausen, 1996). The drive for mastery over the environment begins at birth and steadily decreases with age. Remarkably, it has been suggested that the capacity for learning action-outcome contingencies is apparent in infancy (Heckhausen & Schulz, 1995) even within weeks of being born (Brighi, 1997). According to Schulz and Heckhausen (1996), PC then rapidly declines with old age. It is commonly suggested that the salient declines in health and cognition (e.g., arthritis and memory lapses), and the changes in lifestyle that occur with old age (e.g., restricted transportation), increase the number of threats towards the degree to which one can exert control over the various facets in their life.

The increased number of threats to control in later life has been found to have important implications which often times relate to psychological distress (Rodin, 1986). However, although there is a decline of PC, it is far from obsolete at later points in the age trajectory. Some suggest, for instance, that this is due to a change in cognitive appraisals, whereby the evaluation that one has control over certain domains in life is revised such that with age, people increasingly value the exercise of control in domains they previously unappreciated (Lachman, 2006). Nevertheless, an erosion of PC in later life is common and has important psychological implications.

Reinforcing the importance of Rodin's (1986) notion that PC is associated with psychological well-being is Heckhausen and Schulz's (1995; 1998) contention that the ability to selectively influence the environment in accordance with one's goals is associated with optimal

development. Although there is a general agreement that the *implications* of control beliefs vary by age, such that "what is functional control striving at a certain point in the life span may be dysfunctional at another (Heckhausen & Schulz, 1998, p. 58)", a considerable amount of research has revealed that the benefits of PC for older adults, as well as the repercussions of eroded control beliefs, are salient and abundant (Chipperfield, Newall, Perry, Stewart, Bailis, & Ruthig, 2011; Lang & Heckhausen, 2001). For instance, Lang and Heckhausen (2001) posit that a sense of mastery over one's environment benefits emotional well-being and life satisfaction in later life. Thus, the study of control beliefs is especially important to consider in later life research given that older adults are more vulnerable to restricted opportunities of exercising control. For the present purposes, the following literature review will focus on the consequences of PC in later life with regard to emotional well-being **(**Lang & Heckhausen, 2001; Gadalla, 2010) and, as will be discussed in detail, health (Chipperfield et al., 2012; Rodin, 1986). However, before outlining the empirical research relevant to the main premise of the present thesis, that PC has consequences for emotional well-being, a descriptive review of the literature on emotions in later life is provided.

Emotions in Later Life

The following literature review highlights studies that have investigated reported emotions in later life, considering studies that examine both positive and negative emotions. Although some existing research supports the commonly held stereotype that age brings with it negative and dull emotional experiences, a growing number of developmental and positive psychology studies depict later life more positively and complex. Older adults report more positive emotions than negative emotions (Chipperfield et al., 2003), experience and express emotional intensity (Magai, Consedine, Krivoshekova, Kudadjie-Gyamfi, & McPherson, 2006),

and frequently report an overall interest in life (Levenson, 2000). Not only are positive emotions frequently reported and are more commonly experienced than negative emotions, but older adults also seem to report more positive emotions than do younger adults (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000).

Observations in other studies regarding the saliency of emotional intensity and expression of emotions in older adults are contrary to the stereotype that later life is characterized by a dulling of emotional states. For instance, negative emotions are less frequently reported in old age (Gross et al., 1997) and their levels of intensity are reliably less than that experienced in younger adults (Carstensen, Isaacowitz, & Charles, 1999). Similar results were found in Ong and Bergeman's (2004) study. Negative emotions also appear to have shorter durations in later life compared to that for young adults (Carstensen et al., 2000). Given the unique later life emotional experiences, a theoretical approach that assumes these age-related differences should be taken (when assessing the emotions of older adults). Importantly, PC has been observed as a relevant and important antecedent of later life emotions.

Perceived Control and Later Life Emotions

To promote our understanding of how emotions evolve it is useful to consider their antecedents, and a main premise of this thesis is that a perception of control fosters emotional experiences. In the following review, the emphasis is placed on control beliefs as antecedents to emotional well-being (Lang & Heckhausen, 2001; Weiner, 1985). Since Seligman (1975) posited the important role of control in psychological well-being, particularly in respect to helplessness and depression, a large body of research has examined associations between control beliefs and emotions (Bye & Pushkar, 2009; Jopp & Rott, 2006; Weiner, 1985). To date, control beliefs have been found to play a major role in the emotions experienced by older adults. The

relationship between PC and emotions, particularly positive emotions, has been well replicated (Bye & Pushkar, 2009; Chipperfield et al., 2012; Jopp & Rott, 2006; Lang & Heckhausen, 2001; Langston, 1994). For example, Bye and Pushkar (2009) found that more frequent reports of positive affect (as well as less reports of negative affect) during older adults' transition to retirement were associated with a greater sense of mastery over life events and potential constraints. Moreover, Kunzmann et al's (2002) analysis of older participants in the Berlin Aging Study showed that the degree of control individuals believed they had over desirable events in their life was associated with the frequency of reported positive emotions. Similar results were found in Lang and Heckhausen's (2001) study in which pride was commonly found to be experienced after having successfully carried out a task independently. The authors also found that when older adults experienced positive events, a higher level of PC over various aspects of development (e.g., goals, ability, etc.) was found to predict more positive emotions six months later.

In contrast to the studies on PC and positive emotions, the literature on how PC relates to negative emotions is relatively inconsistent. Age-related idiosyncrasies may explain such discrepancies in the literature on PC and negative emotions. For example, just as a strong perception of control predicted increased positive affect over the course of a year in Lang and Heckhausen's (2001) study of young and middle aged adults, PC also predicted reduced negative affect. However, for older adults, PC related only to positive emotions and not to negative emotions. Various operationalizations of control may also explain the inconsistent PC and negative emotions link. In Kunzmann et al's (2002) study, for instance, the authors did not find that a perception of control *over desired life events* held by older adults related to their negative affect.

Nevertheless, in several other studies, PC has been shown to relate to negative emotions as assessed by the number of emotions reported, magnitude of emotional experience, and frequency of experienced emotions. For example, in studies with community-dwelling samples of seniors, a moderate, inverse relationship was demonstrated between a global perception of control and the number of negative emotions experienced over two days (Ruthig, Chipperfield, Bailis, & Perry, 2008; Ruthig, Chipperfield, Perry, Newall, & Swift, 2007). Similarly, a greater sense of mastery in older adults was associated with more psychological distress over a one month period (Gadalla, 2010). A low sense of mastery was also found to predict a global measure of negative affect experienced over a few weeks for recently retired individuals (Bye & Pushkar, 2009). Additionally, older adults with strong perceptions of control have been shown to have lower rates of depression (Lachman, 2006). In sum, contrary to the expectation that age-related restrictions and a loss of opportunities to exercise control in later life should increase negative emotions, not all literature shows that low PC predicts negative emotions. In contrast, the empirical evidence consistently suggests that PC fosters positive emotions.

A study of reported antecedents for discrete emotions illustrates how PC may relate to later life emotions (Chipperfield, Perry, Weiner, & Newall, 2009). Community-dwelling older adults were asked to choose discrete emotions that they had reported experiencing over the past two days and to state the corresponding antecedents. Interestingly, self-related antecedents, in which an individual attributes an internal locus of causality and controllability to some event (i.e., reasons for certain discrete emotions perceived to be caused by one's own self) were found to play an important role in discrete emotions. Specifically, self-related antecedents that regarded health and well-being were commonly regarded as predecessors to subsequently reported discrete emotions. For instance, the antecedents of discrete emotions like contentment

and gratefulness were often reported to be health-related. Older adults, for example, reported feeling grateful for having lived a long life and having good health. These results suggest that health has important implications for the emotions that older adults experience.

The Role of Perceived Control in Later Life Health

Extensive research consistently demonstrates that PC is associated with health in later life. Later life is health is frequently reported as a self-related antecedent to important later life emotions. In line with Lang and Heckhausen's (2001) abovementioned study of a health and emotion relationship in later life are Chipperfield et al.'s (2009) findings that in a sample of older adults, health was frequently reported as an antecedent for feelings of gratitude. Moreover, many self-related antecedents of negative emotions commonly follow health-related events, such as feelings of frustration due to a lack of ability and personal inadequacies (Chipperfield, 2009). In this review of important antecedents to discrete emotions, health is clearly a highly valued facet to consider.

The following literature review discusses only a few illustrations from the vast literature on PC and health in later life. For over three decades in gerontology research there has been an accumulation of studies demonstrating that in old age PC is associated with health. Overall, high levels of PC have been suggested to have direct and beneficial associations with health-related outcomes (Rodin, 1986), such as health-related functionality for older adults in particular (Heckhausen, Wrosch, & Schulz, 2010). For instance, a heightened perception of control is associated with improved health and psychological well-being in very old adults following a fall (Ruthig et al., 2007), lower risk estimates of anticipated hip fractures (Ruthig et al., 2008), as well as improved physical functioning (Lang & Heckhausen, 2001). The importance of control beliefs is further realized in studies demonstrating that high PC is related to objective

physiological measures of health, such as pain regulation (Salomons, Johnstone, Backonja, Shackman, & Davidson, 2007) and reduction of cortisol levels (Abelson, Khan, Liberzon, Erickson, & Young, 2008). Others have found that higher degrees of PC are associated with fewer hospital admissions for older women (Chipperfield, Perry, Bailis, Ruthig, & Chuchmach, 2007) and lower mortality rates (Menec & Chipperfield, 1997).

Many studies investigating the PC and health relationship have examined objective measures of health. Although such objective health measures as listed above are important, researchers have discovered that many older adults perceive their health differently than an objective measure may otherwise reflect (Chipperfield, 1993). In fact, it has been suggested that subjective reports of health may be more precise in predicting health outcomes than objective health measures (Bailis et al., 2003). Thus, in the current thesis, subjective measures of health were studied.

The Importance of Subjective Health Measures

The implications of subjective health reports are broad, ranging from associated heart failure and hospitalization (Kenndy, Kasl, & Vaccarino, 2001) to predicting survival (Chipperfield, 1993). Importantly, Ruthig and Chipperfield (2007) found that for many community-dwelling older adults an incongruence exists between measures of objective health (e.g., number of chronic conditions) and their *self-rated health* (SRH). In an earlier study by Chipperfield (1993), "health optimists", individuals whose perceptions of health exceed objective measures of their health, had a greater life expectancy than their "pessimistic" peers, who rated his or her own health worse than objective indices would suggest. Health optimists have also been found to perceive more control over their health and manage their health better by exercising and eating a healthy diet (Ruthig, Hanson, Pedersen, Weber, & Chipperfield, 2011).

Although the most common measure of subjective health is a simple self-reported health rating, other subjective measures may also be relevant to understanding a link between PC and emotions. One potentially important subjective health index is *health-related restrictions* (HRR), which is the degree to which individuals perceive their functionality to be restricted due to his or her own health (Chipperfield, 2008). In the current study, perceived functionality is important to consider. The degree to which an individual perceives he or she is functional in their day to day life, either physically or mentally, can be argued as largely dependent on their control beliefs, that is, the extent to which he or she believes they can influence certain events (including health-related events) in their life. Put otherwise, an individual with high PC will likely exercise attempts of mastery more often and in a variety of ways to ensure success. The greater ability to influence one's own life in general will, in turn, result in a higher perceived degree of functionality in life overall. Thus, the current study considers the role of control-beliefs and their implications on perceived functionality as reflected by HRR well as self-reports of health and how they related to emotional well-being. This is in keeping with much previous research that has exemplified the important mind-body connection in respect to health.

The Health and Emotion Relationship

Certain psychological factors have been proposed to have effects on health. Benefit finding following a diagnosis, for example, has been shown to be associated with adaptive health management and improved recovering from certain health issues (Bower, Moskowitz, & Epel, 2009). Stress is another psychological construct increasingly being recognized in popular psychology given numerous studies documenting its aversive effects on health. In fact, the discovery that stress is strongly associated with health prompted much of the psychoneuroimmunology research investigating the association between health and emotions

prevalent today. A recent 30 year meta-analytic study on the effects of stress levels and the subsequent release of cortisol on immune functioning strongly support the effects of chronic stress on impaired immune system functioning (Segerstrom & Miller, 2004). Likewise, daily hassles, as compared to major life events, have been found to be greater sources of negative effects on both psychological and physical well-being (Lazarus & DeLongis, 1983). Overall, numerous well-supported studies investigating emotions and physiological health, particularly in respect to negative emotions, suggest there is a robust mind-body connection.

Health and Negative Emotions

Much in line with the above mentioned observations, negative emotions have been found to be associated with poor health. Negative emotions have commonly been shown to relate to weak immune functioning and even mortality (Pressman & Cohen, 2005), as well as the number of chronic conditions reported by older community-dwelling adults (Chipperfield et al., 2003). In a comprehensive review, Kiecolt-Glaser, McGuire, Robles, and Glaser (2002) summarize numerous studies depicting an association between poor immune functioning and overall negative affect. Given the demonstrated relationship between health and negative emotions, the link between health and positive emotions has more recently been explored.

