

An Analysis of Secondary Control Beliefs and
Physical and Psychological Well-Being in Older Individuals

by

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Abstract

Researchers have struggled to define how to age well since the time of Roman philosopher Cicero in 44 BC, yet today it remains a mystery (Tate, Lah, & Cuddy, 2003). In the context of dealing with age-related declines that often accompany later life, it has recently been suggested that positive reinterpretation, a concept implicit to positive psychology, may be important (Ouweland, de Ridder, & Bensing, 2007; Seligman & Csikszentmihalyi, 2000). Positive reinterpretation has at times been referred to as “secondary control” in the psychological literature. In their seminal article of 1982, Rothbaum, Weisz, and Snyder theorized that there were multiple ways in which people could positively reinterpret outcomes and gain feelings of secondary control, including believing in the power of others and nature, as well as downgrading importance. These belief patterns become especially important in later life, when faced with age-related challenges. In the present study, secondary control beliefs were examined cross-sectionally in 2003 ($n = 223$) and prospectively in 2006 ($n = 117$) in a sample of older adults (M age = 85 years, 62% women) using a variety of outcome measures including severity of chronic conditions score, recent health, self-rated health, positive emotion, life satisfaction, and perceived stress. The unique contributions of this study are twofold. First, the findings suggest that some older adults may emphasize certain secondary control beliefs in combination. Second, the combined beliefs were found to relate cross-sectionally to measures of physical and psychological well-being. These exploratory findings have important implications in applied and theoretical contexts. In applied contexts, they may help to enhance physical and psychological well-being in the very old. In theoretical contexts, they extend contemporary thinking on secondary control.

An Analysis of Secondary Control Beliefs and Physical and Psychological Well-Being in Older Individuals

Research on aging has traditionally focused on age-related physical and cognitive decline, rather than looking at factors that may offset these trajectories, as per the positive psychology movement (Seligman & Csikszentmihalyi, 2000). According to Rowe and Kahn, healthy, successful aging originally had three components: avoiding disease and disability, maintaining high levels of cognitive and physical functioning, and being actively engaged in life. This early definition has been criticized for describing individuals who have aged successfully, rather than describing the process of aging well itself (Ouweland, de Ridder, & Bensing, 2007). In light of age-related declines that often accompany very late life, such as failing mental or physical health, Ouweland et al. suggested that an important part of aging well that had previously been overlooked involved minimizing the effects of such stressors, via positively reinterpreting negative situations and events among other things. To the extent that such positive reinterpretation represents secondary control beliefs, Ouweland et al. (2007) inadvertently suggested an update to Rowe and Kahn's original successful aging definition that included an emphasis on secondary control beliefs, highlighting their importance to healthy aging. Secondary control is a psychological construct originating from Rothbaum, Weisz, and Snyder's (1982) two-process model of control which incorporated a combination of positive reinterpretation and acceptance of negative situations and events. Secondary control beliefs are central to the proposed research, and since they have previously been construed as being part of perceived control (Rothbaum et al., 1982), a mention of perceived control is warranted.

Perceived control is a psychological construct that was first studied in the mid-1960s when researchers began to examine “internal” control that was generated from within the individual vs. “external” control that came from without (Rotter, 1966). In light of the theorized importance of perceptions of control that came from within, the present study examined control beliefs that have been shown to be adaptive in the face of declines in health and well-being that were first considered by Rothbaum and colleagues in 1982, namely, secondary control beliefs. Because secondary control beliefs can take on many different forms, some of which will be described later on, it is possible that individuals may simultaneously hold secondary control beliefs in combination. Accordingly, the main objectives of the present study were to explore whether and how community-dwelling older adults simultaneously held combinations of secondary control beliefs, and to determine whether this in turn related to physical and psychological well-being. Following a brief consideration of the main theoretical perspectives on perceptions of control and some background information, the relevant literature on control beliefs and health and well-being will be reviewed.

Main Theoretical Perspectives on Control

The two-process model. In their seminal article of 1982, Rothbaum et al. theorized two ways in which to gain perceptions of control: primary and secondary control. Primary control, often considered synonymous with the term “perceived control” in the control literature (Skinner, 1996) was originally defined by Rothbaum et al. as the proactive attempts of individuals to influence or alter their environments in ways that are aligned with their wishes. That is, Rothbaum et al. defined primary control as taking direct action to influence the environment. Since 1982, others have emphasized the

importance of measuring primary control in terms of perceived influence over outcomes, (e.g., Chipperfield, Campbell, & Perry, 2004). In light of this more recent research, perceived influence was used as the measure of perceived control in the present study.

In addition to primary control, Rothbaum et al. (1982) suggested an alternate way to feeling in control that involved secondary control beliefs. The authors defined secondary control as psychological adjustment aimed at coming to terms with and accepting the environment without changing it. They suggested that although this type of control was invoked when attempts at primary control had failed (e.g., in conditions of low objective control such as those presumably associated with later life), secondary control could be intrinsically rewarding or valuable in its own right. Rothbaum et al. theorized that there were four distinct types of secondary control: predictive, illusory, vicarious, and interpretive, all of which could be applied to a health and aging context, interpretive control being the most important.

Predictive, illusory, and vicarious control were conceptualized as subtypes of secondary control that could be invoked through different forms of psychological adjustment (Rothbaum et al., 1982). Predictive control was described as perceptions of control gained through adjusting to negative circumstances by preparing for the worst, and thereby avoiding disappointment. Illusory control was construed as feelings of control gained through adjustment in the form of holding beliefs in luck or chance. Vicarious control was described as control perceptions gained through adjusting to negative situations and events by believing that, in circumstances of low objective control, benevolent powerful others could and would step in to exert direct control on behalf of the individual. According to Rothbaum et al., predictive, illusory, and vicarious

control had at least one thing in common: all involved psychological adjustment in the form of positive reinterpretation, which in turn was thought to be an integral part of the broader construct of interpretive control. Further to this, Rothbaum et al. defined interpretive control in terms of positive reinterpretation *plus acceptance*, suggesting the importance of holding combinations of secondary control beliefs.

Morling and Evered (2006) reiterated the importance of holding combined secondary control beliefs when they argued that “a true measure of secondary control requires assessing the self’s own adjustment in addition to asking people whether they accept some aspect of their situation” (p. 280). In other words, they explicitly defined secondary control to include positive reinterpretation combined with acceptance, coining the term “fit-focused” secondary control. The combination of positive reinterpretation combined with acceptance seems to be encompassed in Rothbaum et al.’s notion of interpretive control, therefore, interpretive control will be referred to as “secondary control” from this point forward.

The two-process model vs. the lifespan perspective. Several years after the origin of the two-process model of secondary control, others re-conceptualized it from a lifespan perspective, construing parts of it so differently that Morling and Evered (2006) recently argued that it should not be considered [true, fit-focused] secondary control. The lifespan theory of control emphasized the “functional primacy of primary over secondary control”. That is, the authors saw primary control as the most basic human motivation across the life course, with secondary control being of benefit only in that it compensated for low levels of primary control (Heckhausen & Schulz, 1995). This differed from Rothbaum et al.’s (1982) original two-process model, that did not consider control perceptions over the life course and that viewed secondary control not as compensatory,

but as valuable in its own right. Another important difference between the lifespan theory and the two-process model was that the latter mainly referred to control *beliefs* that fostered a perception of control. In contrast, the lifespan perspective discussed primary and secondary control in terms that were more action-oriented, referring mainly to control-enhancing *strategies*. Lastly, Rothbaum et al. identified interpretive control as the most important of their four types of secondary control, since it was thought to conceptually include the other three. This differed from the lifespan perspective, which did not mention interpretive control per se. In sum, although Heckhausen and Schulz originally borrowed the secondary control construct from Rothbaum et al.'s two-process model, the type of secondary control described in their lifespan perspective is quite different from Rothbaum et al.'s original formulation. Other important differences between the two theories have been discussed in Morling and Evered's article which, in addition to considering the similarities and differences between the Rothbaum et al. vs. Heckhausen and Schulz perspectives, also speculated upon why secondary control has not historically been, and arguably cannot be considered the same as coping.

Fit- vs. control-focused secondary control and coping. Morling and Evered (2006) concurred with Rothbaum et al. (1982) in that they viewed interpretive control as the most important type of secondary control, since it conceptually included the other three. Morling and Evered took this idea further by suggesting that interpretive control was the only true type of secondary control, calling it "fit-focused secondary control", since it involved a combination of psychological adjustment paired with fitting in with or accepting the environment. Morling and Evered did not equate coping with secondary control, since most coping research had historically only involved psychological

adjustment. It was missing the acceptance component, which seemed, according to Morling and Evered (2006), to be integral to fitting in with the environment, hence the term “fit-focused secondary control”. In other words, Morling and Evered suggested that, out of Rothbaum et al.’s four types of secondary control, only interpretive control explicitly fit the criteria of fit-focused secondary control, since it alone was defined to include psychological adjustment combined with acceptance of negative situations and events. In short, Morling and Evered underscored the complexity of secondary control and emphasized the importance of holding combinations of beliefs that included both adjustment and acceptance.

In addition to Morling and Evered’s (2006) theoretical work, recent empirical research has emphasized the importance of secondary [interpretive] control (Swift, Bailis, Chipperfield, Ruthig, & Newall, 2008). Swift et al. (2008) found that in a sample of 166 older individuals, women with serious health problems who held high levels of interpretive control beliefs experienced greater life satisfaction and greater positive emotion prospectively than did others who held interpretive control beliefs to a lesser degree. To the extent that serious health problems can be considered low-control circumstances, other research on conditions of low objective control suggests that secondary control holds much potential for improving the lives of individuals experiencing age-related decline (Thompson, Nanni, & Levine, 1994; Thompson, Sobolew Shubin, Galbraith, & Schwankovsky, 1993).

The Evolution of Perceptions of Control

Perceptions of control have traditionally been thought to originate from what Rothbaum et al. (1982) called “primary control”, or “changing the world” so as to align it with one’s wishes. Researchers have often considered the term “primary control” to be interchangeable with perceived control, or “the expectation of having the power to participate in making decisions in order to obtain desirable consequences and a sense of personal competence in a given situation” (Rodin, 1990, p.4; Skinner, 1996). In addition, perceived primary control has been construed as having *perceived influence* over the environment (Chipperfield et al., 2004). In this tradition, the term “perceived control” will be used to refer to perceived influence in the present study.

Much empirical support exists in favor of the relationship between perceived control/control strategies and physical and psychological health and survival. It has been found to relate to physical health outcomes such as quicker recovery from open-heart surgery (Barry, Kasl, Lichtman, Vaccarino, & Krumholz, 2006), proper nutrition (Biela & Pajak, 2005), decreased asthma symptom severity (Calfee, Katz, Yelin, Iribarren, & Eisner, 2006), decreased health service utilization (Chipperfield & Perry, 2006; Chipperfield & Greenslade, 1999), dialysis adherence (Cvengros, Christensen, & Lawton, 2004), greater pain management in cancer patients (Yates et al., 2004), and survival (Bailis, Chipperfield, & Perry, 2005; Chipperfield, 1993; Menec & Chipperfield, 1997). Psychological health variables linked to perceived control include decreased depression (Abramson, Seligman, & Teasdale, 1978), lower stress (Folkman, 1984; Roberts, Dunkle, & Haug, 1994), increased quality of life (Peters & Sellick, 2006), cognitive adaptation (Thompson et al., 1998), and happiness (Tong et al., 2005).

Empirical evidence has shown secondary control beliefs to benefit individuals faced with the types of challenges that erode a sense of perceived control and that presumably accompany old age. In low-control circumstances such as these, Rothbaum et al.'s two-process model theorized the importance of secondary control beliefs, or positive reinterpretation aimed at coming to terms with and accepting otherwise uncontrollable situations and events. The number of ways in which such positive reinterpretation can be accomplished are many, and some will be discussed later on, underscoring the inherent complexity of secondary control. Secondary control beliefs can be endorsed by older individuals faced with low-control circumstances who, for example, affiliate with their doctors (powerful others) so as to share psychologically in their control, gain feelings of control by believing that Mother Nature knows best, and/or downgrade the importance of their health.

Similar to the research on primary control, secondary control beliefs have been shown to positively relate to the kinds of health and well-being outcomes that often become increasingly important as individuals age. An overview of this research appears in the literature review later on. These studies have typically examined relationships between secondary control beliefs held separately and measures of health and well-being, ignoring the complex nature of secondary control (i.e., the notion that it can occur in a number of different forms). However, just as individuals hold separate secondary control beliefs, they could hold multiple secondary control beliefs simultaneously, and the combinations of secondary control beliefs could in turn influence physical and psychological well-being. This line of thought stems back to the early stress-coping literature in which it was suggested that “there is no one coping mechanism so

outstandingly effective that its possession alone [ensures] our ability to fend off stressful circumstances” (Pearlin & Schooler, 1978 p. 13). The idea that secondary control is similar, albeit not identical, to coping (Morling & Evered, 2006) makes Pearlin and Schooler’s emphasis on combined vs. individual ways of managing stressful, negative situations and uncontrollable environments particularly salient to the present investigation of secondary control.

Combinations of Control Beliefs and Strategies

Rothbaum, Weisz, and Snyder’s (1982) theoretical perspective referred to *perceptions* of control or control beliefs, whereas elsewhere, authors have discussed primary and secondary control in terms that were more action-oriented, referring mainly to control-enhancing *strategies* (Heckhausen & Schulz, 1995). To date there has been no research on the extent to which individuals simultaneously hold combinations of secondary control beliefs. However, two studies have looked at this issue in the context of control-enhancing strategies. First, Chipperfield, Perry, and Menec (1999) showed that 25.7 percent of older adults used predominantly secondary control strategies, 36.1 percent used mainly primary control strategies, and most (38.2 percent) used a combination of both. Second, Haynes et al. (2009) found that some older adults used multiple secondary control strategies combined with primary control strategies. Just as combined secondary control *strategies* relate to well-being, it is possible that certain combinations of secondary control *beliefs* may promote well-being in older individuals. The question of whether and how these combinations of secondary control beliefs relate to well-being has not yet been systematically examined.

As exemplified by Thompson and colleagues' work, the general trend in research to date has been to measure secondary control beliefs held separately but not combined. To the extent that secondary control strategies behave the same way as secondary control beliefs in terms of working together in combined fashion, the research of Chipperfield et al. (1999) and Haynes et al. (2009) emphasizes the importance of considering simultaneously-held combinations of secondary control *strategies* as they relate to measures of physical and psychological well-being, much like the measures to be considered in the present study. The secondary control beliefs that have often been considered separately in past research were used to inform the items that were included in constructing the main independent variables in the present study, which consisted of mutually exclusive groups of study participants who held various configurations of secondary control beliefs. At this point a brief look at the types of secondary control beliefs that have previously been examined separately might be informative.

Secondary Control Beliefs Endorsed Separately

Positive reappraisal and acceptance. Similar but not identical to Rothbaum et al.'s original (1982) definition of secondary interpretive control as positive reinterpretation of negative situations and events so as to come to terms with and accept them, the term "positive reappraisal" was originally coined to refer to positive reinterpretation aimed at coping with or coming to terms with distressing emotions (Lazarus & Folkman, 1984). Since then, positive reappraisal and acceptance have been the focus of much research, some of which suggests that they are used as separate indicators of secondary control beliefs. For example, in 1989 a study was designed to develop the COPE inventory, a scale used to assess various aspects of coping. The

authors measured positive reappraisal and acceptance separately, suggesting that they are independent, measurable constructs (Carver, Scheier, & Weintraub, 1989). In light of this research, positive reappraisal and acceptance will be included separately as measures of secondary control beliefs in the proposed analyses.

Belief in powerful others. Positive reinterpretation has previously been conceptualized as self-awareness and deindividuation aimed at enabling individuals to fit in with, rather than to change, their environments (Rothbaum et al., 1982). Rothbaum et al. coined the term “vicarious control” to describe this type of positive reinterpretation, which involved aligning oneself with powerful others so as to share psychologically in their control. According to Rothbaum and colleagues, the manipulations used in early studies promoted affiliation with powerful others by having study participants wear uniforms, addressing them collectively as a group, and having them engage in group activities, among other things. These manipulations were found to increase uninhibited behavior, which the authors saw as evidence of enhanced feelings of control. In light of the view that such affiliation with powerful others (in this case, the subjects’ peers) enhanced feelings of control, the proposed analyses will include belief in powerful others as a separate measure of secondary control beliefs.

Downgrading importance. Downgrading importance can be construed as a separate form of Rothbaum et al.’s (1982) secondary control. Rothbaum et al. discussed a study that involved rape victims who compared their own rape to that of others who were also killed, desecrated, or subjected to greater violence” (Burgess & Holmstrom, 1979). Through reinterpreting their own rape as being not as bad as that of others, the rape victims in the Burgess and Holmstrom study were able to view the event as tolerable.

This specifically involved downgrading the importance of a negative situation/event (in this case, the rape), in order to come to terms with it. A more recent example of downgrading as a separate form of secondary control comes from a study done in 2001 (Lackovic Grgin, Grgin, Penezic, & Soric, 2001). Here, secondary control was defined as adjusting to new circumstances via accommodation, or “adjusting personal preferences to situational constraints” (Brandtstadter & Renner, 1990 p. 58). A sample secondary control item used was, “[When I personally cannot realize my goals, I...] alter the order of what is important to me” (Lackovic-Grgin et al., 2001, p. 154). To the extent that such ordering represented positive reinterpretation, downgrading can be considered a separate measure of Rothbaum et al.’s secondary control beliefs.

