Changes in Personality and Well-Being Across Adulthood: Riding the Self-Esteem Rollercoaster

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Abstract

Changes in Personality and Well-Being Across Adulthood: Riding the Self-Esteem Rollercoaster

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Concordia University, 2019

Personality factors have long been implicated in how individuals manage and cope with circumstances to maintain well-being and health across the lifespan (Lazarus & Folkman, 1984; Mroczek & Spiro, 2007; Wrosch & Scheier, 2003). However, personality factors have also been shown to change over time in both situational and normative contexts (Caspi & Roberts, 1999; Crocker & Wolfe, 2006; Robins et al., 2002; Roberts, Walton & Virchtbauer, 2006). These changes in personality can provide important information about how individuals adapt to and navigate life events and challenges. We investigate self-esteem as a personality factor that changes across the lifespan and identify age-related differences in the impact of self-esteem levels and changes on indices of well-being. This line of research combines personality and lifespan developmental literature to address the question whether levels of and changes in self-esteem can predict well-being and whether there are age-related effects as self-esteem changes across the lifespan. The present dissertation had three main goals: 1) To examine the impact of self-esteem changes and levels across the adult lifespan; 2) to examine changes in self-esteem in different ways – intraindividual changes in self-esteem, normative changes in self-esteem and experimental changes in self-esteem; 3) to investigate the moderating role of self-esteem changes. In order to address these goals, data was collected to examine within-person changes in self-esteem among older adults, data from Statistics Canada was analyzed to examine normative changes in self-esteem, and finally an intervention study was developed to examine experimental changes in self-esteem among young and older adults, and data on psychological and emotional well-being were collected. Three manuscripts were then written based on this data and are included as part of this dissertation.

The first manuscript examined the potential moderating role of self-esteem on older adults' perceived stress and regret intensity, over 10 years in a sample of 167 community dwelling older adults. This study examined the within-person associations between older adults' perceived stress

and regret intensity, and the moderating role of levels of, and within-person changes in, self-esteem. Within-person results indicated that older adults reported higher levels of regret intensity when they reported higher than their average levels of perceived stress, and that within-person increases of self-esteem, but not between-person levels, moderated this association. The results suggest that within-person changes in self-esteem may be more important than individual differences of self-esteem in protecting older adults from experiencing greater regret intensity under stressful circumstances.

The second manuscript, revised and re-submitted for publication in *Social Science and Medicine*, examines normative changes in self-esteem across the adult lifespan in a 16-year longitudinal sample of 14,117 adults from the National Population Health Survey (NPHS). The study examines whether changes in self-esteem and chronic disease exert reciprocal effects on subsequent changes in self-esteem and chronic disease, and whether individuals' age would moderate these associations. The findings from this paper suggest that there are reciprocal age-related associations between changes in self-esteem and chronic disease. Only among young adults, but not middle-aged or older adults, initial decline in self-esteem predicted subsequent increases in chronic disease, and initial increases in chronic disease predicted subsequent declines in self-esteem. The results from this study highlight that adverse changes in both self-esteem and physical health may be particularly problematic for young adults, and have comparably less impact among middle-aged and older adults.

The third and final manuscript included in this dissertation attempted to improve young and older adults' self-esteem through a brief writing intervention. The study examines whether self-esteem can be improved, whether baseline levels of self-esteem and naturally occurring changes in self-esteem play an adaptive role in mitigating consequences of stress, and predict psychological and emotional well-being, and whether these associations are moderated by age. The study examines 106 young and older adults, randomized into control and intervention groups, who were asked to engage in three consecutive days of writing. All participants completed an in-lab stress task, and cortisol data were also examined. The results of the study suggest that our writing intervention did not work. In addition, the results suggest that high levels of self-esteem and naturally occurring increases in self-esteem (and not experimental changes), predicted positive outcomes, only for older, but not younger, adults. Consistent with previous research, our results highlight age differences in the association between self-esteem and psychological and emotional

well-being, which may also suggest that future self-esteem interventions could be more tailored to each specific age group.