Health and Positive Emotions

In contrast to the large number of studies on health and negative affect, less research has examined the role of health on positive emotions, although this seems to be changing with the rise of positive psychology (Aspinwall & Tedeschi, 2010). Some recent studies suggest that positive emotions are associated with improved physiological health, such as long and short term measures of health (Aspinwall & Tedeschi, 2010), heightened immune system performance (Bower & Segerstrom, 2004), as well as better subjective health (Pressman & Cohen, 2005). In

an extensive meta-analysis of the positive emotion and health linkage, Pressman and Cohen (2005) depict an inverse relationship between positive affect and poor health on a variety of health measures such as compromised immune functioning, illness, disease severity, comorbidity of chronic conditions, risk of illness, accidents and hospitalizations, as well mortality.

Nevertheless, with the relatively novel and emerging research on health and positive emotions some inconsistencies exist given that some studies do and some do not show a link. Pressman and Cohen (2005) provide examples of inconsistencies with regards to positive emotions predicting survival rates (refer to Cassileth, Lusk, Miller, Brown, Miller, 1985 & Moskowitz, 2003, for differing results) and health markers, such as disease severity and physical functioning (refer to Cassileth et al., 1985 & Ostir et al., 2002, for differing results). Pressman and Cohen propose that in many cases, methodological dissimilarities account for such varying findings across studies. For instance, much of the research investigating health and positive emotions is correlational.

Of those studies that test directional hypotheses, however, most have investigated the effects of positive emotions on health. An informal review of the literature on health and negative emotions suggests that this conclusion can be made for the health and negative emotion relationship as well. The comparatively small number of studies investigating the effects of health on emotions thereby merits the question of the present study which asks if health precedes emotions.

The way in which health and positive emotions are causally related is complex, and there is a scarcity of studies on the topic. To date, the limited number of studies suggests that positive emotions lead to resiliency and, as a result, better health, such as pain management and increased longevity (Pressman & Cohen, 2005). Albeit correlational relationships, high reports of positive

emotions have also been shown to relate positively to good subjective reports of health (Pressman & Cohen, 2005), whereas higher negative emotions have been found to be associated with poor subjective reports of health (Chipperfield et al., 2003). Interestingly, it has also been suggested that positive emotions may be stronger predictors of subjective health than negative emotions (Pressman & Cohen, 2005). Clearly, more can be understood by studying the role of control beliefs and subjective health in later life emotional well-being.

A Brief Summary of PC, Emotions, and Health

The discussed research suggests that the experiences of emotions for older adults are unique compared to that for younger age cohorts. In old age it is not necessarily inevitable that one will experience few positive emotions, constant negative affect (Chipperfield et al, 2003), a dimming of emotional intensity or emotional indifference (Carstensen et al., 1999; Ong & Bergeman, 2004; Levenson, 2000). Instead, it seems that the experience of positive emotions remains salient and becomes more stable (Carstensen et al., 1999; Carstensen et al., 2000), as well as more frequent with age while the converse is commonly found for that of negative emotions (Carstensen et al., 2000). As reflected in the above mentioned studies, however, is the emerging agreement that old age is not the sole predictor of emotions in later life (Issacowitz & Smith, 2003). In fact, a relationship between age and emotions has been shown to disappear or decrease upon the introduction of other psychological factors, such as a PC over developmental goals (Lang & Heckhausen, 2001); and global PC (Issacowitz & Smith, 2003), which might suggest it is not age per se, but psychological factors that relate most strongly to emotions. This provides the basis for the present investigation of intra-individual psychological factors, namely PC and subjective reports of health, which are often more powerful predictors of emotional experiences than age alone.

The Present Study: Predicting Emotions in Late Life

The current study seeks to clarify the predictors of older adults' emotions, assessing both positive and negative emotions. A major objective was to examine PC as an important psychological predictor of emotions. The current study addressed a significant gap in the literature of aging by examining how PC and emotions are mediated by health. Methodologically, this rationale is supported by Aldwin's (1991) observation that PC does not always have an isolated or direct effect on psychological well-being outcomes, such as depression. Given the pertinence of health in later life, its relation with PC, and a documented health-emotion relationship, the rationale that health should mediate the PC-emotion relationship is merited. The importance of subjective reports of health relative to objective measures merit the consideration of two subjective indicators of health (i.e., SRH and HRR) as mediators of the relationship between PC and emotions. As a result, the current study offers a more thorough investigation than past studies by considering *why* PC might predict emotions in later life.

Finally, the relationships between PC, health, and emotions were assessed separately *between* two groups of older adults. Much research has demonstrated that the most salient declines in physiological and psychological health typically occur at around the age of 85 (for example, refer to Menec and Chipperfield, 1997). Although many researchers use the senior cut-off year at age 65, recently the continuous senior-age bracket is commonly broken into two sub-populations: the *young-old* (< 84 years) and *old-old* (85+ years) cohorts (Corey-Bloom, Wiederholt, Edelstein, Salmon, Cahn, & Barrett-Connor, 1996; Ruthig, Chipperfield, Newall, Perry, & Hall, 2007). To illustrate the striking difference between the functionality of young-olds and old-olds in Canada, Gilmour and Park (2003) found that in Canadian community-dwelling adults, close to 50% of those 85+ are not independently mobile, whereas for seniors

under 85 years of age, just under 10% were not mobile. The demographic importance in considering this distinction between young-olds and old-olds is further highlighted in Statistic Canada's (2007) *A Portrait of Seniors in Canada* which states that the most rapidly increasing senior cohort are those aged 85+ and that in ten years, the number of oldest-olds will be triple that of the year 2005.

Thus, the relationship of interest in the current study was examined separately for these two age cohorts to consider age-related differences in the mediating effect of health on the PC-emotion relationship. In line with Rodin's (1986) speculation that PC effects might become most prominent with age, a stronger effect of PC on health, and as a result, emotions was expected in the oldest-old relative to the young-old. Specifically, an anticipated lower level of PC in the oldest-olds was expected to result in a higher number of HRR as well as worse self-rated health. Consequently, worse health should have a stronger effect on emotions as compared to the young-olds (Menec & Chipperfield, 1997; Rodin, 1986).

Measuring Perceived Control and Emotions

To assess whether the degree of control older adults believe they have over the various facets of their life contribute to their health and emotions, a global measure of PC is used (see Chipperfield, Campbell, & Perry, 2004). Global PC measures are regarded as valid and reliable indicators that reflect one's belief of the degree to which they can influence their life overall. Global PC is examined in relation to global measures of the frequency positive and negative emotions as experienced by older adults over two days. A priori hypotheses were assessed with two separate models, respectively, for positive and negative emotions. Analyses are also conducted on a selection of discrete emotions to gain a more detailed insight into how PC and

health relate to emotions at a specific rather than global level. A priori hypothesises in respect to discrete emotions were not specified.

Summary of Hypotheses and Research Questions

The current study assessed hypotheses regarding the linkages between PC, health, and emotions. The models including these variables were tested separately for global positive emotions and global negative emotions, as well as for two different subjective health outcomes. Several exploratory research questions are also proposed, as described in more detail below.

Health as a mediator of perceived control and emotions. Health was expected to mediate the way in which PC relates to emotions, both with regard to positive emotions (**Hypothesis 1**) and negative emotions (**Hypothesis 2**). Each hypothesis can be subdivided, such that for positive emotions (see Figure 1) PC should predict the frequency of reported positive emotions (path c); PC should predict better health (path a); better health should predict more positive emotions (path b); and health should mediate the PC and positive emotion relationship (path c′). The expectation that a high degree of global PC will promote positive emotions is derived from the previously discussed studies that have demonstrated this association. For negative emotions (see Figure 2), PC should inversely predict the frequency of negative emotions (path c); lower PC should predict worse health (path a); worse health should predict a high frequency of negative emotions (path b); and health should mediate the PC and negative emotion relationship (path c′). In particular, assuming health partially explains the PC-emotion relationship, the relationships between PC and emotions were expected to be weaker upon the introduction of the health variable (path c′).

The prediction that the PC → health → emotion path will be stronger for the oldest-olds relative to the young olds (**Hypothesis 3**) was also tested It was expected that the strongest

effects PC would have on health and, in turn, on emotions, would be demonstrated in the oldest-olds given the increased threats to PC with age and the implications an erosion of control has on health (Rodin, 1986).

In addition to these hypotheses, several exploratory research questions are investigated. **Question 1** considers whether the indirect PC-health-emotion path in the previously outlined models is stronger for *positive* or *negative* emotions. This question will be addressed separately for each of the two measures of health measures. **Question 2** inquires whether the previously proposed mediation model could be replicated for certain discrete emotions. This involved replacing the global emotion measure with several discrete negative and positive emotions. As described in more detail later, the selection of discrete emotions for analysis is based on the frequency at which they are reported, as well as those that have been theoretically deemed uniquely important in later life (e.g., gratitude). Finally, **Question 3** asks whether an alternative ordering of model variables provided a better fit to the data (see Figure 3). In this analysis emotions (instead of health) were assessed as a mediator of the PC and health relationship.

Method

Description of Participants and Secondary Database

Secondary data analysis was conducted in the current study and was drawn from the Successful Aging Study (SAS), a satellite study of the larger Aging in Manitoba (AIM) project. The SAS has received prior ethics approval from the University of Manitoba Ethics Board. Information identifying participants was kept confidential and identifiers were removed from the database.

Prior to describing the subset of the SAS participants used for the present purposes, some relevant details of the larger AIM project are provided. As described elsewhere (Chipperfield,

Havens, & Doig, 1997), the AIM project began in 1971 with 4803 community-dwelling participants aged 65+ who were selected using a random stratification procedure (stratified by age, gender, and region). Participants were selected from the rural and urban areas in the province of Manitoba. In 1976 and 1983, more participants were recruited. To date, AIM is recognized as one of the largest and longest run cross-sectional and longitudinal studies of aging conducted in Canada having recruited a total of approximately 9000 participants. Data were collected via in-person interviews in 1971, 1976, 1983, 1990, 1996, 2001, 2005, and 2006.

The AIM project has included a breadth of health, psychological, and social measures, such as psychological well-being, functional mobility, social networks, and demographics. Over the years, the AIM project has been established as one of the most comprehensive databases of aging due to its large number of participants over the age of 80, as well as its linkage with national and provincial databases that contain objective measures of health, such as health care utilization and survival rates. The AIM project has not only contributed to the understanding of what factors play a role in successful aging, but has facilitated the investigation and clarification of methodological issues in aging studies, as well as guided policy issues (Roos, Havens, & Black, 1993; Shapiro, 1988).

The current study assessed participants from the 2003 satellite SAS (n = 232, 62.93 % Female) who were part of a large sample of Manitobans drawn from the larger AIM project. The stratification procedure used in the AIM project that includes older adults currently residing in Manitoba contributes to the representativeness of community dwelling seniors. Because this database is a representative population of older adults, findings that emerge should be generalizable to other community-dwelling seniors in Canada.

The SAS has examined a multitude of psychological and physical factors that predict later life well-being. These include demographics (e.g., socioeconomic status), physical activity, psychosocial measures (e.g., loneliness, emotions, and PC), and health (e.g., self-rated health and health-related restrictions), (Chipperfield, 2008; Chipperfield et al., 2003, Newall et al., 2009; Newall, Chipperfield, Blandford, Perry, & Havens, 2004). Data were collected through in-person interviews at three points in time (1996, 2003, and 2006), providing both cross-sectional and longitudinal data.

For each SAS data collection period, participants were selected for recruitment on the grounds that they had participated in the most recent AIM study and agreed to continue participating in future interviews. Moreover, it was required that SAS participants were residents of Manitoba and satisfied a list of pre-determined criterion (e.g., cognitive capacity, articulate, English speaking, etc). Residing in a personal care home was the most frequently reported reason for not being eligible to participate in the 2003 SAS, followed by illness or having passed away. Finally, participants were ineligible if they had cognition and health restrictions, such as memory loss, hearing impairment, or hospitalization. Other participants moved out of Manitoba, withdrew from the study, were not present for an interview, or were not able to be located (Ruthig & Chipperfield, 2006; Newall et al., 2004). To date, the SAS and the larger AIM project have been funded by national agencies and have generated many published studies (for example, Chipperfield et al., 2003; Chipperfield, 2008; Chipperfield et al., 1997; Chipperfield et al., 2012; Newall et al., 2009; Roos et al., 1993; Stewart et al., 2012).