Belief in nature, luck or chance. Rothbaum et al. (1982) proposed that feelings of control could be gained by aligning oneself with chance or luck. This could theoretically be accomplished “through various means – superstitious behaviour, rituals, and, more simply, investing energy in chance-determined vs. skill-determined situations” (Rothbaum et al., 1982, p. 11). Rothbaum et al. suggested that aligning oneself with luck or chance required a certain amount of positive reinterpretation, for example, by believing that luck was on one’s side, or that one had been born lucky. A measure of this type of positive reinterpretation (illusory control) was used in a study of parental adjustment to childhood cancer (Grootenhuis & Last, 1997) that incorporated items focusing on luck and wishful thinking. Since beliefs in luck or chance have previously been used to measure separate secondary control beliefs in empirical research, they will be used the same way here.

Separate Secondary Control Beliefs: Consequences for Well-Being

Despite the voluminous literature in support of the positive relationship between primary control and health and well-being, Rothbaum et al. (1982) theorized that at times, attempts to exert primary control could fail. The authors suggested that it was at these times that secondary control came about. Research has consistently supported this premise, suggesting that secondary control is endorsed when individuals of all ages encounter problems with physical or psychological health (Shapiro, Schwartz, & Astin, 1996).

For instance, in children, secondary control has been linked to positive adjustment to juvenile diabetes (Band & Weisz, 1990) and better adjustment to cancer-related medical procedures (Weisz et al., 1994). In adults, secondary control has related to lower recurrence of heart attack, morbidity, depression, and greater life satisfaction in cardiac patients (Affleck, Tennen, Croog, & Levine, 1987; Croog & Levine, 1982), less depression, anxiety, and distress in cancer patients (Carver et al., 1993; Thompson et al., 1993), and less depression in HIV-positive men (Thompson et al., 1994). In older adults, (who may be even more likely to experience declines in health and well being by virtue of their age), secondary control and related constructs have been linked to lower hospitalization rates, lower mortality, and better self-rated health (Bailis & Chipperfield, 2002; Bailis et al., 2005; Chipperfield & Perry, 2006), greater physical and perceived health in those 80 years old and above (Chipperfield et al., 1999), less depression and more life satisfaction in individuals with Parkinson's Disease (McQuillen, Licht, & Licht, 2003), and less depression and anxiety over age-related changes in appearance (Thompson et al., 1998).

Secondary Control in Low-Control Circumstances

In consideration of the positive consequences of secondary control, researchers have attempted to identify the psychological manipulations that might be adaptive in terms of health and well-being by examining individuals under conditions that presumably erode a sense of objective control. People with serious health problems are particularly appropriate for such investigations, since at times they have and perceive little or no direct, primary control over their health. Thompson et al. (1993) used the term “low-control circumstances” to refer to situations such as this, and their findings suggested that it was under conditions of low objective control that cancer patients tried hardest to maintain perceptions of control. A subsequent study supported and extended these findings, showing that secondary control was most adaptive for HIV-positive men under conditions of low primary control (Thompson, Nanni, & Levine, 1994). Taken together, these findings imply that when faced with objectively uncontrollable declines in health and well-being, individuals may benefit from holding secondary control beliefs. The manner in which they hold these beliefs (i.e., separately vs. combined) has, up to this point in time, remained virtually unexplored.

Literature Review of Separate Secondary Control Beliefs Over the Life Course

Studies on individuals of all ages have found separate secondary control beliefs and strategies to be beneficial in terms of physical and psychological well-being. In children, for example, a study based on reports by parents (93% mothers) examined the ways in which children and adolescents ($n = 174$) coped with a widespread type of recurrent pediatric abdominal pain that affects approximately 20% of children and adolescents and that has an unknown cause (Thomsen et al., 2002). One way in which the

children were reported to have psychologically dealt with the pain was via secondary control engagement coping. Similar to Rothbaum et al.'s secondary control, secondary control engagement coping included separate secondary control beliefs such as positive thinking, reappraisal, and acceptance. Positive reappraisal and acceptance were operationalized using items such as, "My daughter tells herself that everything will be all right", and, "My son realizes that he just has to live with things the way they are", respectively. Thomsen et al.'s findings revealed that each of these separate forms of secondary control coping related to less pain, less anxiety/depression, and fewer somatic symptoms in children with recurrent abdominal pain.

With regard to the relationship between secondary control and *psychological* well-being in children, a study of 64 diabetic children considered self-reported coping strategies for diabetes in terms of doctor and parent assessments of medical and behavioural adjustment (Band & Weisz, 1990). Although this study found that secondary-control strategies were not as strongly associated with medical and behavioural adjustment as were primary-control strategies, some of the children did report the use of one type of secondary-control that Band and Weisz highlighted as being likely to contribute to psychological adjustment to diabetes, namely, keeping a positive attitude. To the extent that keeping a positive attitude involved positive reinterpretation of the diabetes condition, this study provides evidence of a relationship between positive reinterpretation (a type of Rothbaum et al.'s secondary control) and psychological well-being in diabetic children.

In another earlier study on secondary control and children's psychological well-being, 29 youngsters with mild-to-moderate depression were studied cross-sectionally

and prospectively over nine months to determine if an eight-session intervention could be effective in teaching them how to apply secondary control to alleviate depression (Weisz, Thurber, Sweeney, Proffitt, & LeGagnoux, 1997). The PASCET (Primary And Secondary Control-Enhancing Treatment), a cognitive-behavioural intervention, was used to teach the depressed children how to “[find the] silver lining in an otherwise bad experience” (Weisz et al., 1997, p. 705). That is, it taught them how to invoke positive reinterpretation, a separate type of Rothbaum et al.’s secondary control. Results revealed that the treatment group showed significantly greater improvement in terms of depressive symptomatology than did the controls, both cross-sectionally (18 days post-treatment) and longitudinally (after nine months). These findings imply that individuals with mild-to-moderate depression can benefit from being taught how to invoke secondary control beliefs in terms of psychological well-being.

Another study on children’s endorsement of secondary control beliefs and psychological well-being considered how 33 children with leukemia adjusted to the self-reported distress that accompanied their condition and its treatment, namely, overnight stays in the hospital, bone marrow aspirations, vomiting, and hair loss (Weisz et al., 1994). Based on Rothbaum et al.’s (1982) two-process model of control, results showed that the most adaptive way for children to deal with leukemia-related stressors was via secondary control coping. Self-reported secondary-control coping strategies that involved positive reinterpretation (a separate type of Rothbaum et al.’s secondary control) were found to be more strongly linked to illness-specific adjustment (in terms of self-reported distress, third-party observations of child behaviour during medical procedures, and parental assessments of child adjustment) than were primary coping or relinquished

control. These findings provide additional evidence to support a positive relationship between secondary control beliefs held separately and psychological well-being in children with serious health problems.

As in the research literature on children, empirical studies have found separately-measured secondary control beliefs to be beneficial in terms of adolescents' physical and psychological well-being. In a study of 164 adolescents with recurrent abdominal pain, study participants and one of their parents (90% mothers) were questioned about the adolescents' use of individual secondary-control engagement coping strategies such as positive thinking, reappraisal, and acceptance. The objectives of a study by Compas, Boyer et al. (2006) included determining whether adolescents' endorsement of secondary control strategies related to the outcome measures of anxiety, depression, or somatic complaints. The study was an extension of an earlier study of adolescents with recurrent abdominal pain that used identical measures of secondary control but examined somewhat different outcomes (Thomsen et al., 2002). Findings from Compas et al. (2006) supported those of Thomsen et al. (2002) by suggesting that separate forms of secondary-control engagement coping (positive reappraisal and acceptance) may be adaptive for adolescents with recurrent abdominal pain in terms of decreased anxiety and depression. Additional beneficial effects were found in terms of decreased somatic complaints and aggression across the two studies.

Similar to the literature on children and adolescents, empirical studies that have examined separate secondary control beliefs in adults have found them to be beneficial for physical and psychological well-being. In terms of physical health outcomes, a study of 54 adults with rheumatoid arthritis found that those individuals who perceived benefit

from/positively reinterpreted their condition, reported fewer days in which they were limited by their pain than those who did not perceive benefit (Tennen, Affleck, Urrows, Higgins, & Mendola, 1992). To the extent that perceiving benefit can be construed as a separate form of Rothbaum et al.'s secondary control, these findings suggest that secondary control beliefs held separately may benefit individuals with rheumatoid arthritis.

A classic longitudinal study of 205 adult male heart attack victims found that, with sociodemographic factors and initial prognoses controlled, secondary control in the form of benefit finding (positive reinterpretation) related to lower morbidity and lower risk of having another heart attack eight years later (Affleck, Tennen, Croog, & Levine, 1987). The heart attack victims were asked, "Despite all the problems and worries which your illness has involved, do you see any possible benefits, gains, or advantages in this experience? If so, what are they?" The findings implied that the men in this study used a separate secondary-control belief (i.e., positive reinterpretation), to help them come to terms with and accept their heart problems, which presumably negatively related to their physical health concerns.

Similar to the research on *physical* health outcomes in adults, a number of studies suggest that positive reinterpretation relates to adult psychological well-being. For example, the Affleck et al. (1987) study previously mentioned was an extension of a prior longitudinal study that had asked 202 male cardiac patients whether they saw "any possible gains or advantages coming out of [the] experience" (Croog & Levine, 1982, p. 206). The experience referred to was the men's previous cardiac event. Assuming that perceiving gains/advantages from a heart attack can be considered positive

reinterpretation (a separate form of Rothbaum et al.'s secondary control), this study provided support for the relationship between separate secondary control beliefs and psychological well-being in male cardiac patients.

Findings from another study of 65 women with impaired fertility revealed that those who perceived benefit from their condition reported greater psychological adaptation to impaired fertility than those who did not (Mendola, Tennen, Affleck, McCann, & Fitzgerald, 1990). Perceiving benefit can be construed as positive reinterpretation, a separate type of Rothbaum et al.'s (1982) secondary control. In particular, the study found that those women who positively reinterpreted their situation in terms of a stronger marriage reported lower levels of global distress than their counterparts who did not.

In an earlier study that examined 78 women with breast cancer, the belief that a powerful other could control their cancer was associated with psychological adjustment (Taylor, Lichtman, & Wood, 1984). The powerful others referred to were the women's doctors. To the extent that belief in the power of others to control an otherwise uncontrollable situation represents positive reinterpretation, this study found evidence that separate secondary control beliefs can be adaptive for women with breast cancer in terms of psychological adjustment.

An examination of 59 women with early-stage breast cancer considered separate secondary control beliefs as they related to psychological well-being (Carver, Pozo, Harris, & Noriega, 1993). In particular, Carver et al. considered different ways in which the women dealt psychologically with their illness, over the course of one year. Positive reframing/reinterpretation and acceptance were considered separately in terms of how

they related to distress. Acceptance was found to consistently relate to low levels of distress at each of five measurement occasions. Positive reinterpretation related negatively to distress at all measurement occasions except the last one at 12 months, perhaps because by that time the patients had already come to terms with and accepted their illness, overriding the need for positive reinterpretation. In addition, although positive reinterpretation and acceptance were measured individually (i.e., in terms of seeing the bright side vs. accepting the fact that the cancer had occurred), they were significantly correlated ($r = .34$), indicating overlap between them. This overlap could suggest that the individuals being studied simultaneously held combined beliefs in acceptance and positive reinterpretation, highlighting the need for empirical consideration of combinations of secondary control beliefs as they relate to well-being.

A study of health-related quality of life that incorporated adult lupus patients up to 65 years old ($n = 144$) and 129 healthy controls found the lupus patients to score significantly higher on acceptance than the controls (Rinaldi et al., 2006). In addition, the lupus patients' health-related quality of life was found to beneficially relate to positive reinterpretation and growth. These findings lend support to the notion that secondary control beliefs held separately may benefit adult lupus patients in terms of psychological well-being.

Many other findings suggest that combinations of secondary control beliefs could potentially promote adult psychological well-being. One such study examined a sample of cancer patients up to 66 years old who were scheduled to undergo bone marrow transplants (Widows, Jacobsen, Booth-Jones, & Fields, 2005). In this study, positive reinterpretation was found to relate to posttraumatic psychological growth. The most

frequently endorsed indicators of posttraumatic psychological growth included “Appreciating each day” and having “priorities about what is important in life” (Widows et al., 2005, p. 269). The conceptual similarity of these items to acceptance (a type of secondary control), taken together with the finding that the acceptance items significantly related to positive reinterpretation, supports past value placed on studying the role of multiple control strategies as they relate to well-being (Chipperfield et al., 1999; Haynes et al., 2009).

Just as positive reinterpretation has been shown to benefit cancer patients in terms of psychological well-being, it has appeared to help individuals with multiple sclerosis (MS) adapt to their chronic disease. In a sample of MS outpatients ranging in age up to 63 years, positive reinterpretation and growth was the coping style most frequently endorsed in stressful, low-control situations related to having the disease (Lode et al., 2007). In particular, not receiving enough disease-related information at the time of diagnosis was seen as a major stressor. Lode et al.’s findings support past theory and research to suggest that secondary control comes about in times of low objective control, such as when disease-related information is not available (Rothbaum et al., 1982; Thompson et al., 1993).

In adult women with newly-diagnosed breast cancer who were, on average, 52 years old, secondary control engagement coping, (a broad construct which was operationalized to include combinations of items reflecting acceptance, positive thinking, and cognitive restructuring) was found to correlate positively with perceived control over emotional distress to a significantly greater degree than did primary control engagement coping (Compas et al., 2006). In addition, the latent construct “secondary control

engagement coping” correlated more negatively and more strongly with symptoms of anxiety and depression than did primary control engagement coping. These findings suggest that separate secondary control strategies can be used in combination to enhance perceptions of control in low-control circumstances, such as when faced with serious illness.

Although the bulk of the studies done on secondary control as it relates to psychological well-being in adults have shown secondary control to be beneficial, a small amount of research does not support that conclusion. For instance, a study on 34 mothers of offspring with insulin-dependent diabetes showed that finding benefit (positive reinterpretation) and finding meaning from (or accepting) their children’s illnesses did not significantly relate to maternal adaptation to the illness (Affleck, Allen, Tennen, McGrade, & Ratzan, 1985). One potential explanation for these counterintuitive findings is that positive reappraisal and acceptance were measured separately, and hence, they did not capture [fit-focused] secondary control (i.e., the combination of positive reinterpretation and acceptance). Had these measures been operationalized in combined form, a different set of findings may have emerged.

Another study that did not find secondary control beliefs to benefit adult psychological well-being was done on 92 patients with rheumatoid arthritis. The results showed that the belief that health care providers could control daily illness symptoms was associated with negative mood state (Affleck, Tennen, Pfeiffer, & Fifield, 1987). The term “vicarious control” was originally coined to describe feelings of control gained by reinterpreting a positive affiliation with powerful others (such as health care providers), so as to share psychologically in their control (Rothbaum et al., 1982). Health care

provider control was assessed in the Affleck et al. study using items that asked how much control the individuals thought their health care provider had over personal day-to-day illness symptoms such as pain, fatigue, discomfort, and immobility. The relationship between this type of secondary control and negative mood found by Affleck et al. is consistent with subsequent research on the benefits of personal control over the daily consequences of illness (e.g., Thompson et al., 1994).

Especially relevant to the proposed study is past research that has found secondary control beliefs to positively relate to the physical and psychological well-being of *older* adults. With regard to physical well-being, Bailis, Chipperfield, and Perry (2005) found that with age, sex, activities of daily living, chronic health conditions, and prior hospitalization controlled, secondary control beliefs in the form of downward social comparison related to lower chances of hospitalization and death over the two to six years that followed. Downward social comparison was measured in terms of how respondents felt they compared to others their age with regard to physical health, desired activity level, managing health care, physical appearance, and coping with aging. To the extent that such downward social comparison can be viewed as a form of positive reinterpretation, these findings suggest that separate secondary control beliefs may benefit physical well-being in older adults.

With regard to the relationship between secondary control and psychological health in older adults, a study of distress in 105 older patients in an acute care hospital setting found that those who believed more strongly in the power of others to control their health-related outcomes were less distressed by the loss of independence in the hospital setting than their counterparts who believed that they could personally control

their own health outcomes (Cicirelli, 1987). Belief in the power of others to exert control on one's behalf can be considered a separate type of Rothbaum et al.'s (1982) secondary control, since it involves positive reappraisal or reinterpretation of an otherwise uncontrollable situation or event. To the extent that such positive reinterpretation is a separate type of secondary control, these findings suggest that secondary control beliefs held separately may benefit the psychological well-being of older adults in acute-care hospital settings.

Socio-demographic differences in secondary control beliefs. Age differences in secondary control were first considered in the life span theory of control which postulated that as opportunities to exert primary control decreased with age, the use of secondary control strategies increased (Heckhausen & Schulz, 1995; Schulz & Heckhausen, 1996). Evidence has since supported the existence of age and sex differences in secondary control beliefs and strategies. Findings from a study on 241 older adults that examined relationships between control-enhancing strategies and measures of health in later life suggested that old-old individuals (those \geq 80 years) benefited more from accepting personal limitations (acceptance) combined with expecting less of themselves (positive reinterpretation) than did their counterparts who were less than 80 years old (Chipperfield et al., 1999). Chipperfield and colleagues also found sex differences in secondary control: the women in their sample used the acceptance-reinterpretation combination to a significantly greater degree than did the men.

Results from another investigation of demographic relationships, this time between age, culture, and control beliefs suggested that interdependence may mediate these relationships (Ashman, Shiomura, & Levy, 2006). In keeping with past work on

age, culture, and control (e.g., Schulz & Heckhausen, 1999), the Ashman et al. findings suggested that being older and being from Eastern culture related to higher interdependence, which in turn predicted stronger secondary control beliefs. Findings such as these underscore the importance of investigating demographic factors as they relate to secondary control.