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Importantly, I would also like to express my utmost gratitude to my family, friends, colleagues and clinical supervisors who have all stood behind me to prop me up when I am down, push me through challenges and provide wisdom and direction when I am lost. I would like to thank my parents for instilling a sense of peace and calm when I need it, reminding me of the bigger picture and supporting me in whatever decisions I make. To my fiancé, David So, I have so much gratitude to have had you beside me throughout this journey and beyond, and I do not know how I could have completed my PhD without you. I'm looking forward to being beside you through our successes and battle any challenges that we may face together in the future. To my clinical program friends, Halina, Rachael, Jackie, Oren, Guilaine, Steph, Poppy, and Kierla, thank you all for being there on this journey and reminding me that while we may sometimes veer on different paths, in the end we are still doing this together! Special thanks to my lab-mates, Joëlle, Gaëlle, Meaghan, and Heather: you have all provided me with guidance, support, mentorship, and each of you have made such an impact in my graduate career. I would also like to thank our lab coordinator, Stephanie, and the volunteers and research assistants that have worked alongside me to make this happen! Finally, to my friends outside of the program, thank you all for sticking it through with me and giving me the much-needed love, laughter and balance in my life.

Contribution of Authors

This dissertation is composed of three separate research papers and three research studies:

The first paper (see Chapter 2) analyzed data collected from the Montreal, Aging and Health Study, which was conducted by Dr. Carsten Wrosch and his team of research assistants and research coordinator. For this study, I was also involved with the selection of new study materials as each wave of data was collected. In collaboration with Dr. Carsten Wrosch and another graduate student in our lab, Ms. Meaghan Barlow, we prepared a manuscript for submission to a journal (in preparation). I conducted all statistical analyses and prepared drafts of the manuscript. Dr. Wrosch and Ms. Barlow contributed by helping to conceptualize research questions and provide comments and feedback on each draft of the manuscript. This research was supported by CIHR research grants awarded to Dr. Wrosch.

The second paper (see Chapter 3) analyzed data collected by Statistics Canada, as part of the National Population Health Survey (NPHS). Access to the NPHS was granted under a project submitted by Dr. Amélie Quesnel-Vallée. I conducted all statistical analyses and prepared a manuscript for publication to *Social Science and Medicine*. My other co-authors on this paper were Drs. Carsten Wrosch, Alexandre Morin, Amélie Quesnel-Vallée and Jens Pruessner, and they provided feedback, comments and edits on each draft of the manuscript. This article has been published in *Social Science and Medicine* (doi: 10.1016/j.socscimed.2019.112600).

The third paper (see Chapter 4) analyzed data from an experimental study conceptualized and conducted by me in collaboration with Dr. Carsten Wrosch, and supported by funds from Concordia University awarded to Dr. Wrosch (CURC – in Aging and Health Tier 1). Dr. Jens Pruessner collaborated and shared his programming for the in-lab stress task. In addition, two research assistants and our lab research coordinator assisted in data collection and data entry. I conducted all statistical analyses and prepared the manuscript.

I declare that I am the sole author of the entire dissertation document below.

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CHAPTER ONE: GENERAL INTRODUCTION

Personality and lifespan researchers have examined change in personality traits across the lifespan (Roberts, Walton, & Viechtbauer, 2006; Fraley & Roberts, 2005). Self-esteem has been a personality construct of much debate in this literature, particularly whether levels of or changes in self-esteem matter, and to what extent self-esteem changes over time (e.g., Baumeister, Campbell, Krueger, & Vohs., 2003; Robins et al., 2002). Changes in personality factors, such as self-esteem, are important to investigate because they could suggest an adaptive process that can contribute to successful aging (Roberts & Caspi, 2001). While mounting research suggests that self-esteem changes over the life course (Robins et al., 2002), there is a gap in the literature investigating the impact of these changes on adults across the lifespan. This dissertation investigates self-esteem as an adaptive personality construct that changes both across the lifespan and across situational contexts (Robins et al., 2002; Crocker, 2007), and examines the impact of these changes on adults' well-being.

To examine the impact of self-esteem changes empirically, this dissertation conceptualizes changes in self-esteem in three different ways: the present research sought to examine whether self-esteem change matters and to that end, investigated the association between self-esteem changes and indices of well-being and physical health, and whether these associations are moderated by age. More specifically, in the first study, within-person changes in self-esteem were examined in the context of older adults' stress and regret intensity. In the second study, we investigated cross-lagged reciprocal associations between normative changes in self-esteem and chronic disease, and whether these associations differed among young and older adults, over a 16-year period. The third study was a quasi-experimental study to examine the impact of improving self-esteem among young and older adults on indices of psychological and emotional well-being.