Demographics. Table 1 displays descriptive statistics for the demographic variables. Participants' self-reported *age* was collected in AIM and ranged from 79 to 96 (M = 85.03, SD = 4.30). As previously discussed, unique age-related changes at age 85+ merit the classification of

older adults into two age groups which was conducted by dichotomizing age into "Young-olds" who, in the current study, are 79 to 84 (n = 120, M = 81.58, SD = 1.41) and "Old-olds" who are 85 to 96 (n = 112, M = 88.72, SD = 3.13). *Education* was not assessed in SAS, but number of years formally educated was self-reported in the AIM 2001 interview. Missing values for education were mean replaced. On average, participants had just over 10 years of formal education (M = 10.45, SD = 2.62, *Range* = 3-21). Lastly, *annual income* was recorded. A Grubbs test was used to detect outliers, with the highest outlying values set to the highest non-outlying value (n = 232, M = $21, 230, SD = $10, 852). Missing values for income were replaced using regression replacement. As displayed in Table 1, a *socioeconomic status* (SES) variable was created by multiplying annual income and education. The above sociodemographic characteristics were entered as covariates in the major mediation analyses given that they have been shown to relate to health and psychological well-being (e.g., Chipperfield & Havens, 2001; Murrell & Meeks, 2002; Public Health Agency of Canada, 2010; Steverink, Westerhof, Bode, & Dittmann-Kohli, 2001).

Perceived control (PC). PC was assessed with nine items that ask participants the degree to which they can influence: 1) their physical health, 2) where they live or will be living, 3) who they spend their time with, 4) things they do for fun and enjoyment, 5) the development of new friendships, 6) their physical fitness, 7) the basic things for looking after themselves (e.g., cooking), 8) their physical comfort or discomfort, and 9) the usual tasks that need to be done (e.g., housework). Participants rated their responses to each of the nine items on a ten point Likert-type scale, ranging from 1 = *almost no influence* to 10 = *total influence*. A composite PC variable was created by averaging domain-specific PC scores across nine domains such that

higher scores indicated greater overall PC. Justification for the creation of this PC composite variable is provided by an exploratory factor analysis that is presented later.

Subjective health. To assess subjective health, two measures were used, allowing for the examination of the degree to which participants perceived their level of overall health (self-rated heath) and how it affects their functioning in day-to-day life (health-related restrictions). Self-rated health required participants to rate their level of health, relevant to their age, with a four point Likert-type scale, ranging from 1 = *excellent* to 4 = *poor*. Self-rated health was originally rated on a 5 point Likert-type scale (5 = *bad*); however, scores of "poor" and "bad" were collapsed because only one participant reported "bad" health. The scale of self-rated health was reverse coded, such that higher scores represent a higher degree of subjective health (M = 3.59, SD = .68).

The measurement of health-related restrictions was a two-part assessment. Participants were first asked if they had any health conditions (e.g., arthritis) or after-effects of a pre-existing medical condition (e.g., motor loss following a stroke). For each condition reported, participants were then asked to what extent they had, over a one year period, felt restricted by the respective health condition. To reflect the extent of perceived restriction for each health condition, participants were asked to choose from five options, ranging from 0 = *never* to 4 = *almost always*. These levels of restriction scores were then summed to create a composite measure of health-related restrictions (Chipperfield, 2008). Higher levels of health-related restrictions, therefore, indicate more restrictions (M = 8.28, SD = 7.33, *Range* = 1-39). There were five missing values for health-related restrictions.

Emotions. Self-reports of the frequency with which a variety of negative and positive emotions are experienced was used to assess emotions (Chipperfield et al., 2003). Participants

were presented with a list of both positive and negative discrete emotions and asked to indicate how often they felt each emotion over the past two days with a seven point Likert-type scale, ranging from 0 = *never* to 6 = *very often*. Nine positive emotions were provided as options: 1) proud, 2) grateful, 3) hopeful, 4) happy, 5) relived, 6) contentment, 7) excited, 8) love, and 9) inspired. There was one missing value for happiness, relieved, contented, excited, and inspired. For the emotion love, there were two missing values. For negative emotions, ten discrete emotions were provided as options: 1) angry, 2) guilty, 3) ashamed, 4) regretful, 5) irritated, 6) sad, 7) afraid, 8) frustrated, 9) nervous, and 10) bored. For all negative discrete emotions but anger and shame there was one missing value.

To measure global positive emotions and global negative emotions, composite variables were created by averaging the frequency of positive and negative discrete emotions. Alphas were calculated to determine the internal validity and consistency of the composite emotion measures. As will be discussed in more detail, discrete emotions isolated for the analysis of the research question 2 were selected on both theoretical and empirical grounds. For theoretical reasons, an emphasis was placed on understanding a selection of frequently reported discrete emotions observed in Chipperfield et al.'s (2003) study. Discrete emotions were also chosen based on the frequency in which they were reported on the assumption they reflect important later life emotions, thereby adding to the practicality of the proposed findings.

Lastly, a measure of emotion intensity was also considered based on a body of research as summarized in Pressman and Cohen's (2005) review that has demonstrated a relationship between the intensity of emotions and individual reports of health. In the SAS, participants who reported having experienced a discrete emotion were subsequently asked to rate the intensity of the emotion on a seven point Likert-type scale, ranging from 0 = *not intense at all* to 6 = *very*

intense. However, further analyses of the emotion intensity variables were abandoned because the frequency of positive and negative emotion measures were more highly correlated with the major study variables than were the intensity composite emotion variables.

Results

First, results from preliminary analyses are summarized for i) factor analysis of perceived control (PC) and emotions, ii) variable transformations, and iii) correlations. Second, the analytic strategies are summarized along with the results of the main hypotheses. Lastly, the findings of the exploratory research questions are presented.

Factor Analysis of the Major Study Variables

Three separate exploratory factor analyses (EFA) where conducted on PC, negative emotions, and positive emotions, respectively, in order to consider the viability of developing composite measures. One factor emerged in the EFA on PC, showing that all nine items loaded together (α = .96). This provides justification for combining the items into a single composite measure that reflects the extent to which older adults believe they can determine or directly influence events in multiple domains of their life. As displayed in Table 1, older adults reported moderately high levels of PC overall (M = 7.44, SD = 1.79).

For the global positive emotion frequency composite variable, all items were retained (α = .77). EFA did not provide basis for the creation of sub-composite factors, nor were there loadings provoking a theoretical justification for sub-composite factors. Overall, as displayed in Table 1, older adults reported a moderate frequency of positive emotions. The overall frequency of positive emotions was found to be positively correlated with PC and negatively correlated with health-related restrictions (HRR). These results suggest that greater PC and less HRR are related to a higher frequency of positive emotions.

Table 1

*Means and Standard Deviations (*SD*) for Study Variables*

Variable	All Ages		Young-old		Old-old	
	n = 232		*n* = 120		*n* = 112	
	M *SD*	*Range*	*M* *SD*	*Range*	*M* *SD*	*Range*
SES	233, 893 (163, 977)	33, 470 - 115, 200	245, 165 (162, 838)	36, 000 - 840, 014	221, 815 (165, 061)	33, 470 - 1, 152, 000
Gender	1.63 (.48)	-	1.62 (.49)	-	1.64 (.48)	-
Age	85.03 (4.30)	79 - 96	81.58 (1.41)	79 - 84	88.72 (3.13)	85 - 98
PC	7.44 (1.79)	2 - 10	7.61 (1.73)	2 - 10	7.26 (1.84)	2 - 10
	-1.25 (.33) [t]	-2.00 - -.60 [t]	-1.22 (.33) [t]	-2.00 - -.60 [t]	-1.29 (.34) [t]	-2.00 - -.60 [t]
HRR	8.28 (7.33)	0.00 - 39	7.64 (7.13)	0.00 - 33	8.98 (7.51)	0.00 - 39
	3.80 (1.77) [t]	1.00 - 8.89 [t]	3.63 (1.79) [t]	1.00 - 8.19 [t]	4.00 (1.73) [t]	1.00 - 8.89 [t]
SRH	3.59 (.68)	2 - 5	3.58 (.72)	2 - 5	3.60 (.64)	2 - 5
PE	2.72 (1.09)	.33 - 5.56	2.87 (1.19)	.33 - 5.56	2.56 (.94)	.33 - 5.33
NE	0.83 (.84)	.00 - 4.10	.87 (.88)	.00 - 4.10	0.80 (.79)	.00 - 3.90
	0.51 (.51) [t]	.00 - 1.24 [t]	.52 (.35) [t]	.00 - 1.24 [t]	0.50 (.35) [t]	.00 - 1.22 [t]

Note. PC = Perceived Control; HRR = Health-related Restrictions; SRH = Self-rated Health; NE = Negative Emotions; PE = Positive Emotions; SES = Socioeconomic status (income x education); SES was rounded up.
Gender: 1 = Male, 2 = Female
[t] = transformed variable.

Likewise, there were no apparent theoretical or statistical grounds for creating sub-composite factors for negative emotions. Therefore, all items in the global negative emotion frequency composite variable were retained (α = .83). As seen in Table 1, overall, older adults reported a low frequency and had little variability in their reports of negative emotions. The frequency of negative emotions was found to be negatively correlated with PC and HRR, as well as positively related with self-rated health, suggesting that high PC and better subjective health is related to less negative emotions.

Transformations of Major Study Variables

The distributions for all major study variables were inspected to ensure they conformed to the assumption of normality required by the General Linear Model (Howell, 2010). An objective and quantified approach was taken to determine if a distribution required transformation. This was favored over a visual inspection that is commonly used to determine normality of a distribution (Osborne, 2002). A non-normal variable required a transformation if the skew of the relevant variable's distribution fell within the range of twice the standard error of the skew (SE_{skew}), where a problematic skew = Skew $\leq \pm SE_{skew}$ *2 (Price, 2000). In cases where a variable required transformation, a systematic approach was taken.

First, a square root (SQRT) transformation was used. If a SQRT transformation did not successfully adjust for non-normality, a logarithmic (LG10) transformation was used. In instances where the minimum value for a variable was zero, one was added as a constant (for more information refer to Howell, 2010). Moreover, for some variables that were negatively skewed, a SQRT and LOG10 transformation provided coefficients that reversed the original relationship between variables (Grissom, 2000). Therefore, in these cases, the transformation was reflected, then "re-reflected" to rectify the relationship directions. Lastly, as will be

discussed in more detail, a customized transformation equation was created for distributions not corrected by both the standard SQRT and LG10 transformations (R. K. Jamieson, personal communication, May 28, 2012). When a skew was improved, no further transformations were undertaken. A subsequent bivariate correlation analysis between the original non-transformed variable and transformed variable was conducted for each transformation in order to determine indiscriminant validity.

Three of the major variables were non-normal and required transformation: PC, HRR, and negative emotions. Because participants generally reported a high perception of control, PC was highly negatively skewed, falling .51 outside the ± .32 range (*skew* = -.83, SE_{skew}= .16; *kurtosis* =.23). Using a unique LG10 transformation correction, where LG10(12-PC*-2), improved the distribution of PC scores to near-normality (*skew* = -.07, SE_{skew} = .16; *kurtosis* = -.70). A subsequent bivariate correlation demonstrated high indiscriminant validity of the transformed PC variable (r = .98, p < .001).

The distribution of HRR was moderately positively skewed (*skew* = 1.21, SE_{skew} = .16; *kurtosis* = 1.58). On average, participants reported a high number of HRR, with the skew falling .89 outside the ± .32 range. A unique transformation equation was created, where SQRT(HRR*2+1). The distribution of HRR was successfully improved (*skew* = .24, SE_{skew} = .16; *kurtosis* = -.50). Indiscriminant validity of the transformed HRR variable was supported (r = .97, p < .001).

Lastly, participants tended to report a low frequency of negative emotions. In line with the previously mentioned studies (see Chipperfield et al., 2003; Carstensen, Pasupathi, Mayr, & Nesselroade, 2000) older adults were found to report significantly less negative emotions than positive emotions (t(1, 229) = -.836, p < .001). Therefore, the global measure of negative

Table 2

Bivariate Correlations between Covariates and Study Variables

	SES	Gender	Age	PC	HRR	SRH	PE	NE
SES	-	-0.32**	0.08	0.20**	-0.13	0.14*	0.08	-0.07
Gender		-	0.04	-0.11	0.06	-0.05	0.05	-0.03
Age			-	-0.15*	0.15*	0.04	-0.12	-0.02
PC				-	-0.33**	0.35**	0.29**	-0.30**
HRR					-	-0.37**	-0.25**	0.41**
SRH						-	0.19**	-0.26**
PE							-	-0.00
NE								-

Note. SES = Socioeconomic status (income x education); PC = Perceived Control; HRR = Health-related Restrictions; SRH = Self-rated Health; PE = Positive Emotions; NE = Negative Emotions.
[1] = Pearson's r, [2] = Non parametric.
*p < .05, **p < .01, ***p < .001.

emotions (NE) was found to be highly positively skewed, falling .94 outside the ± .32 range (*skew* = 1.26; SE_{skew} = .16; *kurtosis* = 1.40). A unique transformation equation was applied, where LG10(1+NE*4). The skew of the transformed negative emotions variable was improved (*skew* = -.05; SE_{skew} =.160; *kurtosis* = -1.09) and indiscriminant validity of the transformed negative emotions variable was supported (r = .93, p < .01).