Other empirical evidence suggests that there are age differences in primary and secondary control. A study of 383 secondary school, college, and university graduates found that primary control decreased and secondary control beliefs increased with age (Lackovic-Grgin et al., 2001). In this study, secondary control was defined as adjusting to new circumstances via accommodation. A sample secondary control item used was, “[When I personally cannot realize my goals, I...] alter the order of what is important to me” (Lackovic-Grgin et al., 2001, p. 154). This is similar to Rothbaum et al.’s notion of positive reinterpretation (secondary control) in the form of downgrading importance. Furthermore, to the extent that not being able to realize one’s goals is a low-control circumstance, this work supports Thompson et al.’s (1993) argument that it is in times of low objective control, that individuals try hardest to maintain their perceptions of control.

With regard to research on sex differences in secondary control, many previous studies have been done in a variety of health contexts and have focused on men or women exclusively, making comparisons and conclusions difficult. For example, studies have examined women with breast cancer who endorsed acceptance, and men with HIV who identified with powerful others, in the interests of gaining enhanced well-being (Carver et al., 1993; Reed, Taylor, & Kemeny, 1993). Very few studies have compared men’s and women’s endorsement of secondary [interpretive] control per se, nonetheless,

findings from research on other types of secondary control are informative. For example, longitudinal work by Taylor and colleagues on individuals with coronary heart disease and risk factors for cardiac arrest found vicarious control beliefs to positively relate to psychological adjustment six months later, but only among women (Taylor, Helgeson, Reed, & Skokan, 1991). In addition, a study of incarcerated men with HIV found acceptance to correlate positively with anxiety, suggesting the potential benefits of acceptance among men (Thompson, Collins, Newcomb, & Hunt, 1996).

A line of related research on secondary control strategies supports the salutary effects of secondary control as being more reliable for women than for men. Research by Chipperfield and colleagues found that among older individuals with health-related restriction, women used secondary-control strategies (i.e., positive reappraisal) more frequently than did men. In addition, the women in the sample benefited more from their increased use of secondary control strategies than did the men, in terms of fewer and shorter hospital stays (Chipperfield & Perry, 2006; Chipperfield, Perry, Bailis, Ruthig, & Chuchmach, 2007).

Research outside the theoretical framework of primary and secondary control points to a similar conclusion. A meta-analysis of 50 quantitative studies of sex differences in coping found that women engaged more than men in virtually all coping strategies in absolute terms (Tamres, Janicki, & Helgeson, 2002). On a relative basis, however, men favoured active or avoidant coping strategies to other kinds, whereas women favoured emotion-focused strategies: a set of responses to threat that includes positive reinterpretation (a form of Rothbaum et al.'s secondary control). The evidence from multiple studies suggesting that women but not men favour emotion-focused

approaches to other kinds highlights the sex difference that could have occurred in the present examination of secondary control belief combinations.

The Present Study

Most previous research on secondary control has examined different types of secondary control beliefs held separately, but not combined. Although a significant gap exists in the literature in terms of whether secondary control beliefs are emphasized in combination, limited related research suggests the importance of these combinations for enhanced well-being (Chipperfield et al., 1999; Haynes et al., 2009). Objective 1 of this primarily exploratory study was to identify the extent to which older individuals emphasized secondary control beliefs in combination. Objective 2 was to generate a descriptive profile of the groups identified in Objective 1. Objective 3 was to assess whether there were significant between-groups differences on outcome measures of health and well-being.

The secondary control beliefs of interest were measures of Rothbaum et al.'s (1982) definition of "interpretive" control. Interpretive control is a type of positive reinterpretation that conceptually includes acceptance, downgrading importance, belief in powerful others, and beliefs in nature, luck or chance, among other things. In light of the separate emphasis on these seemingly diverse types of secondary control in previous work, the label "secondary control" was adopted for them en masse in the present project, acknowledging that they are actually all forms of Rothbaum et al.'s interpretive control.

Addressing the first objective of the present study involved exploring the types of secondary control beliefs emphasized by the individuals in the study sample. In particular, the question was whether certain beliefs were emphasized in combination,

singularly, or not at all. Once the combined, singular, and absent clusters had emerged, it was then possible to address the second objective: the descriptive profile.

Generating the descriptive profile involved determining the average age, income, education, and level of perceived control of the individuals in each cluster. In addition, the percentages of females vs. males, married vs. single, and urban vs. rural dwellers were assessed. As part of Objective 2, the secondary control belief clusters were also tested for significant between-groups differences on the socio-demographic variables. These analyses were intended to uncover covariates that may affect secondary control, and that may need to be controlled in the main analyses of secondary control and physical and psychological well-being. Bivariate correlations were used to detect the influences of potential covariates upon the dependent measures.

Addressing the third main study objective involved an assessment of whether the secondary control clusters differed on measures of physical health and psychological well-being. These analyses were conducted cross-sectionally in 2003 and prospectively in 2006. The main independent variable was the three-level group variable subsequently identified in Objective 1 called “secondary control”. The three levels reflected emphasis on either combined, singular, or absent secondary control beliefs. The dependent variables (2003 and 2006) were measures of physical health (severity of chronic conditions score, recent health, and self-rated health) and psychological well-being (positive emotion, life satisfaction, and perceived stress). An ancillary attrition analysis was performed to confirm that those individuals who were lost-to-follow-up in 2006 did not differ from their surviving counterparts in terms of the independent variables included

in the study. Significant results in this analysis would render potential main longitudinal findings ungeneralizable.

Research questions and hypotheses. In light of the exploratory nature of this research, no a priori hypothesis was specified with regard to the number or type of secondary control belief clusters that were expected to emerge (Objective 1). It was possible that some people would endorse only one, and others, combinations of secondary control beliefs. For example, some individuals could have endorsed a combination of beliefs in nature and acceptance, whereas others could predominantly downgrade importance. It was also of primary importance to determine what percentage of individuals used a combination of secondary control beliefs.

Similar to Objective 1, no a priori hypothesis was specified with regard to the socio-demographic characteristics of the individuals that would reside in each cluster (Objective 2). However, since Rothbaum et al. suggested that secondary control came about when attempts at primary control had failed, and since past research had detected age and sex differences in separate secondary control beliefs, an evaluation of whether individuals identified by their secondary control belief clusters differed on socio-demographic characteristics was warranted. At the start of this study it was not known whether the individuals who emphasized the beliefs in these clusters would differ in terms of age, gender, income, education, marital status, region of residence, or perceived control, since secondary control belief groupings had not previously been compared. However, since it was conceivable that these factors could play a role in positive reinterpretation, they were considered as potential background variables in the present study.

With regard to the investigation of the secondary control belief clusters and indicators of health and well-being in 2003 and 2006 (Objective 3), in light of a small amount of related research on the benefits of combinations of secondary control *strategies* in older adults (e.g., Chipperfield et al., 1999; Haynes et al., 2009), an emphasis on combined secondary control *beliefs* was expected to benefit older individuals' physical and psychological well-being to a significantly greater degree than emphasis on secondary control beliefs held singularly. Just as combined secondary control *strategies* have been found to relate to well-being, it was expected that certain combinations of secondary control *beliefs* could promote well-being in older individuals. In particular, an emphasis on combinations of secondary control beliefs from 2003 was expected to relate cross-sectionally and longitudinally to a lower severity of chronic conditions score, higher recent health, and higher self-rated health than an emphasis on secondary control beliefs held singularly. Furthermore, membership in the combined group was expected to relate to greater positive emotion, lower perceived stress, and greater life satisfaction in 2003 and 2006 than membership in the singular group. The large proportion of study participants over age 85 provided a rare opportunity to examine the extent to which different secondary control belief clusters were emphasized by very old individuals, and to see whether these clusters of beliefs related to measures of physical and psychological well being.

Method

Overview

The present project used a group of participants from the Aging in Manitoba study (AIM), a far-reaching, longitudinal investigation of older adults. The group

included individuals who took part in the 2001/2003 and 2006 waves of AIM and the Successful Aging Study (SAS), a three-month AIM follow-up. Prior to describing the relevant waves of data, brief overviews of the AIM and SAS studies are provided. Additional details of the procedures and sample characteristics are available from Chipperfield, Havens, and Doig, 1997, Chipperfield et al., 2004, and Chipperfield, Newall, Chuchmach, Swift, and Haynes, 2008.

Aging in Manitoba, the Successful Aging Study, and the Present Study

The Aging in Manitoba (AIM) study began by drawing three independent, cross-sectional, probability samples of community-living senior citizens. The individuals were 60 years old and over, and were drawn from an electronic registry of Manitobans enrolled in the provincial health insurance program in 1971, 1976, and 1983. Longitudinal data were collected six times between 1983 and 2006. Because the Government of Manitoba provides universal coverage for basic health care services, the electronic registry contains accurate information on almost every person who lives in the Province of Manitoba.

Each initial sample (1971, 1976, and 1983) was drawn using an age and sex stratified area-probability sampling method. A substitution procedure was used to minimize the effects of attrition (Chipperfield et al., 1997). The substitution procedure involved selecting two separate samples, an original and an alternate, that were matched on age, sex, and area of residence. When death, serious illness, or migration prevented participants in the original sample from providing responses to the AIM questionnaire, matched equivalents from the alternate sample were selected. In-home interviews were conducted in the language of the participants choice. From its start in 1971 to its

completion in 2006, AIM included a total of 8,947 individuals, making it one of the largest and longest studies of older adults ever conducted.

In 1996, approximately three months after the AIM interview, a subset of AIM respondents were asked to participate in a second in-home interview that covered a variety of topics including control beliefs. More stringent eligibility criteria were applied to the selection of the SAS sample in comparison to their AIM counterparts. Most importantly, SAS respondents were excluded if their first language was not English, if they lived in an institution versus in the community, if they were cognitively impaired, and/or if they resided outside Winnipeg, Brandon, or Selkirk, three urban centres in Southern Manitoba. Once these selection criteria were applied, 353 individuals remained who participated in SAS 1996. Of these 353, 167 participants were followed up in SAS 2003 and 65 new participants were added, increasing the original SAS 2003 sample size to 232. In the original SAS 2006 sample, 121 of the $n = 232$ remained.

In the present study, the original cross-sectional SAS 2003 sample ($n = 232$) was reduced to 223, since nine individuals provided invalid responses to key measures of secondary control. Twenty-nine of the 223 individuals were lost to follow-up in 2006: seven were deceased, seven relocated to a personal care home, one became cognitively impaired, nine were too ill to participate, three were unavailable, one was not willing, and one refused. This left 194 individuals who were not lost to follow-up in 2006. However, 77 of the 194 did not provide valid responses to the measures of well-being in 2006, leaving 117 individuals from 2006 who were eligible for analysis (see Tables 1 and 2 for detailed descriptions of the reduced cross-sectional and longitudinal samples). The analyses of the present study were based on participant responses to items that were part

Table 1

Descriptive Statistics for the Cross-Sectional Sample of the Present Study in 2003 (N = 223)

	<i>M or %</i>	<i>SD</i>	<i>Range</i>	<i>Skewness</i>	<i>Kurtosis</i>
<i>Age^a</i>	84.99	4.32	79 - 98	.77	-.11
<i>Sex^b</i>	62.30	NA	1 = male, 2 = female	NA	NA
<i>Income^c</i>	1505.68	1013.13	0 - 5002.00	1.43	2.17
<i>Education^d</i>	10.45	2.63	3 - 21	.47	1.80
<i>Marital status^e</i>	62.30	NA	1 = single, 2 = married	NA	NA
<i>Region^f</i>	81.20	NA	1 = urban, 2 = rural	NA	NA
<i>Perceived control^g</i>	7.18	1.85	1 - 10	-.74	.29

Note. NA = Not Applicable: Categorical variable.

^aAge in years. ^bPer cent female vs. male. ^cMonthly income in Canadian dollars. ^dYears of education. ^ePer cent single vs. married. ^fPer cent urban vs. rural. ^gMean level of perceived control measured on a Likert-type scale of 1=almost no influence to 10=total influence.

Table 2

Descriptive Statistics for the Longitudinal Sample of the Present Study in 2006 (N = 117)

	<i>M or %</i>	<i>SD</i>	<i>Range</i>	<i>Skewness</i>	<i>Kurtosis</i>
<i>Age^d</i>	86.44	3.92	82 - 100	1.05	.53
<i>Sex^b</i>	65.0	NA	1 = male, 2 = female	NA	NA
<i>Income^c</i>	1563.21	1047.44	0 – 5002.00	1.40	2.15
<i>Education^d</i>	10.68	2.78	4 - 21	.60	1.23
<i>Marital status^e</i>	67.6	NA	1 = single, 2 = married	NA	NA
<i>Region of residence^f</i>	79.5	NA	1 = urban, 2 = rural	NA	NA
<i>Perceived control^g</i>	7.08	1.98	1 - 10	-.73	.13

Note. NA = Not Applicable: Categorical variable.

^a Age in years. ^b Per cent female vs. male. ^c Monthly income in Canadian dollars. ^d Years of education. ^e Per cent single vs. married. ^f Per cent urban vs. rural. ^g Mean level of perceived control measured on a Likert-type scale of 1=almost no influence to 10=total influence.

of the AIM 2001, SAS 2003 and SAS 2006 interviews. The list of potential background variables included age, sex, income, education, socio-economic status (SES; i.e., the income variable multiplied by the education variable), marital status, and region of residence from AIM 2001 and perceived control from SAS 2003. The independent variables for the main analyses were constructed out of secondary control items from SAS 2003 that reflected downgrading importance, belief in distant and close others, beliefs in nature/luck/chance, and acceptance. The dependent variables included the physical health indicators severity of chronic conditions score, recent health, and self-rated health from 2003 and 2006, and psychological well-being indicators positive emotion, life satisfaction, and perceived stress from 2003 and their 2006 versions.

Demographic Variables

Age. A continuous measure of self-reported age in years from AIM 2001 was included as one of the socio-demographic variables used to describe each of the secondary control belief groupings. The mean age of the original 232 respondents in 2001 was 85.03 years, $SD = 4.31$, and the age range was 79 to 98 years. Most (99.1%) of the individuals in the main study sample were 80 years old and over (Chipperfield et al., 1999; Menec & Chipperfield, 1997), allowing for a look at secondary control beliefs in the very old.

Sex. Sex from AIM 2001 was included as a socio-demographic descriptor of each of the three secondary control groupings. The original sample included 146 women (62.9%) and 86 men who participated in SAS 2003 ($n = 232$). Due primarily to death and relocation to personal care homes, these numbers dropped in SAS 2006, to 80 women

(66.1%) and 41 men ($n = 121$). The greater proportion of women at both measurement occasions is typical of older populations (Chipperfield et al., 1999).

Income. Monthly income in Canadian dollars from AIM 2001 was also used to describe individuals in the three secondary control groups in socio-demographic terms. It was assessed by asking the study participants, “What is your best estimate of your total personal income before deductions from all sources during the past 12 months?” Each response was divided by 12 to give the mean monthly income of the individual. The mean monthly income across all SAS 2003 participants was \$1488.35 CAD, $SD =$ \$1008.13. Outlier adjustments were done. The income range was \$0.00 to \$5002.00 CAD per month. Regression replacement was used to deal with missing values, and so the assumption was made that the eight “\$0.00” responses were legitimate in that they were not missing values. On the high end of the income distribution, the \$5002.00 per month was also presumed to be accurate, since the income measure was self-report and there was no way to verify the response.

Education. Years of education was used to describe each of the three secondary control belief groupings in 2003 and 2006. The AIM 2001 version of the variable was used, since participant responses to the education item were not collected as part of SAS 2003. The mean number of years of education across all participants in 2001 was 10.45, $SD = 2.62$.

Socio-economic status. A socio-economic status (or SES) variable was created by multiplying the income and education variables from 2003. Following the removal of six high outliers, this variable was considered for use in lieu of the 2003 income and education variables as a subsequent covariate in the main analyses. Substituting one

variable for two is prudent in analyses in which lack of power is potentially a concern, such as in the main longitudinal analyses under consideration in the present study. The mean of the SES variable in the SAS 2003 sample was 14969.86, $SD = 11211.26$.

Marital status. Marital status from AIM 2001 was included in the descriptive profile analyses. A dichotomous measure of marital status was used (i.e., married vs. not). The original SAS 2003 sample ($N = 232$) was made up of 87 individuals who were married and 145 who were not.

Region. Region of residence from AIM 2001 was included in the descriptive profile of the secondary control clusters. The region variable was dichotomized into urban vs. rural region of residence. Residents of Winnipeg and the surrounding areas were categorized as urban dwellers. Residents of the Eastman, Interlake, Central, Norman/Thompson, Parkland, and Westman regions were classified as rural. In the original SAS 2003 sample, 187 individuals lived in urban- and 45 in rural settings.

Lost-to-follow-up. A dichotomous grouping variable was created to identify participants from SAS 2003 who were lost-to-follow-up in 2006, to distinguish them from the survivors (1 = lost-to-follow-up, 0 = not). Those ineligible to participate in 2006 for reasons of mortality, morbidity, institutionalization, refusal to participate, cognitive impairment, and unavailability were included in the lost-to-follow-up category. Those lost-to-follow-up in 2006 were compared to those who were not on all independent variables in the study. Of the original 232 SAS 2003 participants, 31 were lost-to-follow-up in 2006.