Changes in Personality, Well-Being and Health

Personality can be defined as an individual difference variable that is an endogenous part of an individuals' psychological processes (Wrosch & Scheier, 2003), which includes a combination of an individuals' thoughts, feelings, and behaviours that help them to respond to environmental cues (Allport, 1961). Personality traits have been conceptualized as patterns of behaviours, thoughts, and feelings typically seen as enduring, stable, and immutable (Demo,

1992; Roberts et al., 2006; c.f. Damian, Spengler, Sutu, & Roberts, 2018). Research has long implicated personality processes in how people manage and cope with various life circumstances or stressors to maintain well-being and health (Lazarus & Folkman, 1984; Wrosch & Scheier, 2003). As such, personality traits have also been associated with a wide array of important life outcomes. For example, research has identified that high levels of extraversion and conscientiousness can predict longevity (Terracciano, Löckenhoff, Zonderman, Ferrucci, & Costa, 2008), and high levels of neuroticism were associated with incidence of cardiovascular disease (Wilson et al., 2005). More generally, personality traits have also been linked to relationship satisfaction (Shackelford, 2001), occupational and educational attainment, and socioeconomic status (for a review, Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007).

As there is a significant body of literature to suggest the importance of personality traits for life outcomes, it is important to consider whether changes in personality occur over time. Investigating the impact of personality changes is important because such changes occur across the lifespan (Caspi & Roberts, 1999; Robins et al, 2001), indicating that personality development can be a process that adapts to developmental events across the lifespan. An important question then is whether personality change matters, and whether these changes are associated with other life-long factors that also change, such as well-being and physical health. Previous research has shown that changes in personality can predict health outcomes independently of personality levels (Turiano, et al., 2002; Human et al., 2013), have been associated with management of stress and negative emotions (Watson, Suls, & Haig, 2002), and are even linked to mortality (Mroczek & Spiro, 2007). The association between personality change and such significant outcomes highlights the need to investigate these changes in personality further and whether these changes can be adaptive for successful aging across the lifespan.

Changes in personality have typically been conceptualized as mean levels of change and individual differences in change (Roberts, Walton, & Virchtbauer, 2006). Mean-level change in personality often refers to increases or declines in specific traits over time, and within an age context in the life course for a population of individuals. Individual difference changes reflect deviations from the overall, mean-level patterns (Roberts & Mroczek, 2008). As such, we can investigate change in personality over long periods of time (such as developmental trajectories) and across different situational contexts (such as intraindividual variability and experimental manipulations). Using a lifespan developmental approach to personality research is useful for

investigating changes in personality, as this work can involve investigating both personality levels and change, and how they can contribute to a process of adaptation for successful aging across the adult lifespan.

From a lifespan developmental perspective, changes in personality can provide important information about how individuals adapt to and navigate life events and challenges. Lifespan motivational theories highlight an expectancy-value framework that involves a discrepancy-reducing feedback loop to regulate behaviour and manage problematic circumstances (Carver & Scheier, 1990; Heckhausen et al., 2010). More specifically, individuals can form expectancies that future behaviours will reduce the discrepancy between the present behaviour and a standard. From a lifespan developmental perspective, there are age-normative expectations that could be used as a standard, which individuals compare their development to (Neugarten et al., 1968). In this way, personality development and overall changes in personality processes can be associated with whether individuals meet (or do not meet) age-normative roles and expectations throughout the lifespan (Heckhausen & Krueger, 1993; Neugarten et al., 1968). These normative conceptions are thought to provide a frame of reference for individuals to compare and assess one's own developmental trajectory with others. In addition, individuals may then have experiences of being "on-time" or "off-time" based on events and accomplishments shaped by individual, biological, social structure, and socially shared expectations about age-appropriate norms (Heckhausen, 2006; Wrosch & Freund, 2001).

Young adulthood, for example, is a developmental period where individuals are expected to, and typically accomplish, a number of developmental tasks that contribute to patterns of successful development (Heckhausen, Dixon, & Baltes, 1989). There is a normative expectation in young adulthood regarding the establishment of new social roles, such as starting a new career, a new family, and occupying positions of power and status (Robins & Trzesniewski, 2005). As young adults continue to make progress with normative developmental tasks and perceive their progress as successful or "on-time" (as compared to other peers their age), this is typically associated with positive trajectories of personality and well-being (Heckhausen, et al., 1989). However, based on an expectancy-value framework, young adults may experience negative feelings if they fail in accomplishing normative developmental tasks, and thus may perceive that they are "off-time" from their normative developmental trajectories. This process could have lasting impact on changes in personality functioning. In addition, young adults face

many challenges and must adapt in order to meet the normative expectations of development; however, because this is also known as a transitional period (Ebner, Freund, & Baltes, 2006; Heckhausen & Krueger, 1993; Shulman, Kalnitzki, & Shahar, 2009), young adults may be, at this time, most susceptible to changes in personality (Roberts & DelVecchio, 2001). Personality begins to stabilize as increases in achievement, mastery, and control over one's self and the environment continue until about midlife when these trajectories of personality and well-being may begin to plateau (McCrae & Costa, 1994; Lachman, 2004; Terracciano, Costa, & McCrae, 2006).