In sum, the above transformations of the non-normal variables improved the skewed distributions to near-normality. Moreover, high indiscriminant validity was observed for each transformed variable. Therefore, the transformed variables were used for all subsequently described analyses. Table 1 displays the means and standard deviations of the major study variables that are transformed. Notably, there are minute differences between the original and transformed variable descriptive values. Nevertheless, the transformation of raw data lends itself to a complex interpretation of the results. Thus, the following interpretation of results, particularly in respect to unit changes (e.g., beta weights), are only interpretable for the transformed variables (Grissom, 2000; Howell, 2010).

Preliminary Correlational Analyses

Table 2 provides the bivariate correlations between all major variables and demographics. In respect to the major study variables, bivariate correlations demonstrated that PC is significantly related with all health and emotion measures (see Table 2). Specifically, positive relationships were found with PC, self-rated health (SRH), and positive emotions, whereas inverse relationships were found with HRR and negative emotions, suggesting that high PC is related to better subjective health, a high frequency of positive emotions, and a lower frequency of negative emotions.

Demographic covariates. As mentioned, Table 2 displays all the bivariate correlations between the demographic variables and major study variables. Notably, the correlations with the non-transformed variables were nearly identical. First, age was not found to be related to any other demographic variables. Importantly, however, age was significantly and positively related to PC, implying that, as the participants age, they report less PC. Age was also significantly and positively related to health-related restrictions, such that the older adults were the more restrictions they reported as being due to their health. SES was negatively related to gender; female participants were more likely to have lower SES status than males. SES was also positively related to PC and positively correlated with self-rated health. Age, gender, and SES, therefore, were retained in the analyses as covariates.

Analysis of the Perceived Control, Health, and Emotion Linkage

Rationale for analyses. Using Baron and Kenny's (1986) approach, a causal steps meditational analysis with a series of linear regressions was undertaken to examine the meditational effect of subjective health in the PC-emotion relationship. Each regression model also included the covariates (age, gender, and SES). As previously mentioned, the analyses were conducted for the full sample as well as separately for the young-old and old-old cohorts. Therefore, in the latter cases, age was removed as a covariate. A Sobel test was conducted to consider whether the indirect X→M→Y path, where subjective health (M) partially mediates the effect of PC (X) on emotions (Y), was significant. With a sufficient sample size, the Sobel test allows for an indirect computation of the *p*-value against the unit normal *Z* distribution. A more detailed description of the Sobel test is found elsewhere (e.g., Baron & Kenny, 1986; MacKinnon & Dwyer, 1995; Sobel, 1982).

The full sample mediation models included over 138 participants, which was deemed to be sufficient in an a priori power analysis (G*Power 3.1) that assumed a two-tailed distribution with a decision criteria of $\alpha = .05$. This power analysis estimated that a minimum sample size of 138 is required to detect a medium effect size ($d = .15$) with a power of $\beta = .95$ in a multiple regression model with five predictors (PC, three covariates, and one subjective health measure). However, as outlined later, invalid responses for some variables resulted in smaller samples for the analyses of some models.

Lastly, to determine statistically significant differences between model fits and model paths, a Fisher's Z-Test (FZT) was used (Cohen, 1992). To conduct these FZTs, the comparison samples were restricted to participants who had valid values on all relevant variables. This was done to avoid comparing betas from models based on different samples.

Health as a mediator of the perceived control and positive emotion relationship. Table 3 summarizes the results of a series of linear regressions to test Hypothesis 1, that subjective health (M) is a partial mediator of the PC (X) and positive emotion (Y) relationship. As outlined below, this involved the analysis of multiple paths in the model.

Health-related restrictions (HRR). As depicted in Table 3 and Figure 1, the hypothesis that HRR partially mediate the relationship between PC and positive emotions was supported. PC reliably predicted positive emotions, $\beta = .28$, $SE = .21$, $p < .001$, providing support for the hypothesis that higher reports of PC should relate to a higher frequency of positive emotions (path c). Additionally, high PC was related to less HRR (path a) and less HRR predicted a higher frequency of positive emotions (path b). Notably, a .05 decrease in path c, β (.28 -.23 = .05) resulted when HRR was added in the model (path c′). Mediation was confirmed using the Sobel test, showing a significant indirect PC → HRR → PE path, $Z = 2.11$, $SE = .08$, $p < .05$. A

Table 3

Regression Results for the Analysis of Subjective Health as a Mediator of the Perceived Control and Positive Emotions Relationship

Mediator	Path	*b*(*SE*)	*β*	df_1, df_2	R^2
HRR					
	a PC → HRR	-1.80 (.34)	-0.34***	4, 220	.14
	b HRR → PE	-0.14 (.04)	-0.23***	4, 220	.08
	c PC → PE	0.92 (.21)	0.28***	4, 220	.10
	c′ PC →PE	0.75 (.23)	0.23***	5, 219	.12
SRH					
	a PC → SRH	0.69 (.13)	0.34***	4, 225	.13
	b SRH → PE	0.30 (.12)	0.19**	4, 225	.06
	c PC → PE	0.85 (.21)	0.26***	4, 225	.09
	c′ PC →PE	0.42 (.04)	0.22	5, 224	.10

Note. PC = Perceived Control; HRR = Health-related Restrictions; SRH = Self-rated Health.
Covariates included in each path are SES, gender, and age.
β =Standardized beta weights; R^2 = non-adjusted R^2.
*$p < .05$, **$p < .01$, ***$p < .001$.

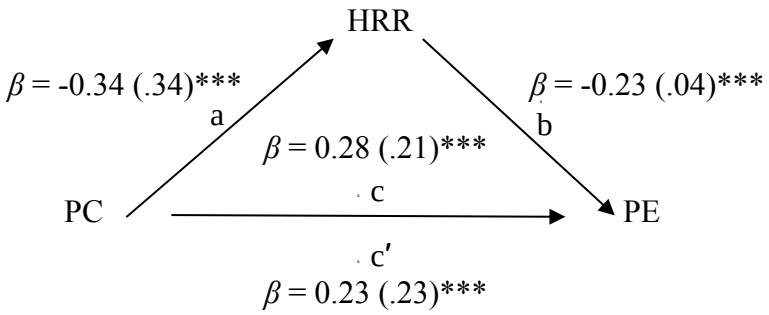

Figure 1. Health-related restrictions as a partial mediator of the perceived control and positive emotion relationship (n = 225).
PC = Perceived Control; HRR = Health-related Restrictions; PE = Positive Emotions.
Covariates included in each path are SES, gender, and age.
β =Standardized beta weights.
*p < .05, **p < .01, ***p < .001.

moderate model fit of the data is suggested by the model fit indices, showing that the covariates and major study variables account for approximately 12% of the variance in positive emotions (Table 3).

Self-rated health (SRH). The hypothesis that SRH partially explains the relationship between PC and positive emotions was not supported. Interestingly, as seen in Table 3, path c,' was non-significant, suggesting a full mediation. However, mediation was not confirmed with a Sobel test, $Z = 1.54$, $SE = .08$, $p = .12$. Nonetheless, the findings for the separate paths are notable. The more PC participants reported, the better their SRH (path a). The better participants reported their SRH, the more positive emotions they reported (path b). A decrease in path c, β (.26 - .22 = .04) resulted when SRH was added to the model (path c′).

In order to further investigate the mediating role of SRH in the PC and positive emotions relationship, covariate reduction was performed. First, age was removed as a covariate based on the theoretical premise (Rodin, 1986) and statistical findings in the current study that age is strongly related to PC and health. The removal of age from the model failed to reveal a significant mediation path. Arbitrary covariate deletion followed. When removing gender in conjunction with age, as well as when removing age, gender, and SES the mediation path failed to approach significance.

In sum, with only one exception of the c′ path for the meditating effect of SRH, statistically significant paths emerged in the analysis of the positive emotions outcome. As such, the significant mediation path in the analysis of HRR appears to play a role in the PC and positive emotions relationship whereas SRH does not. Although HRR plays a unique mediating role in the PC and positive emotions experience in later life, SRH is nonetheless an important predictor of positive emotions. In fact, a FZT failed to find a significant difference between PC

predicting HRR better than SRH, where $Z_{observed}$ (n = 227) = .12 < $Z_{critical}$ = 1.96, p < .05; or the observation that HRR predicts positive emotions better than SRH, $Z_{observed}$ (n = 225) = .36 < $Z_{critical}$ = 1.96, p < .05. Therefore, the above results suggest that whereas SRH is associated with PC and positive emotions no more significantly than HRR, unlike HRR, SRH does not partially explain why older adults' PC is associated with their positive emotions.

Health as a mediator of the perceived control and negative emotion relationship. In hypothesis 2, it was predicted that subjective health (M) partially mediates the PC (X) and negative emotion (Y) relationship. The hypothesis was supported for both measures of subjective health (Table 4), as discussed below.

Health-related restrictions (HRR). Table 4 displays the results showing support for the hypothesis that HRR serve as a partial mediator of the PC and negative emotion relationship. The findings parallel the results shown in Figure 1 for HRR and positive emotions. PC was found to reliably predict negative emotions, such that high PC predicted fewer reports of negative emotions, β = -.31, SE = .07, p < .001 (path c). Moreover, higher PC was found to predict less HRR (path a), which in turn predicted more frequent reports of negative emotions (path b). A decrease in path c, β(-.31 - -.19 = -.12) resulted when HRR was added in the model (path c′). Mediation was confirmed, showing a significant indirect PC → HRR → NE path, Z = 3.77, SE = .03, p < .001. A strong model fit is suggested by the data, with PC and HRR explaining approximately 21% of the variance in negative emotions (Table 4).

Self-rated health (SRH). As depicted in Table 4 and Figure 2, the hypothesis that SRH partially mediates the PC and negative emotion relationship was supported. PC significantly predicted SRH (path a), supporting the hypothesis that higher PC should foster better health. Additionally, higher SRH was significantly related to less negative emotions (path b). A

Table 4

Regression Results for the Analysis of Subjective Health as a Mediator of the Perceived Control and Negative Emotion Relationship

Mediator	Path	*b*(*SE*)	*β*	df_1, df_2	R^2
HRR					
	a PC → HRR	-1.79 (.34)	-0.34***	4, 221	.14
	b HRR → NE	0.08 (.01)	0.42***	4, 221	.18
	c PC → NE	-0.32 (.07)	-0.31***	4, 221	.10
	c′ PC →NE	-0.20 (.07)	-0.19**	5, 220	.21
SRH					
	a PC →SRH	0.68 (.13)	0.34***	4, 226	.13
	b SRH → NE	-0.13 (.03)	-0.26***	4, 226	.08
	c PC → NE	-0.34 (.07)	-0.33***	4, 226	.11
	c′ PC →NE	-0.28 (.07)	-0.27***	5, 225	.14

Note. PC = Perceived Control; HRR = Health-related Restrictions; SRH = Self-rated Health.
Covariates included in each path are SES, gender, and age.
β =Standardized beta weights; R^2 = non-adjusted R^2.
*$p < .05$, **$p < .01$, ***$p < .001$.

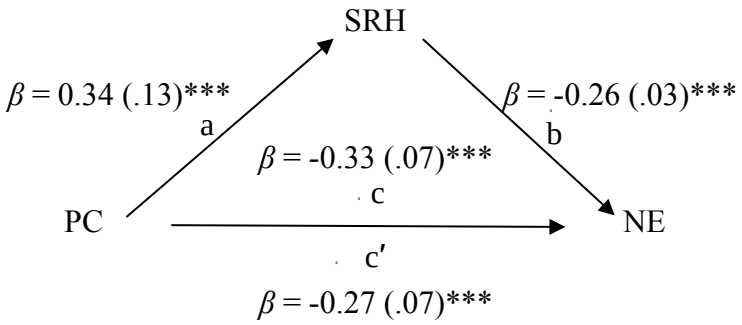

Figure 2. Self-rated health as a partial mediator of the perceived control and negative emotion relationship (n = 231).
PC = Perceived Control; SRH = Self-rated Health; NE = Negative Emotions.
Covariates included in each path are SES, gender, and age.
β =Standardized beta weights.
*p < .05, **p < .01, ***p < .001.

decrease in path c β(-.33 - -.27= -.06) was observed when SRH was added into the model (path c′). A Sobel test confirmed a mediation showing a significant indirect PC → SRH → NE path, Z = 2.30, SE =.03, $p < .05$. Model fit indices suggest a moderate model fit, demonstrating that the covariates and major study variables account for approximately 14% of the variance in negative emotions (Table 4).