Perceived control. Perceived control was measured in SAS 2003 by asking participants about the extent to which they felt they could personally influence various

aspects of their environments (Chipperfield et al., 2004). The perceived control variable was included in the descriptive profile of the three secondary control clusters, since Rothbaum et al. (1982) theorized that secondary control came about when attempts at primary [perceived] control had failed. In particular, the perceived control measure asked participants to rate the extent to which they felt they had influence (1=almost no influence, 10=total influence) over seven domains of daily life. Sample questions included, “How much influence [do] you feel you have over... your physical health?” and “... the usual tasks that need to be done?” (see Appendix A).

The original version of the perceived influence scale came from SAS 1996 and contained 11 items that when combined, had an internal consistency of $\alpha = .85$ (Hladkyj, Chipperfield, & Perry, 2000). The 11 items have since been reduced to 10, due to the conceptual overlap of one item with secondary control (i.e., “How much influence [do] you feel you have over... your emotional or mental well being”). The 10 items will be further reduced to seven for the purposes of the present study, since three of the items from SAS 2003 were not included in the SAS 2006 questionnaire (Newall et al., 2008; $\alpha_{\text{SAS 2003 sample}} = .91, M = 7.20, SD = 1.84$). The sum score over the seven items was used in the present study.

Origins of the Main Independent Variable: Secondary Control

The secondary control belief items. The secondary control belief items were drawn from a pool of 26 conceptually relevant questions from SAS 2003 that involved positive reinterpretation. The items that were incorporated originally came from scales that were initially designed to measure downgrading importance, beliefs in powerful others, beliefs in nature/luck/chance, and acceptance (Chipperfield et al., 2003; Hladkyj

et al., 2000). These items were subjected to an exploratory factor analysis with varimax rotation, which was intended to guide secondary control subscale construction. Since the 26 positive reinterpretation items were not all scaled the same way, they were standardized before being entered into the factor analysis. The items that loaded onto each factor were summed to form secondary control belief subscales. Means across all items in each subscale were calculated in the interests of handling missing values. The secondary control subscales were subsequently entered into a cluster analysis, to determine whether and how they were endorsed in combination.

Downgrading importance. Similar to comparing oneself optimistically to others of the same age (Bailis, Chipperfield, & Perry, 2005), downgrading the importance of various life domains as one gets older can be considered a type of positive reinterpretation (Chipperfield et al., 2003). The notion of downgrading importance originated from Rothbaum et al. (1982) who described it as readjusting personal beliefs and expectations, such that failure situations and threats to control could be avoided. Eight downgrading items were included in the present project which were borrowed from an 11-item scale administered during the SAS 2003 interview in which participants were asked to rate perceived importance of eight life domains now, compared to when they were younger (0 = less important, 1 = about the same, and 2 = more important). Sample items included, “Compared to when you were younger, how important is... good health?” and “... doing a good job of what you do?” (Appendix B). The items were reverse coded such that high scores indicated greater downgrading.

Belief in powerful others. Rothbaum et al. (1982) coined the term “vicarious control” to describe feelings of control gained via identification or association with

powerful others. Beliefs in others were measured in SAS 2003 by asking participants to rate the extent to which they agreed or disagreed with statements like, “Whether my health gets better or worse depends very much on my doctor”, and “I take pride in the achievements of others who are important to me, e.g., my family and friends” (1 = disagree strongly... 6 = agree strongly; Appendix C). Nine conceptually-relevant items were borrowed from an existing 12-item vicarious control scale that had an alpha reliability of .72 (Hladkyj et al., 2000). The nine items were included in the preliminary exploratory factor analysis, which was then used to guide construction of the secondary control subscales.

Belief in nature, luck or chance. The three “nature” and three “luck/chance” items that were included in the present study originated from a 12-item scale ($\alpha = .80$) initially designed to measure illusory control, a subtype of Rothbaum et al.’s (1982) secondary control. According to Rothbaum et al., illusory control involved positive reinterpretation aimed at identifying with luck in chance-determined situations. The original 12-item scale included identifying with nature and luck/chance, so as to psychologically benefit from these associations (Hladkyj et al., 2000). SAS 2003 participants were asked to rate the extent to which they agreed or disagreed with statements like, “Much of what happens in our lives is a part of the way Mother Nature works” and, “I believe that much in life is determined by fate or chance” (1 = disagree strongly... 6 = agree strongly; Appendix D). The six nature/luck/chance items that were chosen for inclusion in the preliminary factor analysis overlapped conceptually with positive reinterpretation.

Acceptance. Rothbaum et al. (1982) originally defined secondary control in terms of a linkage between positive reinterpretation and acceptance of negative situations and

events. Three items that were part of the original 15-item SAS 2003 Overall Control Orientation scale reflect acceptance (Chipperfield et al., 2003). The SAS 2003 participants were asked to rate the extent to which they agreed or disagreed with items like, “When someone is unable to influence major events in life, that person should just take it in stride” (1 = disagree strongly... 6 = agree strongly; Appendix E). These three items were also included in the preliminary exploratory factor analysis of secondary control.

The Physical Health Dependent Measures

Severity of chronic conditions score. The severity of chronic conditions score (SCCS) used in the present study was constructed from responses to the list of 22 chronic health conditions borrowed from AIM 2001 and found in Appendix F. The preamble to the chronic health condition questions asked participants to tell the interviewer whether they had experienced any of the chronic health conditions listed within the past year, or if they were otherwise still have after-effects from having had them earlier (1 = Yes, 0 = No). The yes responses were mapped onto the Seriousness of Illness Rating Scale (SIRS-R) by Chipperfield et al. (2007).

The SIRS-R was a measure of illness severity that originated in 1968 and was later revised (Rosenberg, Hayes, & Peterson, 1987; Wyler, Masuda, & Holmes, 1968). The original SIRS-R involved rankings provided by medical students and residents to depict the seriousness of each of 137 illnesses. In preparing the scale for use with SAS 2003 data, since nine chronic conditions from the SAS 2003 questionnaire were identical to illnesses in the SIRS-R, Chipperfield et al. (2007) imported those scores directly into the new SCCS scale. Ten of the chronic conditions in SAS 2003 did not have an exact

match on the SIRS-R illness list. For each of those, a mean severity score was calculated by summing over multiple relevant conditions in the SIRS-R. Lastly, for the three items in the SAS 2003 questionnaire that did not correspond to the SIRS-R ranking in any way (i.e., missing teeth, incontinence, and Alzheimers), Chipperfield et al. (2007) obtained new estimated rankings by averaging the scores assigned by two medical residents, who were able to assign scores after seeing those assigned for the other 19 chronic conditions. Severity of chronic conditions scores (SCCS) from 2003 and 2006 were used as dependent measures in the present study. They were created by summing over all SCCS for each of the chronic condition ranks identified by the study participants at each measurement occasion ($M = 386.50$, $SD = 196.50$; individual items appear in Appendix F).

Recent health. The dependent measure recent health used in the present study originated from a three-item recent illness scale that asked participants about the extent to which they had felt physically unwell, had experienced some physical symptoms, or had wished they had felt physically better in the past month (1=almost never true to 5=almost always true; Chipperfield et al., 2003). For the purposes of analyzing the data cross-sectionally and longitudinally, two composite measures of recent health were created by summing over each of the three items in 2003 and 2006. The composite variables were reverse-coded such that higher scores reflected better health ($\alpha_{\text{SAS 2003 sample}} = .79$, $M = 10.70$, $SD = 3.21$).

Self-rated health. A single item measure from SAS 2003 was used to indicate perceived general health status for inclusion in the descriptive profile analysis and as a dependent measure in 2003 and 2006. The single item to be used asked participants, “For

your age, would you say in general your health is good, fair, or poor?” Items were originally coded using a Likert-type scale ranging from 1 = excellent to 5 = poor, however, due to only a single “poor” response in the SAS 2003 data, the fifth category was combined with the fourth, resulting in a Likert-type scale of 1 = excellent to 4 = poor. Responses were reverse coded such that higher numbers reflected greater self-rated health. This single item self-report measure has time and time again been found to reliably indicate physical health ($M_{\text{SAS 2003 sample}} = 2.59, SD = .68$).

Measures of Psychological Well-Being

Positive emotion. To measure the relationships between secondary control belief profiles and positive emotion in SAS 2003 and 2006, study participants were asked to recall how often they had experienced nine positive emotions in the two days prior to being interviewed. These nine discrete emotions were assessed because of their relevance to an older population, and most originated from the Positive and Negative Affect Scales (Watson, Clark, & Tellegen, 1988). Respondents indicated the frequency with which emotion was experienced in the past two days (0 = never, 3 = sometimes, 6 = almost always). As reported elsewhere, when these emotions were subjected to a principal components factor analysis, one factor emerged reflecting positive emotion (Chipperfield et al., 2003). For the purposes of the present study, each respondent's frequency ratings of *pride, gratitude, hope, happiness, relief, contentment, inspiration, excitement, and love* were summed to form a positive emotion score ($\alpha_{\text{SAS 2003 sample}} = .80, M = 24.41, SD = 9.79$).

Life satisfaction. The life satisfaction indicator used as a cross-sectional dependent measure in the present study originated from a well-established scale

originally developed by Neugarten, Havghurst, and Tobin in 1961. It was called the Life Satisfaction Index A, and it asked participants to report on whether or not they agreed with 20 statements reflecting satisfaction with life. Sample items include “As I look back on my life, I am fairly well satisfied” and, “I would not change my past, even if I could” (see Appendix G for complete item listing). The “1 = agree” responses were summed to calculate individual life satisfaction scores. In the original SAS 2003 sample ($N = 232$), the 20-item scale was found to be a sufficiently reliable indicator of psychological well-being ($\alpha = .74$, $M = 13.50$, $SD = 3.89$). Since the 20-item life satisfaction measure was not available in 2006, a single-item analog from AIM 2006 was used to indicate life satisfaction longitudinally. It asked participants, “How would you describe your satisfaction with life in general at the present time?” (1 = excellent, 2 = good, 3 = fair, 4 = poor, 5 = bad). Responses were reverse coded such that high scores reflected greater life satisfaction ($M_{SAS\ 2006} = 2.98$, $SD = .65$).

Perceived stress. The measure of perceived stress that was used as a dependent measure in 2003 was the well-established 14-item Perceived Stress Scale developed by Cohen, Kamarck, and Mermelstein in 1983. The scale asked participants questions like, “In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?” and, “how often have you felt nervous and stressed?” (see Appendix H for complete item listing; 0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, 4 = very often). After the seven negatively-worded items were reverse-coded such that high scores indicated lower perceived stress, all 14 items were summed into individual perceived stress scores. In the original SAS 2003 sample ($N = 232$), the 14-item scale was found to be a reliable indicator of perceived

stress ($\alpha = .86$, $M = 37.95$, $SD = 8.02$). Since the 14-item stress measure was not available in 2006, a single-item analog from AIM 2006 was used to indicate longitudinal perceived stress. It asked participants to think about the amount of stress in their lives and rate most days as 1= not at all stressful, 2 = not very stressful, 3 = a bit stressful, 4 = quite a bit stressful, and 5 = extremely stressful. Responses were reverse-coded such that high scores represented low stress ($M_{SAS\ 2006} = 3.90$, $SD = 1.00$).

Four-Phase Analytic Approach

A four-phase analytic approach was taken that involved a scale construction phase (Phase 1), a sorting and profiling phase (Phase 2), preliminary analyses (Phase 3), and the main analyses of the secondary control belief profiles and physical and psychological well-being (Phase 4). As described in more detail later, Phase 1 involved a preliminary exploratory factor analysis to examine the number of secondary control belief scales present in the data. Phase 2 involved a cluster analysis of the secondary control belief scales to determine whether and how multiple secondary control beliefs were emphasized simultaneously in combination. Phase 3 included preliminary bivariate correlations and attrition analyses. Phase 4 (the main analyses) involved univariate analyses of variance (ANOVAs) to determine whether between-groups differences existed in the means of the secondary control belief clusters on measures of health and well-being in 2003 and 2006.

Phase 1: Scale construction. To construct the secondary control belief subscales that were ultimately used to create the main independent variable, 26 items were selected from SAS 2003 that conceptually mapped onto Rothbaum et al.'s (1982) notion of secondary control. Next, a preliminary, exploratory factor analysis with varimax rotation was run on the secondary control belief items. The results of this factor analysis guided

the construction of the secondary control belief subscales which acted as the main independent variables in subsequent phases of the present study. More specifically, standardized secondary control items from the SAS 2003 questionnaire that loaded acceptably onto separate factors (eigenvalue > 1.00 , critical value = $|.50|$; Kaiser, 1960; Stevens, 2002) highlighted groups of items that were summed into different secondary control belief subscales. After the subscale distributions were tested for normality and absence of extreme outliers had been confirmed, their alpha reliabilities were calculated. Mean scores of each of the new subscales were created, eliminating the problem of missing responses.

Phase 2: Sorting and profiling. Following Phase 1, a two-step cluster analysis was conducted to identify individuals who were similar in terms of their endorsement of various configurations of secondary control beliefs. Step 1 of the cluster analysis involved the tree-clustering technique to determine the approximate number of naturally occurring clusters present in the data (Ward, 1963). However, since the tree-clustering method is limited by the way in which it groups individuals hierarchically, Step 2 of the cluster analysis involved following Step 1 with a non-hierarchical procedure, the interactive partitioning of k-means (Huberty, Jordan, & Brandt, 2005; Milligan & Cooper, 1987). The cluster analysis provided information on the numbers of individuals residing in each secondary control subscale grouping. It was then possible to generate a descriptive profile of the individuals in each group.

The description of the individuals making up each secondary control group was generated by assessing whether the groups that formed each cluster differed in terms of age, sex, income, education, marital status, region of residence, and perceived control in

2003. Chi square tests (χ^2) were conducted on the categorical demographic variables sex, marital status, and region of residence, and one-way ANOVAs were performed on the continuous variables age, income, education, and perceived control. Because chi-square tests and ANOVAs only permit omnibus rejections of the null hypothesis, the omnibus effects were probed to determine where the significant differences occurred. Cell percentages were examined in the case of the significant χ^2 s, and post hoc Fisher's Least Significant Difference (LSD) tests were performed where significant F statistics were found. Taken together, the χ^2 and ANOVA findings provided a descriptive profile of the study sample.

Phase 3: Preliminary analyses. The preliminary analyses consisted of bivariate correlations and attrition analyses. The preliminary bivariate correlations were performed to detect potential covariates from 2003 for inclusion in the subsequent analyses of the secondary control belief profiles and physical and psychological well-being in 2003 and 2006. In particular, age, sex, income, education, marital status, region of residence, and perceived control from 2003 were examined in relation to the physical health indicators severity of chronic conditions score, recent health, and self-rated health, and in relation to the psychological well-being indicators positive emotion, life satisfaction, and perceived stress from 2003.

The preliminary attrition analysis examined individuals who participated in the SAS 2003 survey but were lost-to-follow-up in 2006 for reasons of mortality, morbidity, institutionalization, refusal to participate, cognitive impairment, and unavailability. The intent of this analysis was to detect whether attrition was non-random, and whether it could bias study findings. In particular, if participants who were lost-to-follow-up in 2006

did not differ significantly in 2003 from those not lost-to-follow-up on any of the independent variables in the study, it was assumed that sample attrition had occurred in acceptable, random fashion and that the study findings were generalizable. The first step in these analyses was to create the binary outcome measure lost-to-follow-up in 2006 vs. not (1 = lost-to-follow-up, 0 = not). Next, binary logistic regression was used to test whether any of the independent variables from 2003 significantly related to this binary outcome in 2006. Specifically, binary logistic regression was used to regress the lost-to-follow-up dependent variable onto all independent variables. If none of the independent variables were found to significantly relate to this binary outcome, the assumption was that attrition bias was not an issue in the present study.

Phase 4: The secondary control belief clusters and health and well-being. To examine whether between-groups differences existed in the secondary control belief clusters (generated from the cluster analysis) on measures of health and well-being, twelve one-way analyses of variance (ANOVAs) were performed, six cross-sectionally and six longitudinally, three each on indicators of physical and psychological health and well-being. By including the secondary control clusters derived from the cluster analysis as the main independent variables, the ANOVA results suggested an answer to the research question of primary importance: whether simultaneously holding combinations of secondary control beliefs had beneficial consequences for physical and psychological well-being cross-sectionally or prospectively. In particular, between-groups differences in physical health were examined in terms of severity of chronic conditions score, recent health, and self-rated health in 2003 and 2006. The psychological well-being dependent measures included positive emotion, life satisfaction, and perceived stress in 2003 and

2006. The ANOVA omnibus F tests looked at whether there were overall effects for SC group membership on the physical and psychological dependent variables. As recommended by Moore (2000), the significant F -values that emerged were probed with post hoc least significant difference (LSD) tests to pinpoint the groups between which the significant relationships occurred. Ethical approval for the use of the data was previously obtained from the Education/Nursing Research Ethics Board, Human Ethics Secretariat, University of Manitoba (#E2002:057), and the data used contained no personal identifiers.

Results

Phase 1: Scale Construction

The scale construction phase of this study began by screening the data for outliers. Outliers that fell above or below three standard deviations from the mean were excluded, since this indicated that there were obvious gaps between these particular responses and the majority of responses given by the remainder of the study participants. On this basis a total of nine individuals were excluded, decreasing the initial sample size in 2003 from 232 to 223.