Older adulthood has also been identified as another developmental period that experiences a lot of variability and change, and can be riddled with age-related challenges (Baltes & Smith, 2003; Erikson, 1963). In older adulthood, there is the expectation of losses (increases in less desirable attributes, and fewer chances to improve desirable attributes; Heckhausen et al., 1989), and older adulthood is often associated with objective developmental losses such as reductions of personal resources (e.g., energy or time), withdrawal from social roles (e.g., through retirement), increases in health-related problems (Baltes, 1987; Heckhausen, 2006), and psychological stressors (e.g., increased experiences of regret and regret intensity, Heckhausen, Wrosch, & Schulz, 2019). The onset of these age-related challenges in older adulthood requires that older adults rely on adaptive self-regulatory processes to manage them effectively (Heckhausen et al., 1989). From the expectancy-value framework, developmental losses in older adulthood may be expected, and this expectation of losses can be protective if older adults do not perceive much of a discrepancy between their expectations and personal experiences of loss (Carver & Scheier, 1990; Higgins, 1987). In support of this idea, research has shown that older adults' physical health may be protected if older adults expect declines in health to begin with (Chipperfield et al., 2019), and that expectations of losses can be protective of older adults' well-being (Lachman, Röcke, Rosnick, & Ryff, 2008). To this end, it is possible that age-normative expectations and developmental challenges can influence changes in personality for both young and older adults and could provide an adaptive process for young and older adults to navigate such transitional periods in order to improve their changes of successful aging.

One personality factor that has been identified to help individuals adapt to age-related challenges is self-esteem. The adaptive functions and positive associations of self-esteem with

psychological, emotional and physical well-being for adults across the lifespan may be particularly helpful for young and older adults, where there is a greater likelihood of experiencing age-related challenges that may contribute to increased perceptions of stress, poorer emotional well-being, and problems with physical health. Using a lifespan developmental framework to examine changes in self-esteem can provide us with information about the nature and extent of changes in personality, and how it can contribute to adaptive functioning or negatively impact those in vulnerable age periods. The age-normative expectancy-value framework can create a lockstep transition with self-esteem because research has shown that when individuals compare their developmental accomplishments to their peers and perceive themselves as "on-time" or "off-time," their self-concept and self-esteem is impacted as well (Heckhausen, 1999; Heckhausen, Wrosch, & Schulz, 2010).

Self-Esteem

Self-esteem is defined as an individuals' overall evaluation of self-worth – the evaluative component of the self that encompasses different aspects of an individuals' life – in domains such as work, education and interpersonal relationships (Orth, Erol, Luciano, 2018; Rosenberg, 1986). High self-esteem refers to a highly favourable global evaluation of the self; low self-esteem, by contrast, refers to an unfavourable definition of the self. Of note, self-esteem does not carry any definitional requirement of accuracy whatsoever and is a perception based on a subjective evaluation of the self across multiple domains (Rosenberg, 1986). This global definition of self-esteem emphasizes the trait-like characteristics of how an individual can value oneself. In addition, for a long time, self-esteem was assumed to be a personality trait that did not show any systematic changes over time (Wylie, 1979). As such, there was a proliferation of research focused on examining the role of interindividual differences in global self-esteem levels in adaptive functioning for individuals across the lifespan (Brown & Marshall, 2006; for a review, see Baumeister et al., 2003).

High levels of self-esteem have been associated with various correlates of well-being and health (e.g., Brown, 2010; Donnellan, Trzesniewski, Robins, Moffitt, & Caspi, 2005; Orth, Robins, Meier, & Conger, 2016). For example, high self-esteem is associated with overall life satisfaction (Orth, Robins, & Widaman, 2012), relationship satisfaction (Donnellan et al., 2005), higher sense of emotional well-being (Watson, Suls & Haig, 2002; Baumeister et al., 2003), academic achievements and successes at work (Orth et al., 2012), and greater physical health

(Cott, Gignac & Badley, 1999). There is an extensive history of correlational and experimental research that also suggests that self-esteem buffers the consequences of negative outcomes of stress (Greenberg et al., 1999; Brown, 2010). Individuals reporting high levels of self-esteem are also associated with an increased tendency to use adaptive coping to manage stressful circumstances (Orth et al., 2009; 2016). Experimental literature on the buffering function of self-esteem has also shown that when individuals' levels of self-esteem are threatened, individuals with high self-esteem will engage in behaviours to defend or restore their levels of self-esteem (Greenberg et al., 1992; Crocker et al., 2006). These findings suggest that high levels of self-esteem are generally associated with adaptive outcomes, and can protect individuals from negative life outcomes or, even stressful life circumstances, which may be particularly adaptive for young and older adults as they often face age-related challenges.