To summarize, the hypothesis that the PC and negative emotion relationship is partially mediated by subjective health was supported in the analyses of both health measures. Although PC and HRR explained 7% more variance in negative emotions than PC and SRH (where, 21% - 14% = 7%), a FZT failed to support a significant difference between model fits, $Z_{observed}$ (n = 225) = .98 < $Z_{critical}$ = 1.96, $p < .05$ (see Table 4). Therefore, the role of PC and health in mediating negative emotions does not significantly differ depending on the subjective health measure (HRR or SRH). Additionally, as was the case for positive emotions, HRR were found to predict negative emotions relatively better than SRH, β(.42 - -.26= .16); however, a significant difference between the two health predictors was not supported, $Z_{observed}$ (n = 226) = 1.18 < $Z_{critical}$ = 1.96, $p < .05$. Therefore, both subjective health measures predicted negative emotions equally well. Interestingly differences did arise, however, with respect to the young-old and old-old cohorts.

Young-olds versus old-olds. Before testing the third hypothesis that the strongest indirect mediation effects of health on the PC → emotion paths would be observed in the old-olds, preliminary analyses considered potential differences between the young-old and old-old on the major study variables (see Table 1). To detect any significant differences between the two age cohorts on the major study variables, independent sample t-tests were conducted. On

average, the young-olds (M = 2.85) reported a higher frequency of positive emotions than the old-olds (M = 2.54), $t(1, 230) = -.260$, $p < .05$, which further merits the separate investigation of the mediation models for the two age cohorts.

Before conducting the mediation analyses, an a priori power analysis was undertaken to consider the viability of detecting significant effects in small samples (n = 122 for young-old; n = 120 for old-old). G*Power 3.1 was used to determine the minimum sample size required for detecting a medium effect size (d = .15) for a multiple regression model with four predictors, as was the case for the model in hypothesis 1 (PC, two covariates, and one subjective health measure). Given a two-tailed distribution with a decision criteria of α = .05, a minimum of 129 participants is required to find an effect. Therefore, the smaller sample sizes for these models are a shortcoming in respect to Type II error (Faul, Erdfelder, Buchner, & Lang, 2009). Nevertheless, the analyses were conducted and a brief summary of the results is provided.

Beginning with the young-old (Table 5), and the analysis involving HRR, all of the paths were significant for both for positive emotions and negative emotions. However, mediation was not supported. Sobel tests failed to support a significant indirect PC →HRR → emotion path, for either positive emotions or negative emotions, Z = 1.57, SE = .10, $p > .05$; Z =1.91, SE = .04, $p > .05$, respectively.

For the analysis of the young-olds' SRH, the requirements of a mediation effect were not met in the model for positive emotions; that is, paths a and b were not significant (Table 5). Therefore, a Sobel test was not conducted. For negative emotions, however, each path was significant, although a Sobel test did not support a significant indirect PC →SRH → negative emotion path, Z =0.76, SE = .112, $p > .05$. The results failed to support the hypothesis that

Table 5

Regression Results for the Analysis of Subjective Health as a Mediator of the Perceived Control and Emotion Relationship for Young-old Adults

		Positive Emotions				Negative Emotions			
Mediator	Path	*b*(*SE*)	*β*	df_1, df_2	R^2	*b*(*SE*)	*β*	df_1, df_2	R^2
HRR									
	a PC → HRR	-1.24(.51)	-0.23*	3, 113	.06	-1.23(.51)	-0.23**	3, 114	.07
	b HRR → E	-0.16 (.06)	-0.24**	3, 113	.07	0.07 (.02)	0.34***	3, 114	.12
	c PC → E	1.09 (.34)	0.30**	3, 113	.10	-0.30 (.10)	-0.28**	3, 114	.08
	c′ PC → E	0.98 (.34)	0.26**	4, 112	.13	-0.06 (.03)	-0.21**	4, 113	.14
SRH									
	a PC → SRH	0.69 (.20)	0.04	3, 115	.10	0.69 (.20)	-0.32***	3, 116	.09
	b SRH → E	0.26 (.15)	0.16	3, 115	.04	-0.10 (.05)	-0.21*	3, 116	.05
	c PC → E	1.09 (.34)	0.30**	3, 115	.10	-0.30 (.10)	-0.28**	3, 116	.08
	c′ PC → E	1.00 (.35)	0.28	4, 114	.10	-0.25 (.10)	-0.24**	4, 115	.10

Note. PC = Perceived Control; HRR = Health-related Restrictions; SRH = Self-rated Health; E = Emotions. Covariates included in each path are SES and gender.
β =Standardized beta weights; R^2 = non-adjusted R^2.
*$p < .05$, **$p < .01$, ***$p < .001$.

subjective health mediates the PC-emotion relationship for the young-old although this could be due to a lack of power.

For the analysis of the oldest-old (Table 6), the strongest effects of PC and subjective health on emotions were found in regards to HRR, paralleling the results observed in hypothesis 1 for HRR and negative emotions. A decrease in path c, β(-.35 - -.13 = -.22) resulted when HRR was added to the negative emotion model (path c′). Full mediation was confirmed using a Sobel test, showing a significant indirect PC → HRR → NE path, $Z = 3.56$, $SE = .06$, $p < .001$. A strong model fit is suggested by the model fit indices, where PC and HRR account for approximately 30% of the variance in negative emotions (Table 6). Lastly, although the a, b, and c paths were significant in respect to the HRR and positive emotion (PE) model, a Sobel test failed to support a significant indirect PC→ HRR → PE path, $Z = 1.73$, $SE = .18$, $p > .05$.

SRH did not mediate the PC-emotion relationship for the oldest-olds. For the analysis of positive emotions and SRH, the requirements of a mediation effect were not met; that is, path b was not significant (Table 6). Therefore, a Sobel test was not conducted. For the analysis of negative emotions and SRH, all paths were significant, although a Sobel test did not support a significant indirect path, $Z = 0.76$, $SE = .11$, $p > .05$.

Exploratory Research Questions

Comparing the indirect perceived control, subjective health, and emotion paths. Research question one inquired if there are differences between the PC-emotion relationship for the two different subjective measures of health. Because only the HRR model was significant for positive emotions, a comparison of the two health measures in regards to PC and positive emotions was not undertaken.

Conversely, both negative emotion (NE) models for each of the subjective health

Table 6

Regression Results for the Analysis of Subjective Health as a Mediator of the Perceived Control and Emotion Relationship for Old-old Adults

		Positive Emotions				Negative Emotions			
Mediator	Path	*b*(*SE*)	*β*	df_1, df_2	R^2	*b*(*SE*)	*β*	df_1, df_2	R^2
HRR									
	a PC → HRR	-2.47 (.47)	-0.48***	3, 104	.24	-2.47 (.45)	-0.48***	3, 104	.24
	b HRR → E	-0.12 (.05)	-0.22*	3, 104	.06	0.10 (.02)	0.51***	3, 104	.29
	c PC → E	0.76 (.27)	0.27**	3, 104	.08	-0.36 (.09)	-0.35***	3, 104	.15
	c′ PC →E	0.59 (.30)	0.21	4, 103	.10	-0.14 (.10)	-0.13	4, 103	.30
SRH									
	a PC → SRH	0.13 (.03)	0.37***	3, 110	.20	0.69 (.16)	0.37***	3, 107	.20
	b SRH → E	0.37 (.14)	0.25	3, 110	.06	-0.16 (.05)	-0.30**	3, 107	.12
	c PC → E	0.13 (.05)	0.25**	3, 110	.07	-0.39 (.09)	-0.38**	3, 107	.17
	c′ PC → E	0.09 (.05)	0.18	4, 109	.09	-0.32 (.10)	-0.31**	4, 106	.20

Note. PC = Perceived Control; HRR = Health-related Restrictions; SRH = Self-rated Health; E = Emotions. Covariates included in each path are SES and gender.
β =Standardized beta weights; R^2 = non-adjusted R^2.
*p < .05, **p < .01, ***p < .001.

measures were significant. These results suggest that for negative emotions, subjective health plays a *broader* role in comparison to positive emotions. As mentioned previously, when comparing the magnitude of the indirect PC → HRR → NE and PC → SRH → NE paths, there was no significant difference found. Therefore, although PC and subjective health may play a more extensive or consistent role in later life negative emotions, a more specific claim that PC and HRR predict negative emotions better than they predict positive emotions is not supported.

Research question one also inquired if there are differences between the PC-health-emotion relationship for the two different emotion measures. Because only the HRR model was significant for positive emotions, a comparison of the two subjective health measures (HRR and SRH) was not undertaken. However, when comparing the magnitude of the indirect PC → HRR → NE and PC → HRR → PE paths, there was no significant difference found. Therefore, although PC and subjective health may play a more extensive role in later life negative emotions, as well as PC and HRR in emotions in general, a claim that PC and subjective health predict negative emotions better than they predict positive emotions or emotions in general is not supported.

The role of perceived control and health in discrete emotions. Research question two explored whether subjective health mediates the relationship between PC and certain discrete emotions. To answer this question, the main mediation models were re-examined after replacing the global emotion measures with select positive and negative discrete emotions. As previously mentioned, the selection of discrete emotions for analysis was based on the mean of their frequency, as well as those discrete emotions that have been deemed theoretically important in later life.

Positive discrete emotions. Four discrete positive emotions were selected for analysis on the basis that they showed the highest mean frequency: love (M = 4.04, SD = 1.45), happiness (M = 3.93, SD = 1.45), contentment (M = 3.87, SD = 1.59), and gratefulness (M = 3.59, SD = 1.69). This is consistent with the most frequently reported discrete positive emotions in later life observed in Chipperfield et al's (2003) study (although in that study, love was not assessed).

Notably, the four positive discrete emotion variables were highly negatively skewed given that many participants reported a high frequency of positive emotions. In an attempt to improve the non-normality of the discrete positive emotions and to limit the interpretation of the results to individuals having actually reported discrete positive emotions, participants who reported not having experiencing the emotions (responses of zero) were deleted. The deletion improved the non-normality for happiness (*skew* = -.01, SE_{skew}= .18; *kurtosis* = -.86), contentment (*skew* = -.23, SE_{skew}= .18; *kurtosis* =.67), and gratefulness (*skew* = .14, SE_{skew}= .18; *kurtosis* =-.92). Love, however, remained moderately and negatively skewed, falling .12 outside the ± .34 range (*skew* = -.46, SE_{skew} = .17; *kurtosis* = -.60). Neither a SQRT nor LG10 transformation corrected the skew, but a custom equation to transform love SQRT(8-love) successfully improved the distribution to near-normality (*skew* = .18, SE_{skew} = .17; *kurtosis* = -.97). A high indiscriminate validity was found, such that the transformed love variable correlated highly with the non-transformed variable (r = .996, $p < .001$).

Table 7 shows the findings from a regression analyses that were conducted separately for each discrete positive emotion, including separate models for each discrete emotion, first for HRR and then for SRH. Beginning with the models that included HRR, in each of the separate

Table 7

Regression Results for the Analysis of Subjective Health as a Mediator of the Perceived Control and Discrete Positive Emotion Relationship

		Health-related Restrictions				Self-rated Health			
Dependent Variable	Path	*b*(*SE*)	*β*	df_1, df_2	R^2	*b*(*SE*)	*β*	df_1, df_2	R^2
Happiness	a PC → SH	-1.84 (.35)	-0.34***	4, 214	.15	0.73 (.13)	0.35***	5, 218	.14
	b SH → DPE	-0.18 (.05)	-0.26***	4, 214	.07	0.49 (.12)	0.26***	5, 218	.07
	c PC → DPE	1.48 (1.63)	0.38***	4, 214	.14	1.51 (.25)	0.38***	5, 218	.14
	c′ PC → DPE	1.28 (.27)	0.33***	5, 213	.16	1.30 (.27)	0.33***	6, 217	.16
Contentment	a PC → SH	-1.93 (.35)	-0.36***	4, 212	.16	0.66 (.13)	0.33***	4, 217	.12
	b SH → DPE	-0.27 (.05)	-0.34***	4, 212	.12	0.62 (.14)	0.30***	4, 217	.10
	c PC → DPE	1.94 (.27)	0.45***	4, 212	.20	1.95 (.27)	0.46***	4, 217	.21
	c′ PC → DPE	1.63 (.29)	0.38***	5, 211	.24	1.71 (.28)	0.40***	5, 216	.23
Gratitude	a PC → SH	-1.84 (.36)	0.35***	4, 203	.15	0.68 (.13)	0.34***	4, 207	.13
	b SH → DPE	-0.21 (.05)	-0.23***	4, 203	.11	0.36 (.14)	0.18***	4, 207	.07
	c PC → DPE	0.96 (.28)	0.24***	4, 203	.09	0.91 (.27)	0.23***	4, 207	.08
	c′ PC → DPE	0.65 (.29)	0.17*	5, 202	.13	0.75 (.29)	0.19***	5, 206	.10

Note. PC = Perceived Control; SH: Subjective Health; DPE: Discrete positive emotion; Covariates included in each path are SES, gender, and age.
β =Standardized beta weights; R^2 = non-adjusted R^2; $p < .05$, $^{**}p < .01$, $^{***}p < .001$.

models for discrete emotions (path c): High PC predicted more frequent reports of happiness, contentment, and gratitude (path c). High PC also significantly and inversely predicted HRR (path a). Moreover, the number of HRR significantly predicted less frequent reports of each of the three discrete emotions (paths b). Sobel tests supported partial mediation effects for each of the models. When including HRR as a mediator of the PC and happiness relationship the indirect path was significant, $Z = 1.995$, $SE = .10$, $p < .05$, showing a partial mediation. A moderate model fit was observed, with PC and HRR explaining approximately 16% of the variance in happiness (Table 7). For contentment, a partial indirect mediation effect was significant, $Z = 2.72$, $SE = .12$, $p < .01$ and the PC and HRR model explained 24% of the variance (Table 7). Lastly, HRR was found to partially mediate the PC and gratitude relationship, $Z = 2.67$, $SE = .11$, $p < 01$. A moderate model fit was observed with approximately 13% of gratitude's variance was explained by PC and HRR (Table 7).