Exploratory factor analysis. To determine the underlying factor structure of the 26 secondary control items, an exploratory principal components factor analysis with varimax rotation was performed. Since the scaling differed between the downgrading items and the rest of the secondary control items, each item was standardized. In determining the number of factors to retain (which were later to be turned into secondary control scales), Kaiser's (1960) well-established method was used in which only factors with eigenvalues greater than 1.00 were kept. The critical value of $|\lambda| \geq .50$ was chosen as the

lowest acceptable item-to-factor loading, since this represents 25% overlap in variance between item and factor (Stevens, 2002). Adherence to these criteria resulted in the formation of eight secondary control factors, seven of which, when summed into secondary control scales, had alpha reliabilities that were considered sufficient for retention (i.e., $\alpha > .60$; see Table 3).

Factor 1 consisted of five *downgrading importance* items that were active or instrumental in nature. That is, these items reflected downgrading the importance of *doing* certain things or *being* certain ways, and in the process, presumably promoted feelings of control. For example, considering being efficient as less important than before, conceivably promotes feelings of control in older individuals who may be limited in their efficiency as a result of age-related decline. Factor 2 included four *belief in others* items that represented affiliation with distant others (for example, finding it comforting to learn that someone famous, successful, or powerful has problems similar to one's own). Factor 3 was represented by three *beliefs in nature* (e.g., believing that Mother Nature knows best). Factor 4 consisted of three *acceptance* items (e.g., taking otherwise uncontrollable major life events in stride).

Table 3

The Secondary Control Scales Formed Based on the Factor Loadings in the Varimax Orthogonal Seven-Factor Solution for the

23 Standardized Positive Reinterpretation Items from SAS 2003 (Analysis N = 223)

Item	Factor 1 <i>Downgrading (Instrumental /Active)</i>	Factor 2 <i>Affiliation (Distant Others)</i>	Factor 3 <i>Beliefs in Nature</i>	Factor 4 <i>Acceptance</i>	Factor 5 <i>Affiliation (Doctor)</i>	Factor 6 <i>Downgrading (Non- instrumental /Passive)</i>	Factor 7 <i>Living Vicariously Through Close Others</i>
1. How important is doing a good job of what you do?	.80	.03	-.14	-.06	-.08	.03	-.14
2. How important is being efficient at what you do (i.e., getting things done quickly?)	.80	.03	-.20	.06	.02	.06	.01
3. How important is it to be physically active?	.71	-.15	.02	-.19	-.08	.08	-.13

4. How important is being knowledgeable?	.66	-.17	.02	.08	-.06	.21	-.13
5. How important is planning for the future?	.56	-.01	.00	.31	.08	.22	.02
6. I often find it comforting to learn that someone famous, successful, or powerful has problems similar to mine.	-.07	.85	.16	.03	-.00	-.02	-.04
7. Knowing that there are others with problems similar to mine gives me a good feeling of belonging to a group of people who share something in common.	-.17	.75	.09	.22	.07	-.01	.14

8. I feel a shared success when a person or a team that I want to win succeeds.	-.07	.68	.11	.16	.05	-.13	.29
9. I gain comfort from being around other people who have problems like mine.	.08	.68	.17	.05	.35	-.14	-.25
10. I believe that "mother nature knows best".	-.09	.15	.85	.04	-.01	-.11	.11
11. I believe that the way nature works is all for the best in the end.	-.06	.08	.84	.17	.14	-.07	.12
12. Much of what happens in our lives is a part of the way 'Mother Nature' works.	-.12	.23	.73	.13	.05	.20	.02
13. When people cannot have what they want, they should learn to ignore their desires.	-.06	.22	.10	.85	-.05	-.03	.07

14. When someone is unable to influence major events in life, that person should just "take it in stride".	.04	.09	.07	.75	.01	-.06	.21
15. I believe that it is better not to expect to have control over those things that are important to me.	.09	.08	.16	.75	.01	-.07	-.29
16. My doctor is usually the best judge of my health or my health problems.	-.02	.17	.03	-.02	.81	-.03	.26
17. Whether my health gets better or worse depends very much on my doctor.	.01	.05	.09	-.04	.78	-.14	-.09
18. I usually accept my doctor's advice.	-.12	.05	.02	.03	.72	.10	.29
19. How important is good health?	.17	-.03	.07	-.09	-.07	.79	.04
20. How important is your family?	.09	-.07	-.10	.01	-.00	.77	-.24

21. How important is friendship?	.38	-.15	.02	-.11	-.04	.54	-.15
22. I take pride in the achievements of others who are important to me (family & friends).	-.11	.08	.16	-.04	.15	-.20	.77
23. I can enjoy others' accomplishments.	-.25	.05	.11	.12	.26	-.11	.66

	<u>Factor 1</u> <i>Downgrading (Instrumental /Active)</i>	<u>Factor 2</u> <i>Affiliation (Distant Others)</i>	<u>Factor 3</u> <i>Beliefs in Nature</i>	<u>Factor 4</u> <i>Acceptance</i>	<u>Factor 5</u> <i>Affiliation (Doctor)</i>	<u>Factor 6</u> <i>Downgrading (Non- instrumental /Passive)</i>	<u>Factor 7</u> <i>Living Vicariously Through Close Others</i>
Eigenvalue	2.88	2.49	2.21	2.17	2.05	1.80	1.64
% Variance	12.51	10.81	9.60	9.43	8.90	7.82	7.14
Cronbach's α	.78	.79	.81	.76	.74	.66	.64
Mean	.80	3.68	4.37	3.61	4.71	.99	5.32
SD	.49	1.08	.96	1.18	.93	.38	.66
Range	0 - 2	1 - 6	1 - 6	1 - 6	1 - 6	0 - 2	1 - 6
Skewness	-.04	-.07	-.18	-.43	.16	.75	-.67
Kurtosis	-.65	-.02	.21	.01	.48	-.78	-.60

Note. Non-standardized values of the descriptive statistics are shown. The original study sample in SAS 2003 consisted of 232 individuals, however, the analysis *N* decreased to 223 since not all individuals provided valid responses to key indicators of secondary control.

Factor 5 included three *belief in others* items that represented an affiliation with one's doctor (e.g., seeing one's doctor as the best judge of one's health). Factor 6 was represented by three *downgrading importance* items that were passive or non-instrumental in nature. These items reflected downgrading the importance of things in an individual's life that were not likely directly controllable and as such, downgrading their importance presumably promoted feelings of control. For example, by downgrading the importance of family or of friends, an older individual may let go of the notion that he needs to see these individuals as often, opening the door to the potentially attractive possibility of spending more time alone with his thoughts. Factor 7 consisted of two *belief in others* items that involved living vicariously through close others (e.g., family and friends), and Factor 8 (which was eliminated due to its low alpha reliability) included three items that represented the belief that much in life is determined by fate or chance.

Based on these eight factors, eight potential new secondary control scales were identified, specifically: *instrumental/active downgrading*; *affiliation with distant others*; *beliefs in nature*; *acceptance*; *affiliation with doctor*; *non-instrumental/passive downgrading*; *living vicariously through close others*, and *beliefs in luck/chance*.

Composite scores were created for each of the eight scales by summing over the applicable items and calculating their mean. After the distributions were tested for normality and the absence of extreme outliers had been confirmed, the alpha reliabilities of the eight new secondary control belief scales were calculated (see the end of Table 3). All were found to be greater than .60 except for *beliefs in luck/chance*, which had an unacceptably low alpha of .52. As a result, the *beliefs in luck/chance* scale was dropped, leaving seven viable new secondary control belief scales that were used in the subsequent

cluster analysis. Interestingly, beliefs about *living vicariously through close others* were most strongly endorsed in the full sample, whereas beliefs about *active instrumental downgrading* were the least (see Figure 1).

Phase 2: Sorting and Profiling

Phase 2 involved cluster analysis which identifies groups of individuals who are similar within groups and dissimilar between groups on a given set of response variables (Huberty et al., 2005). The specific purpose of the cluster analysis was to identify groups of individuals who differed from each other in their secondary control beliefs. Step 1 of the cluster analysis used Ward's (1963) hierarchical tree-clustering technique to determine the approximate number of naturally-occurring clusters in the data. Step 2 involved following up on the hierarchical procedure with the non-hierarchical interactive partitioning of k-means (Huberty et al., 2005; Milligan & Cooper, 1987). Similar to a factor analysis, the final interpretation of the cluster analysis solution was guided by theory and past empirical research.

Hierarchical cluster analysis and k-means. Results from the hierarchical cluster analysis (Step 1 of the two-step cluster analysis) suggested that there were between two and four naturally-occurring secondary control groupings in the data (see Figure 2). To help narrow down the exact number of clusters to retain, the k-means procedure was run specifying two-, three-, and four-cluster solutions separately (Step 2). The three-cluster solution was the most theoretically meaningful and resulted in acceptable sample sizes in each cluster (Table 4). Since the seven secondary control belief scales were standardized, the secondary control belief loadings shown in Table 4 can be interpreted in terms of a mean of 0.00 and a standard deviation equal to 1.00. The objective of the cluster analysis

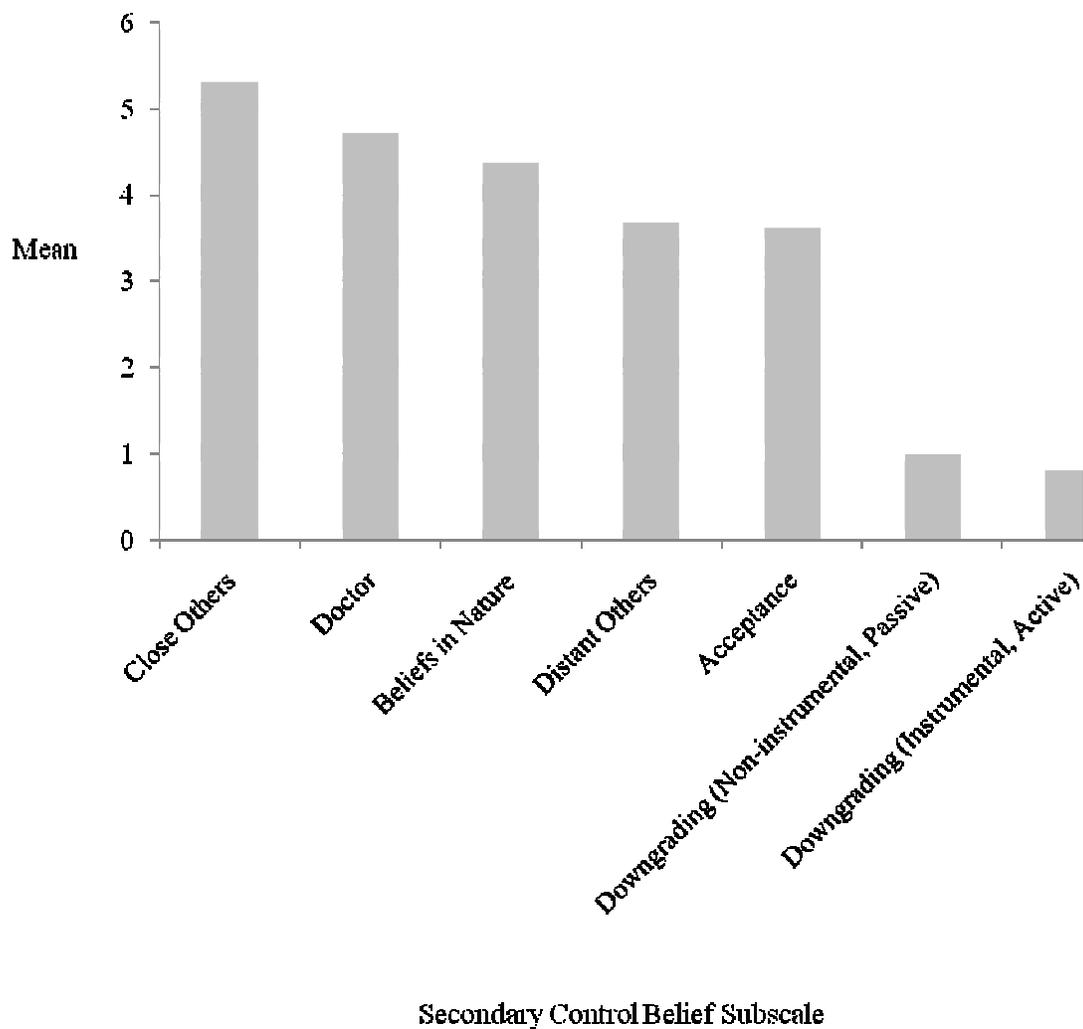
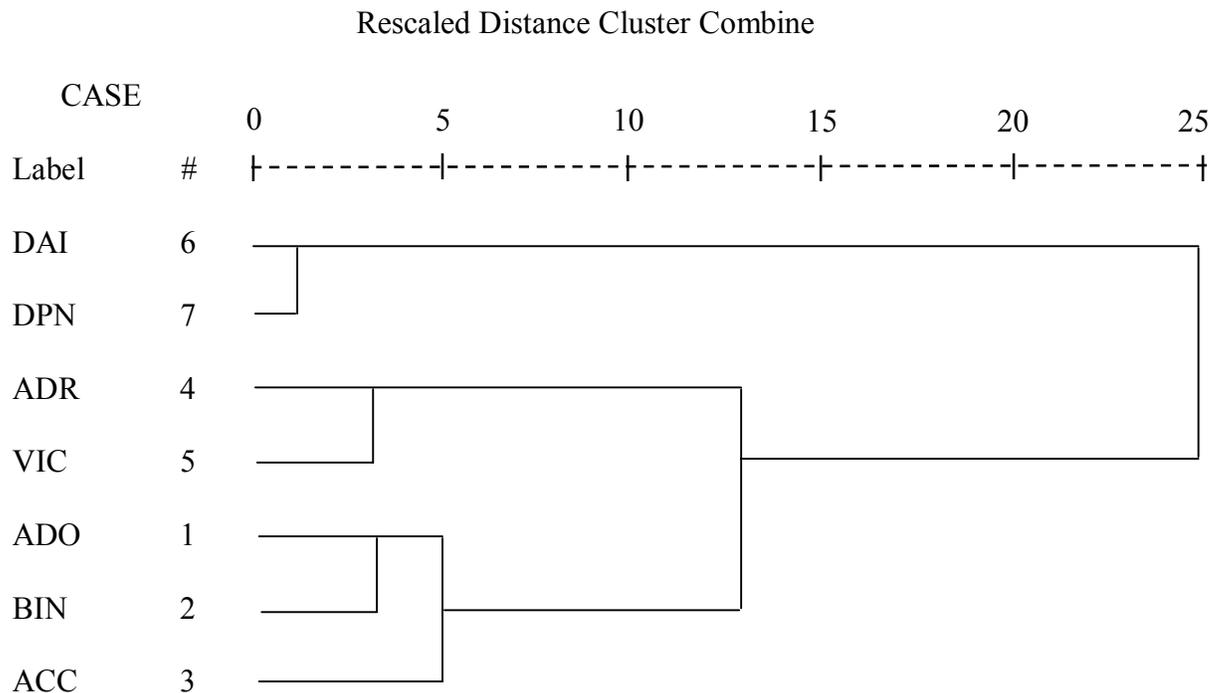


Figure 1. Mean scores of the full sample from SAS 2003 ($N = 223$) on the newly-created secondary control belief subscales generated from the exploratory factor analysis.

Dendrogram using Ward Method



<i>Abbreviated Factor Name</i>	<i>Extended Name</i>
<i>ACC</i>	Acceptance
<i>ADO</i>	Affiliation with Distant Others
<i>ADR</i>	Affiliation with Doctor
<i>BIN</i>	Beliefs In Nature
<i>DAI</i>	Downgrading (Active/Instrumental)
<i>DPN</i>	Downgrading (Passive/Non-instrumental)
<i>VIC</i>	Living Vicariously through Close Others

Figure 2. Hierarchical cluster analysis of the $N = 223$ sample (all valid cases from 2003) suggesting three naturally-occurring secondary control belief clusters in the data.

Table 4.

K-Means Cluster Sizes and Loadings of the Secondary Control Belief Clusters in the Full Sample from 2003 (N = 223)

N	Seven secondary-control belief scales generated from the exploratory factor analysis						
	ACC	ADO	ADR	VIC	BIN	DPN	DAI
Cluster 1 (SC Combined)							
76	.51	.61	.18	.43	.79	-.37	-.37
Cluster 2 (SC Singular)							
77	-.11	-.25	-.34	-.84	-.33	.66	.48
Cluster 3 (SC Absent)							
70	-.42	-.34	.17	.45	-.54	-.34	-.11
Total							
223							

Note. Positive values indicate above-average emphasis, negative values indicate below-average emphasis, and values between -.50 and +.50 indicate moderate or average emphasis of the given secondary-control belief cluster. SC = secondary control; ACC = acceptance; ADO = affiliation with distant others; ADR = affiliation with doctor; VIC = living vicariously through close others; BIN = beliefs in nature; DPN = downgrading (passive/non-instrumental); DAI = downgrading (active/instrumental).

was to classify individuals into groups based on whether or not they emphasized each of the secondary control belief clusters. Simultaneous emphasis on multiple secondary control beliefs was of particular interest, since it was expected to significantly relate to measures of health and well-being, and in doing so, could offer a novel way to improve the lives of older individuals.

Although there are many approaches to interpreting the results of a cluster analysis, loadings of greater than or equal to $+0.50$ (i.e., half a standard deviation above the sample mean) were interpreted as an emphasis on a certain type of belief, loadings of -0.50 or lower (half a standard deviation below the sample mean) represented a de-emphasis, and values between -0.50 and $+0.50$ were considered average emphasis of a given secondary control belief (see Fiori, Antonucci, & Cortina, 2006 for a similar procedure). Consistent with the study of positive-psychology, the preferred interpretation to describe the cluster groups involved a focus on loadings that showed an *emphasis* on a particular secondary control belief, ignoring loadings that showed a de-emphasis or an average emphasis.