Similar results were found for models including SRH as a mediator (see Table 7). SRH significantly predicted happiness, contentment, and gratitude, such that better reports of SRH were associated with more frequent reports of each discrete emotion (path b). A Sobel test supported a partial mediation effect for SRH in the analysis of happiness, $Z = 2.04$, $SE = .10$, $p < .05$, showing that SRH better helps explain why PC fosters happiness (Table 7). Notably, PC and SRH explained approximately 16% of the variance in happiness. A reliable indirect path was also supported in the analysis of contentment, $Z = 2.34$, $SE = .10$, $p < .01$. PC and SRH explained a large (23%) amount of the variance in contentment (see Table 7). In contrast, a significant indirect path was not supported in the analysis of gratitude, $Z = 1.58$, $SE = .10$, $p = .115$.

Notably, there was a striking difference between the effect PC had on contentment compared to gratitude, path c, β(.45 -.24= -.21). A FZT was used to detect if PC significantly predicts contentment better than gratitude. PC was not found to be a stronger predictor of contentment than gratitude, $Z_{observed}$ (n = 205) = 1.95 < $Z_{critical}$ = 1.96, $p < .05$. Moreover, the amount of variance PC and HRR explained in contentment was much larger than observed in gratitude. To understand if there was a significant difference between observed effect PC and HRR had on contentment (24%) that was almost double in size PC and HRR had on gratitude (13%) was significantly different, a FZT was conducted. A FZT failed to confirm a significant difference between the HRR models for contentment and gratitude, suggesting that PC and HRR are not more powerful predictors of contentment in later life than when predicting feelings of gratitude, $Z_{observed}$ (n = 201) = 1.65 < $Z_{critical}$ = 1.96, $p < .05$.

Lastly, the findings for the analysis of love are not reported in Table 7 because a Sobel test was not significant in the analysis of either the HRR or SRH (Z = 1.50, SE = .03, $p > .05$; Z = .99, SE = .02, $p > .05$, respectively). Thus, no support was found to suggest that the relationship between PC and love was due to subjective health. However, PC was found to predict reports of love (untransformed), β = .225, SE = .28, $p < .001$. HRR was also found to predict love, however SRH did not (β = .187, SE = .01, $p < .01$; β = -.125, SE = .04, $p > .071$, respectively). Not only do these results further replicate the important of HRR, but they suggest that love is a discrete emotion of interest when studying later life control beliefs, subjective health, and emotions.

Overall, when entering discrete positive emotions into the mediation models, most of the mediation models are significant. As previously noted, the interpretation of these findings is based only on the positively “emotional” individuals since those who did not report these

discrete emotions were excluded from the analysis. Specifically, with the exception of gratefulness and love, both HRR and SRH are partial mediators of the PC and discrete positive emotion relationship. It was hoped that these results would offer a more specific understanding of the PC and important positive emotion relationships in later life. However, for many of the discrete positive emotions, the effects of PC and health were similar. For example, even the apparently large difference in effect that was observed for PC and HRR on contentment and gratefulness was insignificant. As such, although a more precise breakdown of the discrete positive emotions is interesting in its own right by illuminating the various individual effects of PC and health on certain positive emotions, the inference that perhaps PC and health mediation models are stronger for certain discrete positive emotions than others is refuted. In sum, the analysis of discrete positive emotions further supports the analysis of global positive emotions in the current study.

Negative discrete emotions. The three discrete negative emotions that were selected for further analysis were those with the highest mean frequency of occurrence: boredom (n = 88, *M* = 3.10, *SD* = 1.21), frustration (n = 111, *M* = 2.93, *SD* = 1.25), and sadness (n = 103, *M* = 2.79, *SD* = 1.26). Again, these negative emotions were highly skewed, and attempts were made to reduce non-normality by deleting individuals who had not experienced the emotions. As a result of the deletion, the sample sizes for the analyses ranged from 88 to 111 participants. Thus, further analysis of discrete negative emotions were abandoned due the power being substantially lower than what is recommended in a G*Power 3 analysis (n = 138) to detect a medium effect size (*d* = .15) with five predictors.

Competing model: Emotions as a mediator of the perceived control and health relationship. Research question three asked whether a competing model would offer a greater

understanding than the *original models* that examined subjective health as a mediator of the PC-emotion relationship (for examples, see Figures 1 and 2). The *competing model* (Figure 3) involved an alternate ordering of the mediating and dependent variables to address a different question: Do emotions explain the PC and health relationship? Specifically, the indirect PC (X), emotion (M), and subjective health (Y) path was assessed using Baron and Kenny's (1985) procedure for mediation analysis. Again, the models were tested for the full sample and separately for the old-old compared to the young-old. In order to simplify the comparison of the original and competing models, the following discussion focuses only on the significant mediation effects that emerged in these competing models.

Positive emotions as a mediator of the perceived control and health-related restriction (HRR) relationship. Table 8 presents the paths for the analysis of the competing model that examined health-related restrictions (HRR) as the dependent measure of health. Positive emotions partially mediated the PC and HRR relationship (Figure 3). Positive emotions significantly predicted HRR (path b), such that a higher frequency of positive emotions predicts less HRR. A decrease in path c, β(-.34 - -.30 =-.04) resulted when positive emotions was added as a mediator of the PC and HRR relationship (path c′). A significant indirect PC →PE→HRR path was confirmed with a Sobel test, $Z = 2.02$, $SE = .11$, $p < .05$. A moderate model fit was observed as well, where PC and positive emotions explain approximately 16% of the variance in HRR (Table 8).

Overall, the results parallel those described in the original HRR and positive emotion models (hypotheses 1 and 3). To consider whether the original or competing models differed significantly (12% - 16% - 4%), a follow up Fisher's Exact Z test (FZT) was conducted to test

Table 8

Regression Results for the Competing Model Analysis of Positive Emotions as a Mediator of the Perceived Control and Health-Related Restrictions Relationship

Dependent Variable	Path	*b*(*SE*)	*β*	df_1, df_2	R^2
HRR					
	a PC → PE	0.92 (.22)	0.28***	4, 220	.10
	b PE → HRR	-0.32 (.12)	-0.23***	4, 220	.09
	c PC → HRR	-1.79 (.34)	-0.34***	4, 220	.14
	c′ PC → HRR	-1.57 (.35)	-0.30***	5, 219	.16

Note. PC = Perceived Control; HRR = Health-related Restrictions; PE = Positive Emotions.
Covariates included in each path are SES, gender, and age.
β =Standardized beta weights; R^2 = non-adjusted R^2.
*$p < .05$, **$p < .01$, ***$p < .001$.

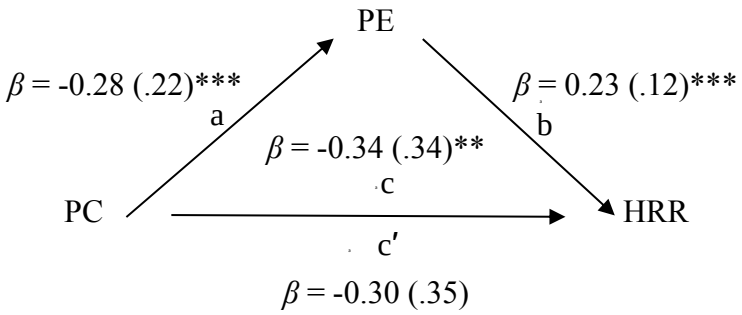

Figure 3. Positive emotions as a full mediator of the perceived control and health-related restrictions relationship for Young-old adults (n = 118).
PC = Perceived Control; PE = Positive Emotions; HRR = Health-related Restrictions.
Covariates included in each path are SES and gender.
β =Standardized beta weights
*p < .05, **p < .01, ***p < .001.

the difference between the models. A significant difference between the original and competing model fit was not found, $Z_{observed}$ (n = 225) = .46 < $Z_{critical}$ = 1.96, p < .05.

Negative emotions as a mediator of the perceived control and subjective health relationship. Negative emotions were found to significantly mediate the relationship between PC and health, both for HRR and for SRH. First, a mediating effect of negative emotions on the PC and HRR linkage was investigated (Table 9). Negative emotions partly mediated the relation between PC and HRR. All paths were significant. Negative emotions predicted HRR, such that the more negative emotions participants experienced the more HRR they reported (path b). A decrease in path c, β(-.34 - -.23 =-.11) resulted when negative emotions were added to the model (path c′). Mediation was confirmed using a Sobel test, showing a significant indirect PC →NE→HRR path, Z = 3.59, SE =.16, p < .001. Model fit indices suggest a good model fit, where PC and negative emotions explain approximately 25% of the variance in HRR. A FZT failed to support a significant difference between the original and competing models including HRR and negative emotions (21% - 25% = 4%), $Z_{observed}$ (n = 226) = .431 < $Z_{critical}$ = 1.96, p < .05.

Negative emotions were also found to reliably and partially mediate the PC and SRH relationship (Table 9). All paths were significant. The less negative emotions participants reported, the better their SRH, β = -.25, SE = .12, p < .001 (path b). A decrease β (.34 - .28 =.06) in path c resulted when negative emotions were added to the model (path c′). Mediation was confirmed using a Sobel test, showing a significant indirect PC →NE→SRH path, Z = 2.26, SE =.05, p < .05. A moderate model fit was observed, where PC and negative emotions explain approximately 15% of the variance in SRH (Table 8). A FZT failed to support a significant difference between the original and competing PC, SRH, and negative emotions models (14% -

Table 9

Regression Results for the Competing Model Analysis of Negative Emotions as a Mediator of the Perceived Control and Subjective Health Relationship

Dependent Variable	Path	*b*(*SE*)	*β*	df_1, df_2	R^2
HRR					
	a PC → NE	-0.32 (07)	-0.31***	4, 221	.10
	b NE → HRR	2.09 (.31)	0.41***	4, 221	.20
	c PC → HRR	-1.79 (.34)	-0.34***	4, 221	.14
	c′ PC → HRR	-1.22 (.34)	-0.23***	5, 220	.25
SRH					
	a PC → NE	-0.34 (.07)	-0.09***	4, 226	.11
	b NE → SRH	-0.49 (.12)	-0.25***	4, 226	.08
	c PC → SRH	0.68 (.13)	0.34***	4, 226	.13
	c′ PC → SRH	0.57 (.14)	0.28***	5, 225	.15

Note. PC = Perceived Control; HRR = Health-related Restrictions; SRH = Self-rated Health; NE = Negative Emotions.
Covariates included in each path are SES, gender, and age.
β =Standardized beta weights; R^2 = non-adjusted R^2.
*p < .05, **p < .01, ***p < .001.

15% - 1%), $Z_{observed}$ (n = 231) = .18 < $Z_{critical}$ = 1.96, p < .05.

The competing models for the young-olds and old-olds. As will be discussed, no support was found for the expectation that the mediating effect of emotions. Nevertheless, explaining the PC-Health link would be stronger for the old-old compared to the young-old. Mediation was supported, however, in some models. Again, only the models with significant mediation effects will be presented.

Table 10 presents the findings for the analysis of the young old where negative emotions fully mediated the link between PC and HRR. All paths were significant. A decrease in path c, β(-.23 - -.15 = -.08) occurred when negative emotions were included in the model as a mediator (path c′), such that c′ became insignificant. A significant indirect PC → NE → HRR path was supported with a Sobel test, Z = 2.11, SE =.20, p < .01. Model fit indices suggest a moderate model fit, wherein PC and negative emotions explained approximately 15% of the young-olds' variance in HRR. Thus, the competing model that switches the temporal designation of the mediator and dependent variable (HRR) provides more compelling findings for the young-olds given that the original models failed to support either SRH of HRR as mediators of the PC-emotion relationship.

For the oldest-olds, negative emotions partially mediated the PC and HRR relationship (Table 11). In this model all paths were significant. A decrease in path c, β(-.48 - -.35 = -.13) occurred when the negative emotion measure was included in the model (path c′). A significant indirect path was supported with a Sobel test, Z = 2.76, SE =.12, p < .01. Model fit indices suggest a strong model fit, where PC and negative emotions explain approximately 37% of the oldest-olds' HRR (Table 11). Regardless of a (37% - 30% = 7%) model fit difference between the original and competing models (shown in Table 6 and Table 11), a FZT failed to

Table 10

Regression Results for the Competing Model Analysis of Negative Emotions as a Mediator of the Perceived Control and Health-Related Restrictions Relationship for Young-old Adults

Mediator	Path	*b*(*SE*)	*β*	df_1, df_2	R^2
Negative Emotions	a PC → NE	-0.40 (.15)	-0.26**	3, 114	.07
	b NE → HRR	1.17 (.30)	-0.34***	3, 114	.13
	c PC → HRR	-1.23 (.51)	-0.23**	3, 114	.06
	c′ PC → HRR	-0.81 (.51)	-0.15	4, 113	.15

Note. PC = Perceived Control; HRR= Health-related Restrictions; NE = Negative Emotions.
Covariates included in each path are SES and gender.
β =Standardized beta weights; R^2 = non-adjusted R^2.
*$p < .05$, **$p < .01$, ***$p < .001$.

Table 11

Regression Results for the Competing Model Analysis of Negative Emotions as a Mediator of the Perceived Control and Health-Related Restrictions Relationship for Old-old Adults

Mediator	Path	*b*(*SE*)	*β*	df_1, df_2	R^2
Negative Emotions	a PC → NE	-0.49 (.14)	-0.32***	3, 104	.13
	b NE → HRR	1.69 (.29)	0.50***	3, 104	.26
	c PC → HRR	-2.47 (.45)	-0.48***	3, 104	.24
	c′ PC → HRR	-1.83 (.43)	-0.35***	4, 103	.37

Note. PC = Perceived Control; HRR: Health-related Restrictions; NE = Negative Emotions.
Covariates included in each path are SES and gender.
β =Standardized beta weights; R^2 = non-adjusted R^2.
*$p < .05$, **$p < .01$, ***$p < .001$.

support a significant difference between the model fits, $Z_{observed}$ (n = 108) = .65 < $Z_{critical}$ = 1.96, p < .05. In sum, switching the temporal designation of the mediator and dependent variable did not provide a more informative approach to investigating the relationship between PC, HRR, and negative emotions for the old-olds.

However, a different conclusion can be drawn from the analysis of the young-old. As mentioned above, the competing model offers a better explanation of the PC, health, and emotion relationship for the young-olds. This is argued because when HRR are a dependent variable in the PC and negative emotion competing model, a mediation effect in the young-old is supported for the first time. The value of asking whether emotions mediate the PC and health relationship is therefore supported. The overall conclusion with the exception of the young-olds, is that when comparing the significant original and competing models, the abovementioned FZTs do not support the observation that switching the mediator and criterion variable in the mediation models serves much benefit. Thus, as will be discussed, to choose between the original competing models should depend on the questions of interest.

Discussion

It has been consistently shown that perceived control (PC) plays a role in later life physical and emotional well-being. The current study is unique having assessed the linkages between PC, health, and emotions in later life. Both positive and negative global emotions were examined with two different health outcomes: health-related restrictions and self-rated health. Differences between the young-old and old-old were also investigated. Lastly, several exploratory research questions were addressed. Together these findings provide insight into how later life emotions can be better understood by considering the interplay between key psychological (PC) and physical (health) variables.

Health as a Mediator of the Later Life Perceived Control and Emotion Relationship

The following presents findings from the analysis of emotions, beginning with negative emotions. The findings will be discussed separately for the two health measures. Differences observed between the young-old and old-old will be discussed as well. To conclude, a discussion of the strengths, limitations, future directions, and implications of the present study is undertaken.

Negative emotions: The role of perceived control and health. The prediction in hypothesis two that health mediates the PC and negative emotion relationship was supported for both measures of health. First, PC was associated with negative emotions: Older adults who reported high levels of PC reported less negative emotions. A low perception of control also predicted more health-related restrictions (HRR), in turn, provoking more negative emotions. Thus, the effect of PC on negative emotions in later life appears to be explained, in part, by the degree to which older adults report being restricted by their health.

These same results were replicated for self-rated health (SRH) as a mediator of the PC and negative emotion relationship. Low levels of PC predicted worse SRH, which, in turn, predicted more negative emotions. These findings replicate previously discussed studies suggesting that low control beliefs are linked to worse health (Calfee et al., 2006; Lang & Heckhausen, 2001; Rodin, 1986). Thus, older adults who have low PC and perceive their health poorly are likely to have a high frequency of negative emotions. As the findings from the analysis of HRR confirmed these same patterns, the present study has thus demonstrated that the way in which older adults perceive their health partially explains why their beliefs about influence (control) over events in their life overall is associated with their negative emotions. In short, their control beliefs appear to foster health, which may protect against the frequency of

negative emotions they experience. Replicating these finding across two separate measures of health provides confidence in a model showing PC → health → negative emotions.

Positive emotions: The role of perceived control and health. As was predicted in hypothesis one, higher PC predicted more frequent positive emotions. This finding replicates the previously discussed studies that suggest control beliefs have beneficial effects on one's emotions (Chipperfield et al., 2012; Gadalla, 2010; Kunzmann et al's (2002); Lang & Heckhausen, 2001; Ruthig et al., 2008), albeit many of which having either examined correlational or emotion → health directional relationships. More importantly, the findings provide some support to show that the relationship between PC and positive emotions was partially explained by health, although, this finding was qualified by the type of health measure.

As was predicted, HRR appeared to partially explain the PC and positive emotion relationship. Each of the paths was significant. Older adults who believe they can influence various domains in their life overall report less restrictions due to their health compared to those with low perception of having control. Higher PC was associated with less HRR, which in turn predicted positive emotions. In later life, having a strong perception of control may lessen one's perception of HRR which, in turn, may help to explain why high PC fosters positive emotions.

Unlike the findings for the measure of HRR, the overall mediational model involving SRH was not supported. Nonetheless, some meaningful relationships between the variables were observed. First, PC was associated with SRH: The more PC older adults reported the better they perceived their health. This finding replicated the previously discussed studies that suggested a high level of PC fosters health in later life (Chipperfield et al., 2004; Lang & Heckhausen, 2001; Rodin, 1986) and replicates the important associations between PC and SRH (Kempen et al., 2005). Moreover, SRH was associated with positive emotions, such that better self-reports of

health are related to a higher frequency of positive emotions. This finding is unique given that most studies have examined the reverse relationship, where positive emotions foster health (Pressman & Cohen, 2005).

Overall, HRR mediated the PC-emotion relationship more consistently than SRH. The current study offers the interesting observation that, unlike HRR appearing to mediate PC an both negative and positive emotions, SRH does not explain why PC and positive emotions are related. As described below, important differences between these health measures may provide some insight into why HRR more consistently than SRH, mediate the link between PC and emotions.

Differences between health-related restrictions (HRR) and self-rated health (SRH). Part of the reason why HRR mediate the PC-emotions link might be that HRR reflect something more than a *health* measure, per se. The theoretical distinction between SRH and HRR may be found by drawing on Lazurus and DeLongis' (1983) research on daily hassles. Because hassles generate psychological stress, reinterpreting health-related restrictions as health-related hassles may explain why HRR play a more consistent role in the PC-emotion relationship than SRH.

Lazarus and DeLongis' (1983) work is informative because it attempts to understand the cognitive mechanisms inherent in psychological stress responses. In particular, Lazarus and DeLongis were particularly interested in the impact of day-to-day events. Specifically, *daily hassles*, "the irritating, frustrating, distressing demands and troubled relationships that plague us day in and day out (Lazarus & DeLongis, 1983, p 247)" which commonly require some type of behavioural adjustment (Schuster & Hammit, 2002) are sources of great stress. Some studies have replicated this assertion in respect to later life. For instance, Holahan, Holahan, & Belk (1984) demonstrated that in a sample of elderly individuals aged 65 to 75, hassles were a strong

and negative predictor of agitation and depression. As a result of such studies, much speculation has been put forth regarding why daily hassles have such a strong effect on well-being.

One major reason Lazarus and DeLongis (1983) suggest that hassles predict well-being measures is because of the temporal nature, specifically, the proximal nature, of the events. A hassle is *proximal* because an immediate reaction has been evoked by an unanticipated and undesired episode. As a result, the emotional experience associated with a hassle is highly salient, secures attention to the present moment, and is, therefore, difficult to disengage from emotionally. Holahan et al (1984) suggest that hassles affect well-being more than major life events because hassles are recent, frequent, and chronic in contrast to more distal, infrequent, and acute major life events.

In later life, daily health-related hassles are not uncommon. For example, Holahan et al (1984) found that the hassles many older adults report are relevant to their current lively-hood (e.g., hassles related to daily tasks and not, for instance, a new career). In a study of older adults with osteoarthritis, for instance, Weinberger, Hiner, and Tierney (1987) found that many of the hassles reported by older adults related to perceived health, such as physical disability and pain. These studies not only connote the value of health in later life emotional well-being but also imply that HRR can be interpreted as health-related hassles.

First, the proximal nature of experiencing a restriction due to one's health implies that these restrictions represent hassles. HRR, like hassles, are proximal in nature due to the present-moment reality forged by the immediate realization of successfully or unsuccessfully completing a task. For example, an older man with motor difficulties following a stroke may have many proximal and stress-inducing health-related hassles, such as difficulty dressing, cleaning, etc.

Therefore, it seems logical to interpret health-related restrictions as a type of hassle: a health-related hassle.

The above logic, wherein a hassle is a failure to accomplish some goal due to one's own health, also relates to a perception of control. In this respect, HRR and hassles share a premise of an action-outcome non-contingency of some desired event. This suggestion is further supported by Holahan et al's (1984) proposal that self-efficacy is inherent when encountering a possible hassle: individuals evaluate their own capacity and resources for adequately dealing with the hassle. The belief that one can influence events in their life overall (i.e., PC), therefore, should be related to the confidence that they can prevent and/or rectify (i.e., control) a hassle (i.e., event). With a stronger belief that one can influence outcomes in his or her own life overall, older adults may be more adept at proactively influencing hassles than individuals with low PC. Importantly, Holahan et al found that older adults who had a high self-efficacy over hassles reported better management and adaptiveness to the hassles they experienced. As a result, individuals with high self-efficacy over hassles had improved psychological well-being. It can be argued that in regards to health-related hassles, for an individual to perceive that he or she is restricted by their health (i.e., HRR) is to believe that he or she is struggling to influence a health-related or health-dependent outcome.

Thus, HRR and SRH are distinct health measures, not only because they differ in temporality (proximal versus distal, respectively), with HRRs' proximal temporality more readily evoking stress and emotionally engaging reactions, but also because both the operationalizations of PC and HRR measure action-outcome contingencies. Although PC does not predict HRR significantly better than it predicts SRH, the action-outcome contingency

premise shared by PC and HRR might explain the more consistent association PC has with models including HRR *and emotions* found in this study.

In sum, an alternative explanation for why HRR (relative to SRH) more consistently acted as a mediator in the PC-emotion link may lie in the possibility that HRR reflect something more than just health. In other words, is might be that it is some other psychological factor (i.e., feeling hassled or the associated stress) rather than health per se that mediates the link between PC and emotions. For instance, the associated stress inherent within a hassle may not only evoke emotions more frequently than reflections of overall health (SRH) but because of the immediate emotional reaction forged by a hassle, the disengagement from the emotional state may be more difficult. As a result, the hassles that accompany poor health may have a more consistent role in emotional well-being given their capacity to affect psychological states. This interpretation of HRR as a type of hassle with a strong emotional component may lend insight into why it helped to explain the PC-emotion relationship. Interestingly, the present study observed other important differences between how the two measures of health mediate the PC-emotion relationship in respect to the young-old and old-olds.