The first cluster consisted of 76 older people who were characterized by their emphasis on beliefs in nature, affiliation with distant others, and acceptance. They emphasized all remaining secondary control beliefs to an average degree. Participants in this grouping endorsed these three types of secondary control beliefs simultaneously, presumably to gain feelings of control in otherwise uncontrollable circumstances. Because the three beliefs were endorsed at the same point in time, this cluster was conveniently named “SC Combined”.

In the second cluster there were 77 individuals who emphasized passive, non-instrumental downgrading and de-emphasized living vicariously through close others, namely family and friends. They endorsed all remaining secondary control beliefs to an average degree. Participants in this grouping emphasized passive, non-instrumental downgrading presumably in search of feelings of control in low-control circumstances. Since only one secondary control belief was emphasized, this cluster was temporarily termed “SC Singular”.

The third and smallest cluster of older adults consisted of 70 individuals who did not emphasize any of the secondary control beliefs examined in this study. Rather, they de-emphasized beliefs in nature and endorsed the remainder of the secondary control beliefs to an average degree. Due to the absence of emphasis on any of the secondary control beliefs examined, this cluster was, for the time being, named “SC Absent”.

Descriptive profile of the clusters. The descriptive profile analyses involved performing one-way ANOVAs and chi-squares to determine whether the three secondary control belief groupings differed significantly in terms of potential covariates. Results revealed significant between-groups differences only on perceived control: $F(2, 220) = 7.3, p \leq .001$. Post hoc Fisher’s LSD tests revealed that the SC Combined and SC Absent groupings were significantly higher in mean level of perceived control than was the SC Singular group (see Table 5; $p \leq .001$ for both differences). These significant differences suggested the need to account for perceived control in the multivariate analyses that were initially planned to assess the differences between the means of the secondary control belief clusters on the measures of physical and psychological well-being in 2003 and 2006.

Table 5

Descriptive Profile of the Three Secondary Control Belief Clusters from 2003 (N = 223)

	<i>SC Combined</i> (<i>n</i> = 76)	<i>SC Singular</i> (<i>n</i> = 77)	<i>SC Absent</i> (<i>n</i> = 70)	<i>X² or F</i>	<i>p</i>
<i>Age^a</i>	85.04	85.75	84.10	2.74	.07
<i>Sex^b</i>	61.84	58.44	67.14	1.19	.55
<i>Income^c</i>	1361.42	1518.01	1648.74	1.48	.23
<i>Education^d</i>	10.29	10.16	10.93	1.78	.17
<i>Marital status^e</i>	63.16	63.63	60.00	.24	.89
<i>Region of residence^f</i>	80.26	79.22	84.29	.69	.71
<i>Perceived control^g</i>	7.48	6.55	7.54	7.20	.001

Note. SC = Secondary Control.

^aMean age in years. ^bPercent female vs. male. ^cMean monthly income in Canadian dollars. ^dMean years of education. ^ePercent single vs. married. ^fPercent urban vs. rural. ^gMean level of perceived control measured on a Likert-type scale (1=almost no influence to 10=total influence).

Phase 3: Preliminary Analyses

Bivariate correlations. Preliminary bivariate correlations between potential covariates from 2003 and the cross-sectional dependent measures of physical and psychological well-being are presented in Table 6. Taken altogether, the significant correlations initially suggested that age, gender, SES, and perceived control could be potential covariates needing to be controlled when examining whether the secondary control belief clusters differed in physical and psychological well-being. Perceived control was the only covariate found to consistently and strongly relate to the independent and dependent variables (Tables 5 and 6). Since Tabachnick and Fidell (2007) recommended keeping the number of covariates at a minimum when performing multivariate analyses with small sample sizes to preserve power, perceived control was initially to be retained as the sole covariate in all analyses of secondary control and physical and psychological well-being.

Attrition. Phase 3 included an attrition analysis of the individuals who participated in the SAS 2003 survey but were lost-to-follow-up in 2006 for reasons of mortality, morbidity, institutionalization, refusal to participate, cognitive impairment, and unavailability. Out of the 223 individuals in the present study sample from 2003, 29 were lost to follow-up in 2006. In particular, the attrition analyses involved using the SAS 2003 data as a baseline, to determine whether those lost-to-follow-up in 2006 differed significantly from the survivors on all independent variables in the study. A series of binary logistic regressions were performed and only education significantly related to being lost-to-follow-up. In particular, those who were lost-to-follow-up were

Table 6

Bivariate Correlations between Potential Socio-Demographic Covariates and the Dependent Measures from 2003 ($N = 223$)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	--											
2. Sex ^a	.05	--										
3. SES ^b	-.02	-.39**	--									
4. Marital status ^c	-.23**	-.45**	.15*	--								
5. Region ^d	.02	.02	-.09	.00	--							
6. Perceived control	-.14*	-.13	.21**	.03	.02	--						
7. Recent health	.11	-.20**	.18**	.01	.04	.47**	--					
8. Self-rated health	.01	-.07	.10	.06	-.08	.34**	.49**	--				
9. SCCS ^e	.04	.01	-.02	-.02	-.04	-.33**	-.40**	-.39**	--			
10. Positive emotion	-.14*	.04	.09	.12	-.00	.27**	.04	.19**	-.12	--		
11. Life satisfaction	-.11	-.09	.19**	.10	.05	.49**	.38**	.26**	-.21**	.36**	--	
12. Perceived stress ^f	-.04	-.02	.06	-.08	.09	-.52**	-.44	-.30**	.23**	-.16*	-.48**	--

Note. All correlations reported are Pearson's r .

^aSex was coded 1 = males, 2 = females. ^bSES (Socio-Economic Status) = income * education in 2003. ^cMarital status was coded 1 = single, 2 = married. ^dRegion of residence: 1 = urban, 2 = rural. ^eSCCS = Severity of Chronic Conditions Score. ^fPerceived stress was coded such that high scores = more stress.

* $p \leq .05$, ** $p \leq .01$.

significantly less educated than their peers who had survived (see Table 7). This implied that sample attrition over time may have been biased by years of education.

Power. Due to a variety of reasons including mortality, morbidity, institutionalization, refusal to participate, cognitive impairment, unavailability, and not providing responses to some of the key questionnaire items, the *N*-size decreased from 223 individuals in 2003 to 117 individuals in 2006. To increase the probability of the main analyses being able to detect significant longitudinal effects, statistical power was calculated. Following the procedures of Cohen (1988), the power of the longitudinal analysis on physical health was calculated at 31.2% (Figure 3) and the power on psychological well-being in 2006 was 27.7% (Figure 4). These low power levels (Garson, 2009) eroded the empirical justification for proceeding with the longitudinal MANCOVAs.

Table 7

Summary of Binary Logistic Regressions performed for Attrition Analysis: All Independent Variables from 2003 predicting Lost-to Follow-Up vs. Not in 2006

Variable	<i>B</i>	<i>SE</i>	Odds ratio	Wald statistic
SC Combined	-.02	.52	.99	.00
SC Singular	-.23	.54	.79	.19
Perceived control ^g	.00	.02	1.00	.00
Age ^a	.07	.05	1.07	2.18
Sex ^b	-.44	.51	.64	.75
Income ^c	.00	.00	1.00	3.23
Education ^d	-.19	.09	.82	4.79*
Marital status ^e	-.17	.50	.84	.12
Region ^f	-.80	.65	.45	1.52

Note. Lost-to-follow-up = 1, Not = 0. SC = Secondary Control.

^aAge in years. ^bPer cent female vs. male. ^cMonthly income in Canadian dollars. ^dYears of education. ^ePer cent single vs. married. ^fPer cent urban vs. rural. ^gMean level of perceived control measured on a Likert-type scale of 1=almost no influence to 10=total influence.

* $p < .05$.

Number of variables on y side: $k_y = \text{SCCS, recent health, and self-rated health from 2006} = 3$
Number of variables on x side: $k_x = \text{SC and perceived control from 2003} = 2$
$s = 2$ (from Table 10.2.1, p. 475) Small effect size: $f^2 = 0.02$ $R^2_{y,x}$ as a function of f^2 and $s = 4\%$ (Table 10.2.3, p. 479)

$m = N - \max(k_c, k_a, + k_g) - (k_y + k_x + 3) / 2$ $= N - 0 - (k_y + k_x + 3) / 2$ numerator df: $u = k_y * k_x$ denominator df: $v = m * s + 1 - u / 2$ $\lambda = f^2 (u + v + 1)$
$m = 117 - 0 - (3 + 2 + 3) / 2 = 113$ $u = 3 * 2 = 6$ $v = 113 * 2 + 1 - 3 = 224$ $\lambda = 0.02 (6 + 224 + 1) = 4.62$

From Table 9.3.2 (p. 421): **Power = 31.2%**

Figure 3. Power of the longitudinal multivariate analysis of covariance to detect small effects of secondary control on physical well-being in 2006 with perceived control controlled (Cohen, 1988).

Number of variables on y side: $k_y =$ Positive emotion, perceived stress, life satisfaction, and perceived control from 2006 = 4
Number of variables on x side: $k_x =$ SC and perceived control from 2003 = 2
$s = 2$ (from Table 10.2.1, p. 475) Small effect size: $f^2 = 0.02$

$R^2_{y,x}$ as a function of f^2 and $s = 4\%$ (Table 10.2.3, p. 479)

$m = N - \max(k_c, k_a, + k_g) - (k_y + k_x + 3) / 2$ $= N - 0 - (k_y + k_x + 3) / 2$ <p>numerator df: $u = k_y * k_x$</p> <p>denominator df: $v = m * s + 1 - u / 2$</p> $\lambda = f^2 (u + v + 1)$
$m = 117 - 0 - (4 + 2 + 3) / 2 = 112.5$ $u = 4 * 2 = 8$ $v = 112.5 * 2 + 1 - 4 = 222$ $\lambda = 0.02 (8 + 222 + 1) = 4.62$

From Table 9.3.2 (p. 421): **Power = 27.7%**

Figure 4. Power of the longitudinal multivariate analysis of covariance to detect small effects of secondary control on psychological well-being in 2006 with perceived control controlled (Cohen, 1988).

Main Analyses

The initially-planned multivariate analyses of covariance were abandoned in favour of univariate ANOVAs for two reasons. First, in the multivariate analyses, the covariate perceived control was found to relate so strongly to the cross-sectional measures of physical and psychological well-being, that it attenuated the effects of secondary control (the main independent variable) on the dependent measures. Second, the power levels calculated for the longitudinal multivariate analyses were low (Garson, 2009), suggesting that those analyses should be abandoned. As a result, the main analyses in the present study consisted of a series of univariate ANOVAs that examined the effects of secondary control group membership on health and well-being in 2003.

The dependent variables in each ANOVA consisted of measures of well-being, both physical (severity of chronic conditions score, recent health, and self-rated health) and psychological (positive emotion, life satisfaction, and perceived stress) in 2003 and 2006. The sole independent variable was the three-level categorical secondary control variable that reflected the three groups that emerged in the cluster analysis. Although different interpretations of the three clusters are possible and will be discussed later, the labels *SC Combined*, *SC Singular*, and *SC Absent* were adopted momentarily, since they captured different configurations of secondary control beliefs in keeping with the main objectives of the study. The relationship of the *SC Combined* category to the measures of health and well-being was of particular interest, since combinations of simultaneous secondary control beliefs had not yet been considered in empirical research.

Univariate ANOVA Rationale

Univariate ANOVA is used to test differences in a single continuous dependent variable between several groups or categories of an independent variable, such as the three-category secondary control variable used in the present study. In particular, univariate ANOVAs compare the variation from specific sources (i.e., the between-groups variation) with the variation among individuals who should be similar (the within-groups variation). Specifically, univariate ANOVAs test whether several populations have the same mean by comparing the distance between the means with how much variation there is within the samples. In other words, univariate ANOVAs test the null hypothesis that the independent variable (in this case, secondary control group membership) has no effect on a single dependent measure. If the groups differ significantly, the conclusion is that the independent variable has had an effect on the dependent variable. Similar to all inferential procedures, ANOVA should only be used once certain assumptions have been satisfied. Specifically, the study participants should be randomly sampled from a normal population; the dependent variable should be continuous and the independent variable, categorical; the observations should be independent of each another; and the variances should be equal.

Eta squared is the measure of effect size in univariate ANOVA. It is the non-linear analog of R square in regression, and can be interpreted as percentage of variance explained. Once significant results are found, post hoc tests such as Fisher's Least Significant Difference (LSD) are typically employed to test for significant differences between the categories of the independent variable with respect to the dependent variable. Fisher's LSD is less conservative than other post hoc tests, and therefore has a greater

likelihood of detecting significant between-groups differences. Because post hoc tests determine which group means differ significantly from others, they help to specify the exact nature of the significant overall F test. In other words, if an overall F test detects a significant effect for an independent on a dependent variable, post hoc tests such as Fisher's LSD can be used to pinpoint which mutually-exclusive group differs significantly from the others in terms of mean level of the dependent variable (Garson, 2009; Moore, 2000).

Univariate ANOVA Findings in the Present Study

In the present study, a total of twelve univariate ANOVAs were performed on secondary control and various measures of physical and psychological well-being from 2003 and 2006. More specifically, three univariate ANOVAs were performed on physical health and three on psychological well-being from 2003, and identical analyses were repeated using the 2006 versions of the dependent variables. Significant omnibus F -tests revealed overall model significance in select cross-sectional analyses of secondary control and physical and psychological well-being, however, no significant longitudinal findings emerged. Interested readers can view the non-significant longitudinal results in Appendixes I and J.

Secondary control and cross-sectional physical health. A marginally-significant effect was found in the cross-sectional ANOVA in 2003 that examined secondary control and the physical health measure severity of chronic conditions score. This analysis suggested that the three secondary control clusters (i.e., SC Combined, SC Singular, and SC Absent) differed marginally in terms of mean severity of chronic conditions score (SCCS; see Table 8). Post hoc LSD tests revealed that the mean SCCS of the combined

Table 8

Univariate Analyses of Variance for the Effects of Secondary Control Group Membership on the Three Cross-Sectional Physical Health Measures in 2003

Variable and source	<i>SS</i>	<i>MS</i>	<i>F</i> (2, 220)	η^2
SCCS				
Secondary Control	219468.88	109734.44	2.90 ⁺	.03
Error	8336499.49	37893.18		
Recent health				
Secondary Control	3.19	1.60	.15	.00
Error	2301.68	10.46		
Self-rated health				
Secondary Control	.49	.25	.52	.01
Error	103.72	.47		

Note. η^2 = effect size. SCCS = Severity of Chronic Conditions Score.

⁺*p* = .06.

group was significantly lower than that of the singular and absent groups (see Table 9 and Figure 5). This was consistent with the expectation that combinations of secondary control beliefs would be more beneficial in terms of health and well-being than would those held singularly or not at all. No significant effects were found in the univariate ANOVAs conducted on secondary control and recent or self-rated health in 2003.

Secondary control and cross-sectional psychological well-being. Significant effects were found in the cross-sectional ANOVAs in 2003 that examined secondary control and two of the measures of psychological well-being examined. These analyses suggested that the three secondary control clusters (i.e., SC Combined, SC Singular, and SC Absent) differed significantly in terms of mean levels of positive emotion and life satisfaction (see Table 10). Post hoc LSD tests revealed that the mean positive emotions score of the combined group was significantly higher than that of the singular or absent groups (see Table 11 and Figure 6). In addition, the mean life satisfaction of the combined group was significantly higher than that of the singular group, which in turn had significantly lower mean life satisfaction than did the absent group (Table 11 and Figure 7). No significant effect was found in the univariate ANOVA conducted on secondary control and perceived stress in 2003.

Table 9
*Means, Standard Deviations, and Post Hoc Findings for the Three Secondary Control Clusters on the Three Physical Health
 Dependent Variables from 2003*

Variable	<u>SC Combined (1)</u> <i>n</i> = 76		<u>SC Singular (2)</u> <i>n</i> = 77		<u>SC Absent (3)</u> <i>n</i> = 70		LSD
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
SCCS	343.04	194.25	411.47	214.61	406.47	170.51	1 < 2*, 3*
Recent health	10.66	2.96	10.86	3.39	10.57	3.34	1 = 2 = 3
Self-rated health	2.61	.68	2.52	.66	2.63	.73	1 = 2 = 3

Note. The numbers in parentheses in column heads refer to the numbers used for indicating significant differences in the last column titled "LSD". SCCS = Severity of Chronic Conditions Score. LSD = post hoc Least Significant Difference test results.

**p* < .05.

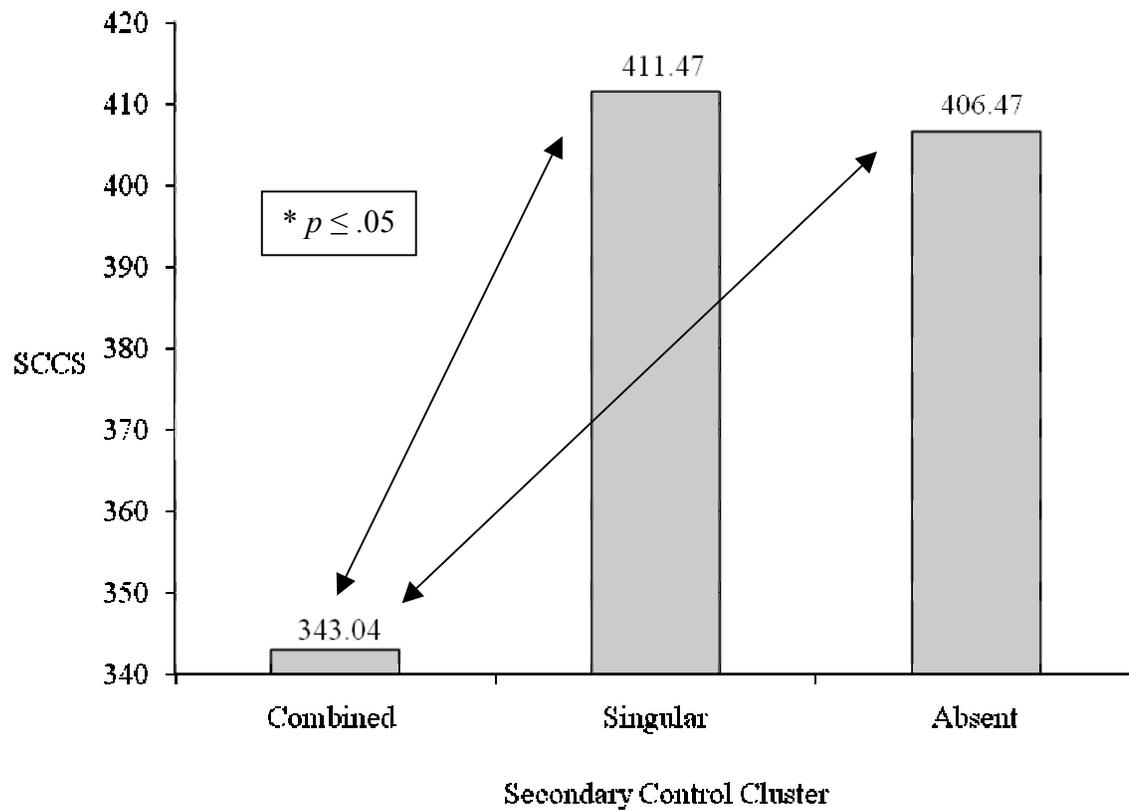


Figure 5. Differences between the SC Combined vs. the Singular and Absent groups in terms of mean severity of chronic conditions score (SCCS) in 2003.

Table 10

Univariate Analyses of Variance for the Effects of Secondary Control Group Membership on the Three Cross-Sectional Psychological Well-Being Measures in 2003

Variable and source	SS	MS	F(2, 220)	η^2
Positive emotion				
Secondary Control	2561.41	1280.71	14.90***	.12
Error	18906.20	85.94		
Life satisfaction				
Secondary Control	120.64	60.32	4.10*	.04
Error	3238.86	14.72		
Perceived stress				
Secondary Control	181.03	90.51	1.42	.01
Error	13857.14	63.57		

Note. η^2 = effect size.

*** $p \leq .001$. * $p < .05$.

Table 11
Means, Standard Deviations, and Post Hoc Findings for the Three Secondary Control Clusters on the Three Psychological Well-Being Dependent Variables from 2003

Variable	<u>SC Combined (1)</u> <i>n</i> = 76		<u>SC Singular (2)</u> <i>n</i> = 77		<u>SC Absent (3)</u> <i>n</i> = 70		LSD
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Positive emotion	28.97	10.12	20.96	8.52	23.46	9.09	1 > 2***, 3***
Life satisfaction	13.74	3.34	12.49	4.16	14.24	3.97	1 > 2* < 3**
Perceived stress	38.33	8.15	36.66	8.22	38.74	7.50	1 = 2 = 3

Note. The numbers in parentheses in column heads refer to the numbers used for indicating significant differences in the last column titled “LSD”.
 LSD = post hoc Least Significant Difference test results.

p* < .05. *p* < .01. ****p* ≤ .001.

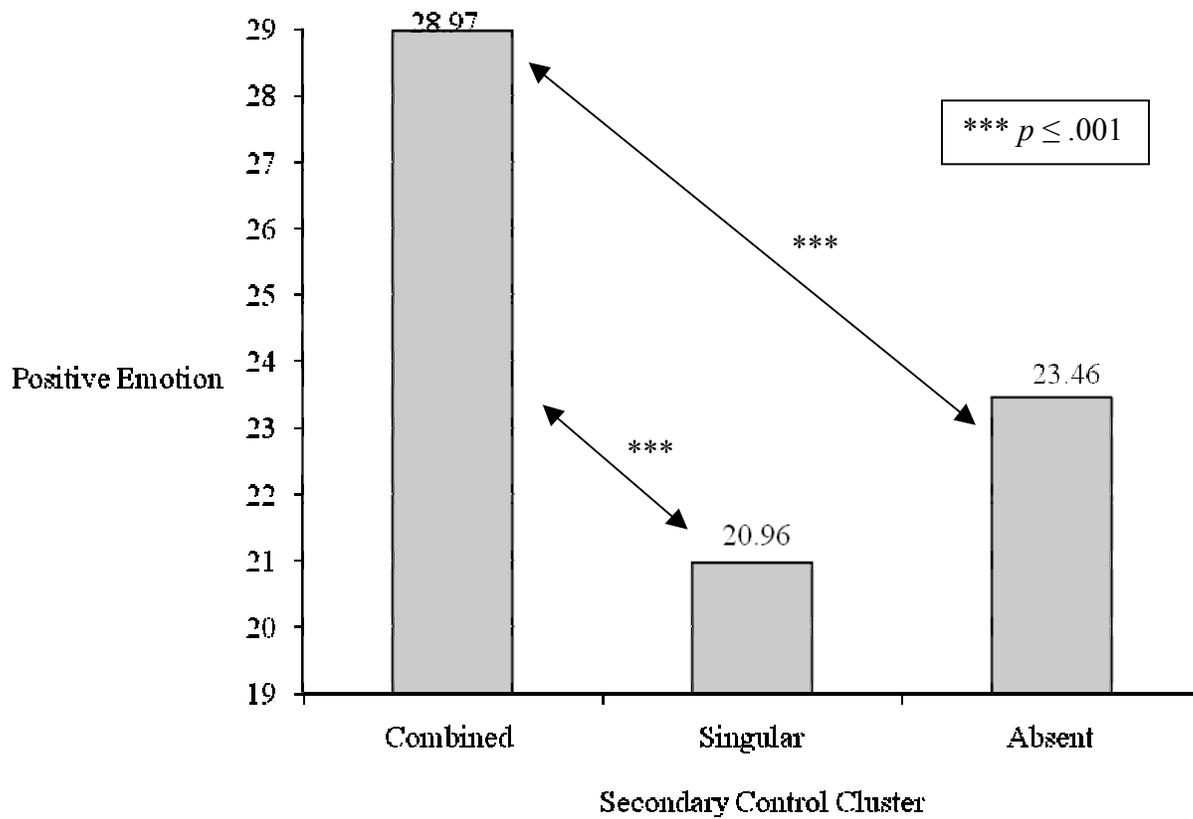


Figure 6. Secondary control and cross-sectional psychological well-being: Significant differences between the secondary control groups in terms of mean level of positive emotion in 2003.

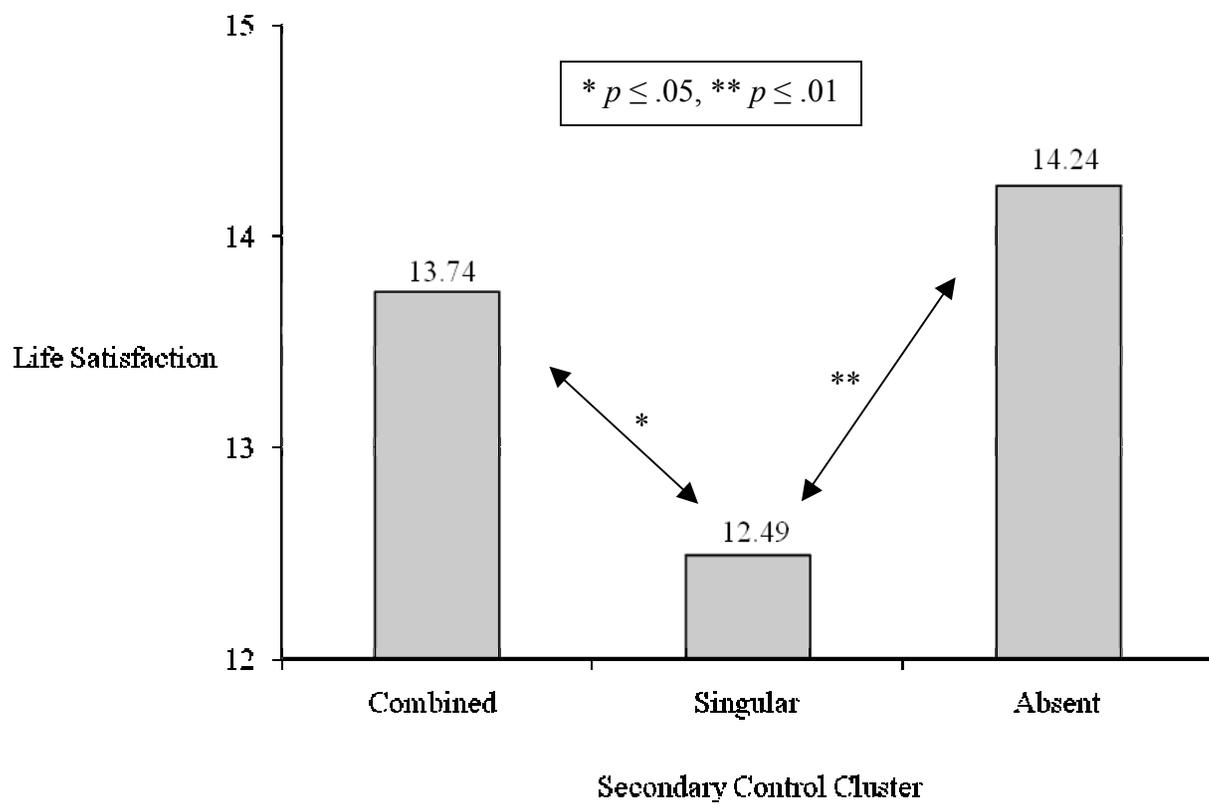


Figure 7. Significant differences between the secondary control groups in terms of mean level of life satisfaction in 2003.

Discussion

Findings from the present exploratory study of secondary control beliefs suggest that some older individuals emphasize multiple secondary control beliefs in combination, some emphasize secondary control beliefs singularly, and some may not emphasize them at all. There are many different ways to interpret these clusters, depending, for example, on whether the focus is on number or content of beliefs, which are confounded in the present study. This confound will be explained in greater detail later, but for present ease of understanding, the clusters are first discussed with reference to a number-focused interpretation using the labels “combined”, “singular”, and “absent”. More specifically, “combined” will refer to the combination of three secondary control beliefs that were emphasized simultaneously, “singular” will refer to one belief that was emphasized on its own, and “absent” will be used to designate the group of individuals who did not emphasize any of the secondary control beliefs examined in the present study.

Consistent with the main expectations of the present study, membership in the combined secondary control belief cluster was found to relate to measures of psychological well-being and physical health. In particular, those who emphasized the combined beliefs reported significantly higher positive emotion, higher life satisfaction, and marginally lower severity of chronic conditions scores than did individuals in the other two groups. Furthermore, the singular group reported significantly lower life satisfaction than did the other two groups. These relationships were found cross-sectionally but not longitudinally, perhaps implying that the benefits of emphasizing the secondary control belief combination are limited to immediate instead of prospective

outcomes. Nevertheless, the cross-sectional findings alone hold important implications in applied and theoretical contexts.

The Combined Cluster

Prior to the present study, little, if any empirical research had considered the possibility that individuals could emphasize multiple secondary control beliefs in combination. Also previously untested was the possibility that such emphasis could beneficially relate to measures of psychological or physical well-being. That being said, secondary control theory (Rothbaum et al., 1982; Morling & Evered, 2006) implied that individuals could simultaneously hold combinations of secondary control beliefs

Almost 30 years ago, Rothbaum et al. defined interpretive control as positively reinterpreting negative situations and events, so as to come to terms with and accept them. The authors highlighted interpretive control as the most important type of secondary control, since it was thought to be a conceptual *combination* of their other three types. In other words, Rothbaum et al. covertly suggested that if an individual held interpretive control beliefs, it was conceivable that he or she could also hold illusory or vicarious beliefs. Much later, in 2006, Morling and Evered theorized that a type of secondary control they called fit-focused secondary control, a derivative of Rothbaum et al.'s (1982) interpretive control, included the simultaneous combination of psychological adjustment (in the form of positive reinterpretation) and acceptance.

Consistent with Morling and Evered's (2006) adjustment-acceptance perspective, the present study showed empirically that a subgroup of individuals endorsed two types of psychological adjustment (i.e., affiliation with others/vicarious control and beliefs in nature/illusory control) together with acceptance in the combined secondary-control

cluster. These empirical results suggest that, as Morling and Evered (and Rothbaum et al.) had originally speculated, certain combinations of secondary control beliefs could be emphasized simultaneously. The secondary control belief combination found in the present study was made up of beliefs in nature, affiliation with distant others, and acceptance.

As to what it is about emphasizing this cluster of beliefs that may benefit older individuals, it could be that it helps older individuals to handle age-related stressors. The early work of Pearlin and Schooler (1978) supports the thinking that fending off stressful circumstances likely requires more than one cognitive behavioural technique at a time. In the present findings on psychological and physical well-being, those individuals who emphasized combined secondary control beliefs reported greater positive emotion, greater life satisfaction, and marginally lower severity of chronic conditions score than did those in other groups. To the extent that greater positive emotion, greater life satisfaction, and a lower severity of chronic conditions score relate to decreased emotional distress, these findings suggest that emphasizing the combination of beliefs in nature, affiliation with distant others, and acceptance could benefit older individuals facing stressful circumstances in later life.

Up to now, the combined secondary control belief cluster has been discussed in numeric terms in that it was made up of three different secondary control beliefs. An alternative interpretation involves a focus on the content of the beliefs in the cluster. Taken together, the combined beliefs can be seen as having spiritual connotations that could conceivably help fend off certain types of [age-related] stress. For example, an emphasis on the combination of affiliation with distant others, (perhaps God or another

higher being), beliefs in Mother Nature (also presumably a higher being), and acceptance (or letting go) may fit well for individuals who are perhaps facing the loss of a spouse. Taken in this somewhat spiritual context, the beliefs making up the the combined cluster could collectively be re-labelled “Zen”, to capture the tranquility and ultimate feeling of control presumably associated with embracing and completely letting go of a stressful negative life event or circumstance. This combination of embracing negative stress and completely accepting it without looking back is arguably the ultimate form of control, since once an individual has reached this point, he or she is presumably no longer vulnerable to the negative emotions and mindsets that may accompany stressful low control circumstances.

That being said, there are potential detrimental outcomes to the Zen state. A case in point may be that of an older individual, living alone, who has reached the Zen state so much so that he no longer worries about yard maintenance. When his neighbors contact the authorities about the overgrown weeds in his yard, his Zen state has indeed become maladaptive. In cases like this, service providers such as Home Care may be able to intervene, to supervise the need for yard maintenance and provide the appropriate support services when required.

In the present study sample, approximately 30% of the individuals emphasized the Zen state. It would be interesting to know what proportion of that 30% was experiencing considerable emotional distress specific to, say, losing a spouse at the time of the survey. If the 30% that emphasized the Zen state was made up of the same individuals who reported experiencing considerable emotional distress due to specific age-related stressors such as loss of a spouse, this would suggest that the Zen combination of beliefs

may be useful in applied settings, such as, in exchanges with health care professionals interested in minimizing the psychological impact of bereavement in older adults.

Unfortunately, a measure of specific stressors such as loss of a spouse was not available in the present study.

The Singular Cluster

Just as the emergence of the combined cluster was important in the present study, the emergence of the singular cluster was relevant, since it supported previous research which suggested that individuals can and do emphasize certain secondary control beliefs singularly. In particular, downgrading the importance of family, friends, and health was emphasized by the individuals in the singular cluster, with acceptance being conspicuously absent. To the extent that downgrading importance can be viewed as a form of psychological adjustment *without* acceptance, and in light of Morling and Evered's (2006) theory that [fit-focused] secondary control involves both adjustment *and* acceptance, the individuals in this cluster can be thought of as getting there in terms of feeling in control. Hence, the singular cluster was re-named, "Getting There".

The Absent Cluster

The unexpected emergence of the cluster of individuals who emphasized being absent of secondary control beliefs was in some ways the polar opposite of the combined cluster. In contrast to the combined cluster, the individuals in the absent group were low in beliefs in nature, affiliation with distant powerful others, and acceptance. They also emphasized three out of the four remaining secondary control beliefs to a lesser degree than did the individuals in the combined cluster (Table 4). This lack of emphasis on

secondary control beliefs in this cluster could have been a by-product of high levels of perceived (primary) control.

Rothbaum, Weisz, and Snyder (1982) originally suggested that secondary control came about when attempts at primary control had failed. Likewise, the descriptive profile in the present study (Table 5) suggested that the individuals who emphasized an absence of secondary control beliefs were significantly higher in perceived control than were their peers in the combined and singular groups. In other words, if primary control has *not* failed, (as suggested in the descriptive profile of the individuals in the absent group in Table 5), there may be no need to emphasize secondary control beliefs. In other words, the individuals in this cluster appeared to be “in control”.

The findings for life satisfaction further support this thinking. In particular, the individuals in the absent group had significantly higher life satisfaction than did those in the singular group. In light of the strong correlation between life satisfaction and perceived control (Table 6), the individuals in the absent cluster could be seen as being in [primary] control, and therefore may not have needed to emphasize secondary control beliefs. Hence, an alternate content-focused label for the absent group could be, “In Control”.