Differences between the young-old and old-old. In hypothesis three it was predicted that the previously outlined models would differ for the young-olds and old-olds, such that the effect of PC on health, and in turn, emotions would be greater for the oldest-olds, given their more vulnerable health status. Hypothesis three was partially supported: only HRR were found to explain the PC-emotion relationships and only for the oldest-olds' negative emotions. Having observed only one significant model for the old-olds may be due the finding that the oldest-olds did not have significantly lower mean levels of PC, SRH, or HRR than the young-olds. Therefore, the current study fails to support the notion that a distinction of the young-olds and

old-olds is based on significantly different degrees of PC or health (Corey-Bloom et al., 1996; Rodin, 1986; Ruthig et al., 2007).

Competing model: Differences between the young-old and old-old. For the young-old, one competing mediation model was significant, where the negative emotions that young olds report partially explain the PC and HRR relationship. The re-ordering of the variables is a likely explanation for the significance of the competing model, the importance of which is highlighted by the original model *not* being supported for the young-olds: for the young-olds who have low PC and higher negative emotions, the number of HRR they report does not play a role in the PC and negative emotion relationship. Although the significance of this model for the young-olds could suggest a causal relationship between PC, negative emotions, and HRR, causality cannot be inferred with cross-sectional data used in mediation models (MacKinnon & Fairchild, 2009). Future work should replicate hypothesis three with an experimental design and larger sample size in order to increase power for detecting any causal effects that were not able to be detected in the current study.

Strengths, Limitations, and Future Directions

Strengths of the current study. Perhaps the greatest strength of the current study is the representativeness of the sample of participants. As was previously mentioned, most Canadian elderly are not institutionalized but reside in a family home within the community (Statistics Canada, 2007). Moreover, the Successful Aging Study (SAS) is a satellite study from one of the largest and longest run longitudinal Canadian studies of aging (Chipperfield et al., 1997). Participants were randomly selected from the AIM project using a stratified sampling procedure. Therefore, the results of the present study are generalizable to the greater Manitoban, and perhaps Canadian, community-dwelling population of individuals aged 65 and over.

In respect to the analyses in the current study, it was hoped that an analysis of discrete positive emotions would lend a more detailed account of exactly which positive emotions are more strongly related to PC and health in later life (for example, does PC and health impact contentment but not happiness?). With the exception of love, the models including gratitude, contentment, and happiness were significant. However, the strength of the PC, health, and discrete emotion relationship did not differ significantly, such that PC and health did not predict any one particular discrete emotion better than another (e.g., contentment compared to gratefulness). Therefore, the analysis of discrete positive emotions in respect to PC and health did not provide a more detailed and complex account of later life emotions than did the analysis with a positive global emotion measure.

There are some strengths associated with the present analysis of negative discrete emotions as well. Although it can be argued that the small size preventing the detection of effects in the analysis negative discrete emotions is a methodological shortcoming of the present study, it replicates previous studies suggesting that negative emotions, relative to positive emotions, are infrequent in later life (Carstensen et al, 1999; Magai et al, 2006). However, significant differences were not found between the two types of global emotions (i.e., the frequency of negative emotions compared to positive emotions). In this respect, the previous studies that suggest that in later life there should be a significant increase of positive emotions compared to negative emotions was not supported, albeit an insufficient sample size for conducting analyses with discrete negative emotions. Therefore, the investigation of discrete emotions has been useful not only by highlighting the relative infrequency of negative emotions in later life but by suggesting that in some cases, older adults do not report a significantly higher number of positive emotions than negative emotions.

As was mentioned previously, there are some discrepancies in the scarce number of studies regarding a health and positive emotion relationship. The current study furthers an understanding of this relatively novel and complex area. The current study also found that the degree to which an older adult perceives he or she is restricted by their health but *not* their overall self-rated health, partly explains why PC relates to positive emotions. Moreover, numerous and informative comparisons were undertaken by comparing, for example, the effects of health on positive versus negative emotions.

Lastly, another strength of the current study is the unique comparison of an original model (where health mediates the PC-emotions relationship) to an alternative model (where emotions mediate the PC-health relationship). The support found for both models might imply that the relationships between PC, health, and emotions are reciprocal. In their meta-analysis of health and positive emotions, Pressman and Cohen (2005) note that most studies examine the effects of emotions on health, compared to the effects of health on emotions. The observation that there is some variability in the associations between PC, health, and emotions might suggest that either approach is valid: a causal PC-health-emotion relationship, or causal PC-emotion-health relationship. The approach taken simply depends on the question one wants to ask. If the effects PC and health have on emotions is sought to be understood, the original model is informative; if, however, one wishes to research the effect PC and emotions have on perceptions of health, the present study supports this endeavour by having demonstrated that emotions can also serve as an important mediator of the PC-health relationship. In sum, it can be argued that neither model is more valid and that the emotion-health relationship is likely reciprocal (Tugade, Fredrickson, & Barret, 2004). It is of valuable, therefore, for future research to examine health or emotions as either predictors or dependent variables.

Thus, the current study lends support to the claim that PC is an important factor in later life emotions. It is unique in its systematic examination of the links and nuances between later life global PC, subjective overall health and health-related restrictions, and the frequency of emotions. Overall, a significant gap in the literature of aging and well-being has been addressed having documented how later life control beliefs and their association with emotions can, in part, be explained by health.

Limitations and future directions. In respect to the major limitations of the current study, one methodological limitation and two statistical limitations are discussed. First, the main methodological limitation of the current study is the usage of self-report measures. Subjective measures of control and health are open to the critique that the major study variables are subject to self-report bias. To merit the usage of a self-report measure in respect to control, a phenomenological approach is necessary to assess the degree to which an individual *believes* they have direct influence over the events in their life overall. Self-reports of control are also essential because an individual can fail to perceive control where he or she does in fact have opportunities to exercise influence or, at times fail to accept that he or she does not have the ability to determine an event. This logic is supported by the notion that control beliefs can be intentionally changed (Hall et al, 2006; Weiner, 1985).

Similarly, the health measures included in the current study are vulnerable to self-report bias. For instance, the previously mentioned studies that suggest older adults do not always hold "realistic" perceptions of their own health (i.e., congruent with objective health status measures), lend further support to the critique that subjective health measures are biased (Ruthig & Chipperfield, 2007). In the current study, however, it is argued that this "bias" is of value given that subjective health measures, compared to objective health measures, are at times more

powerful in not only predicting important health-related behaviours and outcomes, such as mortality (Chipperfield, 1993), but are also related to emotions (Pressman & Cohen, 2005). Therefore, while the risks of including subjective measures in the current study are acknowledged, their inclusion, with their associated bias, was intentional in hopes to utilize their inherent value in respect to their association with well-being.

One of the statistical limitations of the current study was the insufficient sample sizes of the young-old and old-old cohorts for detecting medium effects (as determined with a-priori power analysis). This limitation may explain why there were no significant differences found between the means of the young-old and old-old for most of the major variables. As a result of the limited sample size upon splitting the file, there was insufficient power to detect the predicted effects in hypothesis three (Faul et al., 2009). Nonetheless, despite the limited power, significant effects emerged for the young-old competing models where negative emotions were found to mediate the PC-HRR relationship.

The second major statistical limitation in current study was the bimodal distribution of the global negative emotion measure. Many participants did not experience many of the discrete negative emotions at all, reporting zero frequency for some discrete negative emotions. This complexity is in line with numerous studies demonstrating that older adults generally report a low frequency of negative emotions. In order to correct for the two different samples (0 response versus ≤ 1 responses), a filter was created to withdraw participants from the global negative emotion variable who did not report a frequency of the selected discrete emotions. However, the filter dramatically reduced the sample size and greatly reduced power. This would have allowed for interpreting the results relevant to only those who had experienced a negative

emotion. To resolve the above issues of power, a sufficient sample size in future research is recommended.

The limitations of the current study suggest future directions for research. For instance, longitudinal studies are needed to examine relationships between PC, health, and emotions, of which numerous designs are possible. For example, one design would be to measure PC at time one, health at time two, and emotions at time three, allowing for a systematic analysis of how these three variables relate to one another overtime. Another option would be to create a PC and health interaction term in time one and assess its effects on health in a later period of time. Although such studies are optimal and feasible, to date, no studies exist measuring the linkage between global PC, subjective health and health-related restrictions, with the frequency of positive and negative emotions overtime. There have been some longitudinal studies, however, examining PC and health (Chipperfield et al, 2004, 2012; Chipperfield & Greenslade, 1999; Infurna, Gerstorf, & Zarit, 2011; Menec & Chipperfield, 1997). For example, Gertrudis et al (2003) showed that older adults' global PC predicted future health, such as functional status, up to eight years later. Moreover, an experimental design involving a control group (no PC intervention) and treatment group (PC intervention) would address the previously mentioned issue of inferring causality using cross-sectional data in a mediation model (MacKinnon & Fairchild, 2009). Taking the above methodological recommendations into practice in future research would contribute to the field of later life well-being by advancing the knowledge of the operationalization and assessment of these important psychosocial variables.

Implications of the Present Study

The present study suggests that health plays an important role in the PC-emotion relationship in later life. These findings have practical implications in respect to how the

enhancement of PC and good health can foster later life emotional well-being. The primary implications of the present study are based on the argument that PC can be manipulated for the better. Put otherwise, if PC can be fostered, this has the potential to improve health and emotional well-being. For instance, previous studies have demonstrated that a sense of mastery can be taught (for examples refer to Hall, Perry, Chipperfield, Clifton, & Haynes, 2006). Such studies are commonly based on Weiner's (1985) attribution theory. Weiner's attribution theory has provided grounds for Attributional Retraining (AR), in which attempts are made to change individuals' maladaptive attributions for outcomes that otherwise result in negative emotions and de-motivation. Presumably, more adaptive explanations can promote positive emotions and foster motivation.

AR has been used to enhance control in the elderly, having important implications for later life well-being. In a study with institutionalized adults aged 65 and over, Sarkisian, Prohaska, Davis, and Weiner (2007) investigated the benefits AR had on activity levels (i.e., daily steps taken). The attribution that poor health is inevitable with age (uncontrollable) was discouraged and participants were encouraged to explain health-related behaviours as controllable. These discussion sessions facilitating adaptive attributions in conjunction with exercise classes led to an overall decrease in sedentary lifestyles with 24% more steps taken overall. Therefore, because controllability attributions can be taught, treatment interventions designed to increase an older adults sense of control should result in less health-related restrictions as well as foster better health. Just as perceptions of control can be manipulated, it might also be possible to change subjective impressions of health.

The ability to change poor health perceptions should also have promising results for the emotional well-being of older adults. For example, reducing the number of health-related

restrictions older adults experience would benefit their emotional experiences. This could be accomplished by enforcing the implementation of home care assistance to community-dwelling older adults. Providing in-home assistance for daily tasks that older adults are restricted from accomplishing should result in less health-related restrictions (i.e., hassles) and a decrease in associated stress. In fact, Chappell (2012) argues that the aging community-dwelling demographic have unmet needs not having sufficient homecare assistance with managing their day-to-day lives. Ideally, a program that includes AR to maintain and foster PC married with practical health-related assistance provided to community-dwelling elderly would likely be the most beneficial for their overall well-being. Notably, however, preliminary studies investigating the nuances (e.g., causality issues) between PC, health, and emotions in later life should first be conducted with an experimental design. In time, the development of treatment interventions, such as teaching older adults cognitive methods for enhancing their sense of mastery and adequate home care provisions, should benefit the well-being of many older adults who continue to reside within the community.

Conclusion

This study systematically demonstrated that older adults' perceptions of control have important implications for their emotions. Moreover, the findings provide some support to suggest that part of the explanation for why PC predicts emotions is due to the ways in which older adults perceive their overall health and their health-related restrictions. Compared to self-rated health, health-related restrictions played a more consistent role in helping to explain the PC emotions linkage. To the extent that health-related restrictions can be regarded as daily hassles, this might imply that this health measure has a more immediate and stronger psychological (i.e., emotional) effect on emotional well-being than a simple self-rating of health. Therefore, this

unique study addresses a significant gap in the literature of well-being having further clarified how two primary factors, PC and health, contribute to later life emotions.

Future researchers will likely continue to struggle with theoretical and methodological deliberations regarding control beliefs, health, and emotions. For instance, do any of the variables work together? Specifically, PC and health-related restrictions share an action-outcome contingency premise. That said, is there an interaction between the two variables, such that the effect that low PC has on emotions changes as a function of a high number of health-related restrictions? Moreover, what exactly are self-rated health and health-related restrictions measuring and how are they distinct? Lastly are there other factors that should be considered in studying how health explains the PC and emotion relationship? For example, gender differences may explain how PC, health, and emotions are related. This is suggested by Chipperfield and Perry's (2006) study, wherein the authors found that the way in which control strategies relate to health outcomes depends on one's gender. Questions such as these should be investigated in future research endeavors that address the relationship between later life PC and well-being. While investigating the factors that contribute to the flourishing of successful aging, such studies will aid in harnessing the momentum of the aging demographic in Canada.

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