That being said, due to the available data, the present analyses were not able to take into account the variability in secondary control beliefs. For example, it could be that these beliefs change from hour to hour, they may be situation-specific, or maybe both. Furthermore, individuals may use these beliefs in a flexible manner, combining secondary control beliefs that are different from the ones included here. If indeed the types of secondary control beliefs emphasized are fluid and situation-specific, individuals

could be classified into different groups at different points in time, perhaps explaining the lack of significant longitudinal findings in the present study. Finally, it is critical to point out that the identification of the three clusters in this study does not imply that only three clusters are possible. A wide array of secondary control clusters could potentially exist based on individuals' proficiencies at emphasizing secondary control beliefs and/or the characteristics of the stressful circumstance at hand.

The Secondary Control Clusters and Measures of Well-Being

In terms of how the secondary control clusters related to cross-sectional measures of psychological and physical well-being, the present findings showed that individuals who emphasized a combination of secondary control beliefs were significantly higher in positive emotion, higher in life satisfaction, and marginally lower in severity of chronic conditions score than were individuals in other groups. These findings were not surprising, given past research that supports positive relationships between secondary control and health and well-being (e.g., Affleck et al., 1987; Thompson et al., 1994). If the results from the present study can be replicated, they may hold implications for the design of an intervention aimed at using combinations of secondary control beliefs to enhance immediate health and well-being in older adults. A seniors' centre might be a good setting for such an intervention. In such a setting, health care professionals might be able to teach older individuals how to see age-related decline as a natural part of the lifecourse (beliefs in nature), to see health problems as less important than before (downgrading), and to ultimately come to terms with and accept their health problems (acceptance). The present study results suggest that such an intervention could

conceivably decrease severity of chronic conditions score, and increase positive emotion and life satisfaction in older individuals.

Not surprisingly, in the present study, individuals in the Getting There group reported significantly lower life satisfaction than did those in the Zen group. That is, those who emphasized downgrading the importance of family, friends, and health over time reported significantly lower life satisfaction than those who reported emphasizing beliefs in nature, downgrading, and acceptance. As was previously suggested, this may be because they were still “getting there” in terms of feeling in control, however, an alternate explanation is possible. It could be that this group was gaining feelings of control by preparing for the worst to avoid disappointment, something along the lines of Rothbaum et al.’s predictive control.

Rothbaum et al. (1982) originally defined predictive control as perceptions of control gained through adjusting to negative circumstances by preparing for the worst, and thereby avoiding disappointment. It could be that the individuals who downgraded the importance of health, family, and friends were gaining feelings of control by preparing for the worst, to avoid future disappointment stemming from specific potential age-related losses. This way of feeling in control is conceptually different from feeling in control as a result of positively accepting negative situations and events and letting them go (as per the Zen group), which could account for the lower level of life satisfaction in the Getting There group compared to the Zen group.

The unexpected finding that those who emphasized an absence of secondary control beliefs reported significantly greater life satisfaction than did those who emphasized downgrading importance, however, is a different matter that may involve

significant between-groups differences in perceived (primary) control. Table 5 shows the Absent group to be significantly higher in perceived (primary) control than the Singular group. Primary control was found to be strongly correlated with life satisfaction (Table 6). Perhaps if one is high in primary control and life satisfaction (as was the Absent group in the present study), one does not need to emphasize secondary control beliefs.

Limitations

One limitation in the present study was the previously alluded-to issue of number of beliefs per cluster vs. content of the clusters. That is, it was not possible to tell whether it was the number of beliefs emphasized in each cluster that was important in terms of health and well-being, or the content of the beliefs in each cluster. There were not enough clusters available in the data to control for number of beliefs, and the conceptual similarity between the clusters made it difficult to control for content.

The present study was also limited by the possibility that the findings may represent a cohort effect that could vary over time. Past research in the area of control suggests that the older an individual becomes, the more he or she relies on secondary control (Schulz & Heckhausen, 1996). Other evidence suggests that individuals are living longer and remaining healthier for a longer period of time than ever before (Fries, 2005). Taken together, these lines of research suggest that future cohorts of older individuals may be more likely to emphasize secondary control beliefs (and in particular, Zen beliefs) at older ages than did the current cohort.

Similarly, past research suggests that women endorse secondary control to a greater degree than do men (Chipperfield et al., 1999). However, as time goes on, the lines between male and female gender roles seem to be blurring. For instance, today men

are granted maternity leave, whereas previously that option was reserved for women, and the notion of stay-at-home dads is now well accepted, whereas 20 years ago it was not. In future cohorts, this blurring of gender roles could be accompanied by an increased emphasis on secondary control beliefs in men.

As to why no significant differences were found between the three secondary control groups in terms of mean levels of perceived stress, the nature of the stress measure may have played a role. The stress measure used was the the well-established 14-item Perceived Stress Scale developed by Cohen et al. in 1983. The scale asked participants questions like, “In the last month, how often have you found yourself thinking about things that you have to accomplish?” and, “how often have you felt that you were on top of things?” In other words, the Perceived Stress Scale was a global measure of perceived stress, which could have contributed to the lack of significant findings in the present study. Had the stress measure asked about specific stressful life events such as the sudden diagnoses of a serious illness, or the loss of a spouse, perhaps significant differences between the three secondary control groups on the stress measure would have been found. Unfortunately, no specific measure of stressful life events was available for use in the present study.

In addition to the study limitations already mentioned, direction of causality could have played a role. That is, the causal ordering of the secondary control beliefs and outcomes cannot be ascertained, since the findings were cross-sectional. An application of Fredrickson’s Broaden-and-Build theory provides a suitable example of the counter-argument. The theory suggests that positive emotions may promote broader thinking (as per the multiple beliefs in the Zen cluster), which in turn builds the personal resources of

the individual. In contrast, the present study hypothesized that broader thinking (as per the Zen cluster) preceded positive emotion. Such cross-sectional direction-of-causality issues are typically resolved via subsequent longitudinal analysis of the variables in question. However, in the present study, no longitudinal findings emerged. That being said, the lack of longitudinal findings was not a limitation in and of itself, since the absence of significant findings can sometimes be informative. However, the decreased longitudinal sample size and its corresponding low statistical power was of concern (Figures 3 and 4), since the low statistical power eroded the empirical justification for proceeding with the initially-planned longitudinal MANCOVAs. These analyses would have shown the effects of secondary control group membership on combined measures of psychological and physical well-being, with the effects of perceived control controlled.

Other study limitations were implicit in the use of factor and cluster analysis. Both factor and cluster analysis have a subjective element in which multiple interpretations of the same results are possible. For example, the seven factors found in the present study could have been reduced down to three, based upon the conceptual reasoning that they could be categorized into three out of the four types of Rothbaum et al.'s (1982) secondary control. Specifically, the two downgrading factors and acceptance could have been conceptually combined into "interpretive control", the three affiliation factors could have been considered "vicarious control", and beliefs in nature could have been called "illusory control". This re-classification of the seven initial factors into three would likely have resulted in completely different cluster analysis results. Including only three secondary control belief factors in the cluster analysis, (instead of seven), would have downplayed the exploratory nature of the present study.

Just as factor analysis is open to different interpretations, so is cluster analysis. Closer inspection of the hierarchical cluster analysis results in Figure 2 shows that the three clusters found could have been interpreted as four: namely, downgrading importance; affiliation with close others (e.g., friends, family, and doctor); affiliation with distant others (e.g., famous people and Mother Nature); and acceptance. However, when the *k*-means cluster analysis was run specifying four clusters, the results were non-interpretable and the *n*-size of one of the clusters was too small to warrant further consideration. Another potential interpretation of the hierarchical cluster analysis was that two clusters emerged, one representing downgrading and the other, everything else (Figure 2). When the *k*-means procedure was run specifying two clusters, the two-cluster pattern persisted, however, the results were not within the acceptable boundaries of loadings between half a standard deviation above and below the sample mean. As a result, the three-cluster solution was retained.

A final methodological limitation in the present study has to do with potential misinterpretation of the *z*-scores in the *k*-means cluster analysis. Loadings of greater than or equal to $+0.50$ (i.e., half a standard deviation above the sample mean) were interpreted as an emphasis on a given secondary control belief scale, loadings of -0.50 or lower (half a standard deviation below the sample mean) represented a de-emphasis, and values between -0.50 and $+0.50$ were considered average emphasis. The problem is that the original secondary control belief scales were not ratio level. Ratio-level data is characterized by the presence of an absolute zero and equal distances between response categories. The secondary control belief scales, however, were ordinal, and so the intervals between response categories may not have been equidistant. Such variation in

intervals means that the question of whether an average emphasis corresponds to a high or a low level of a given belief is unanswerable, since detecting the midpoint of the interval is not possible.

Conclusion

Study limitations notwithstanding, the findings from the present exploratory study suggest that some older individuals emphasize secondary control beliefs in combination, some emphasize them singularly, and some may not emphasize them at all. In addition, membership in these secondary control belief clusters was found to relate to measures of health and well-being. Those individuals who emphasized the secondary control belief combination of beliefs in nature, affiliation with distant others, and acceptance reported significantly higher positive emotion, greater life satisfaction, and marginally lower severity of chronic conditions scores than did individuals in other groups.

These findings may be most important in applied contexts, particularly those in which the goal is to enhance well-being in older individuals. If the findings can be replicated, it may be possible to design an intervention aimed at promoting well-being in older individuals. In particular, such an intervention could aim to increase positive emotion and life satisfaction and decrease severity of chronic conditions score among older individuals who are dealing with age-related stressors such as loss of a spouse, or being diagnosed with a serious illness. This could be accomplished by teaching at-risk individuals to emphasize adaptive secondary control beliefs in combination.

The results of this study also have important theoretical implications in that they help to extend current thinking on secondary control. Prior to the present study, limited related research suggested that combined secondary control *strategies* related beneficially

to physical and psychological well-being (Chipperfield et al., 1999; Haynes et al., 2009). The notion that secondary control *beliefs* could be endorsed in combination had only been covertly considered by secondary control theorists. The preliminary findings of this exploratory study open up a new area of inquiry into secondary control belief combinations as they relate to health and well-being.

New areas of inquiry are typically accompanied by new research questions, such as whether or not individuals remain in certain belief clusters indefinitely, or whether they move back and forth from one cluster to the next. If the latter is the case, (as is suggested by the lack of longitudinal findings in the present study), then what prompts individuals to switch back and forth? Could it be the characteristics of certain types of stressors, such as perceived urgency? Or perhaps it has to do with individual proficiency or comfort level with emphasizing certain secondary control beliefs. These research questions just begin to address the exciting new knowledge that has yet to be uncovered in the area of secondary control beliefs.

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Appendixes

Appendix A

Perceived Control Items (SAS 2003)

“Please select a number that corresponds to how much influence you feel you have over... “

(1 = Almost no influence, 10 = Total influence)

1. ... your physical health.
 2. ... the things you can do for fun and enjoyment.
 3. ... developing new friendships.
 4. ... your physical fitness.
 5. ... your physical comfort or discomfort.
 6. ... the usual tasks that need to be done (e.g., housework, yard work, shopping, laundry).
 7. ... your life in general.
-

Appendix B

Downgrading Items (SAS 2003)

“Compared to when you were younger, how important is...”

(0 = Less important, 1 = About the same, 2 = More important)

1. ... good health?
 2. ... your family?
 3. ... friendship?
 4. ... planning for the future?
 5. ... being knowledgeable?
 6. ... being efficient at what you do (i.e., getting things done quickly)?
 7. ... doing a good job of what you do?
 8. ... it to be physically active?
-

Appendix C

Powerful Others Items (SAS 2003)

“How strongly [do] you disagree or agree with the following statements... “

(1=Strongly disagree, 6=Strongly agree)

1. I take pride in the achievements of others who are important to me
(e.g., my family and friends).
 2. Knowing that there are others with problems similar to mine gives me
a good feeling of belonging to a group of people who share something
in common.
 3. My doctor is usually the best judge of my health problems
 4. I can enjoy others' accomplishments
 5. I often find it comforting to learn that someone famous, successful, or
powerful has problems similar to mine.
 6. Whether my health gets better or worse depends very much on my doctor.
 7. I feel a shared success when a person or team I want to win succeeds.
 8. I gain comfort from being around other people who have problems like
mine.
 9. I usually accept my doctor's advice.
-

Appendix D

Nature Luck and Chance Items (SAS 2003)

“How strongly [do] you disagree or agree with the following statements... “

(1=Strongly disagree, 6=Strongly agree)

1. Much of what happens in our lives is a part of the way ‘Mother Nature’ works.
 2. I believe that the way nature works is all for the best in the end.
 3. I believe that “mother nature knows best”.
 4. I believe that much in life is determined by fate or chance.
 5. I believe that good things are more likely to happen to people who are lucky.
 6. I fully accept that life sometimes works in ‘mysterious ways’ that are out of our control.
-

Appendix E

Acceptance Items (SAS 2003)

“How strongly [do] you disagree or agree with the following statements... “

(1=Strongly disagree, 6=Strongly agree)

1. When someone is unable to influence major events in life, that person should just “take it in stride”.
 2. When people cannot have what they want, they should learn to ignore their desires.
 3. I believe that it is better not to expect to have control over those things that are important to me.
-

Appendix F

Severity of Chronic Conditions Items: SAS 2003

“[I’ll read a list of common health problems], and you tell me if you have had any of them within the last year or if you otherwise still have after effects from having had them earlier.”

(1 = Yes, 0 = No)

1. Heart and circulation problems (hardening of the arteries, heart troubles).
2. High blood pressure (hypertension).
3. Have had a heart attack.
4. Have had a stroke.
5. Anaemia or other blood diseases.
6. Arthritis or rheumatism (joints, back, or orthopaedic).
7. Palsy (Parkinson’s Disease).
8. Alzheimer’s Disease or other dementias.
9. Eye trouble not relieved by glasses (cataracts, glaucoma).
10. Ear trouble (hearing loss).
11. Dental problems (teeth need care, dentures don’t fit).
12. Number of missing teeth *Specify* _____ .
13. Chest problems (asthma, emphysema, T.B., breathing problems).
14. Stomach trouble (including upper & lower gastro-intestinal problems).
15. Incontinence, that is, trouble controlling your bladder.
16. Trouble controlling your bowels.
17. Kidney trouble (including bladder troubles).

18. Diabetes.
 19. Foot trouble.
 20. Skin problems.
 21. Nerve trouble (including all mental illness or emotional problems).
 22. Cancer, any variety (may have been mentioned above).
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Appendix G

Life Satisfaction Items: SAS 2003

“Can you tell me whether you agree or disagree with the following statements?”

(1 = Agree, 0 = Disagree, 8 = Not sure)

1. As I grow older, things seem better than I thought they would be.
2. I have gotten more of the breaks in life than most of the people I know.
3. This is the dreariest time of my life.
4. I am just as happy as when I was younger.
5. My life could be happier than it is now.
6. These are the best years of my life.
7. Most of the things I do are boring or monotonous.
8. I expect some interesting and pleasant things to happen to me in the future.
9. The things I do are as interesting to me as they ever were.
10. I feel old and somewhat tired.
11. I feel my age, but it does not bother me.
12. As I look back on my life, I am fairly well satisfied.
13. I would not change my past, even if I could.
14. Compared to other people my age, I've made a lot of foolish decisions in my life.
15. Compared to other people my age, I make a good appearance.
16. I have made plans for things I'll be doing a month or year from now.

17. When I think back over my life, I didn't get most of the important things I wanted.
 18. Compared to other people, I get down in the dumps too often.
 19. I've gotten pretty much what I expected out of life.
 20. In spite of what people say, the lot of the average person is getting worse, not better.
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Appendix H

Perceived Stress Items: SAS 2003

“In the last month, how often have you...”

(0 = Never, 1 = Almost never, 2 = Sometimes, 3 = Fairly often, 4 = Very often)

1. Been upset because of something that happened unexpectedly?
 2. Felt that you were unable to control the important things in your life?
 3. Felt nervous and stressed?
 4. Dealt successfully with irritating life hassles?
 5. Felt that you were effectively coping with important changes that were occurring in your life?”
 6. Felt confident about your ability to handle your personal problems?
 7. Felt that things were going your way?
 8. Found that you could not cope with all the things that you had to do?
 9. Been able to control irritations in your life?
 10. Felt that you were on top of things?
 11. Been angered because of things that happened that were outside of your control?
 12. Found yourself thinking about things that you have to accomplish?
 13. Been able to control the way you spend your time?
 14. Felt difficulties were piling up so high that you could not overcome them?
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Appendix I

Univariate Analyses of Variance for the Effects of Secondary Control Group Membership in 2003 on the Three Physical Health Measures in 2006

Variable and source	SS	MS	F(2, 114)	η^2
SCCS				
Secondary Control	101971.21	50985.60	1.49	.03
Error	3891460.35	34135.62		
Recent health				
Secondary Control	35.04	17.52	1.68	.03
Error	1191.75	10.45		
Self-rated health				
Secondary Control	1.47	.73	1.22	.02
Error	68.45	.60		

Note. η^2 = effect size. SCCS = Severity of Chronic Conditions Score.

Appendix J

Univariate Analyses of Variance for the Effects of Secondary Control Group Membership in 2003 on the Three Psychological Well-Being Measures in 2006

Variable and source	<i>SS</i>	<i>MS</i>	<i>F</i> (2, 114)	η^2
Positive emotion				
Secondary Control	50.27	25.14	.21	.00
Error	13504.04	118.46		
Life satisfaction				
Secondary Control	.28	.14	.33	.01
Error	47.69	.42		
Perceived stress				
Secondary Control	.24	.12	.12	.00
Error	117.31	1.03		

Note. η^2 = effect size.