Psychological theories of stress emphasize the individual's appraisal of a stressful event and the belief as to whether or not the individual has the resources to cope with the stressor in question (Lazarus & Folkman, 1984), which can in turn impact an individual's biological stress regulatory systems (providing homeostatic maintenance, such as the hypothalamic-pituitary-adrenal [HPA] axis), resulting in downstream implications on an individual's physical health (Cohen et al., 2007). In this regard, research suggests that self-esteem can promote effective coping (Baumeister et al., 2003) and is associated with less threatening appraisals of problematic situations (Orth et al., 2009), motivating individuals to problem solve or seek outside resources for help mitigating the challenge at hand (Brown, 2010; Ford & Collins, 2010). Such benefits of high self-esteem include the potential for the promotion of adaptive biological responses (e.g., cortisol and the HPA axis; Dickerson & Kemeny, 2004; Miller et al., 2007), which may contribute to greater physical health. In support of this assumption, Pruessner and colleagues (1999) demonstrated that participants with low self-esteem secreted higher levels of cortisol in response to a stressor than their high self-esteem counterparts. Other research has shown conceptually comparable findings by documenting that those reporting high levels of self-esteem buffer biological stress responses to age-related challenges and psychological distress (Seeman et al., 1995; Liu et al., 2014).

Criticisms of the self-esteem literature.

Over the past few decades, given the extant literature on high levels of self-esteem and its associated benefits, self-esteem has been considered the panacea to society's problems. As such,

it became a topic of interest in popular psychology, and has even influenced policy and governmental programs targeted at increasing individuals' self-esteem levels (Baumeister et al., 2003). This "self-esteem movement" was based on the idea that self-esteem is one of the most important factors for predicting an individual's well-being (Branden, 1969); however, self-esteem programs that were implemented invited criticism and scrutiny as there were concerns about over valuing high levels of self-esteem, as there were concerns about "too" high levels of self-esteem contributing to maladaptive behaviours and tendencies (Narcissism, Baumeister et al., 2003). Indeed, some researchers who have reviewed the literature on self-esteem levels and adaptive outcomes, have suggested that research on self-esteem has been inconsistent, with some outcomes being shown in certain contexts but not others (Baumeister et al., 2003), such as only among girls and not boys, or only among certain age groups (Neumark-Szatainer, Story, French & Resnick, 1997). In addition, it has been argued that global self-esteem measures are too broad to effectively predict specific outcomes (Baumeister et al., 2003; Crocker & Wolfe, 2001). This has led to a discussion about the predictive value of self-esteem and the dangers of implementing programs geared at targeting an individual's self-esteem levels without there being substantial research.

There is also much discussion about the different facets of self-esteem and which are most impactful and therefore worth promoting (Brown et al., 2006). For example, there is criticism regarding research on the trait-like features of self-esteem and how this literature relies too heavily on limited homogenous samples, such as childhood and adolescence (Demo, 1992), in addition to using limited statistical methods to conduct longitudinal studies (Robins et al., 2005; Baumeister et al., 2003). While investigating trait-like features of self-esteem can be useful, including the identification of how self-esteem works for individuals and whether it can be predictive of adaptive outcomes, researchers have also argued that other conceptualizations of self-esteem can add significantly to the literature. There is now mounting literature that suggests that self-esteem changes across the lifespan (Orth et al., 2018; Robins et al., 2002), and new ways of conceptualizing change, such as investigating longitudinal self-esteem associations from a life-span developmental perspective, can provide answers to whether self-esteem can predict adaptive outcomes, for whom that might be the case, and whether self-esteem can be improved.

Self-Esteem Change

Recent research has identified self-esteem as a construct that can change over time. As such, using a lifespan developmental framework to investigate self-esteem has yielded significant work, and demonstrates the important role of personality across all stages of life (Roberts & Caspi, 2001). Using the developmental expectancy-value framework approach to investigate personality change, self-esteem changes across the adult lifespan also provide us with important information about how changes can help individuals adapt to normative or non-normative life events. As noted above, there is a paucity of research to investigate the changes in self-esteem on individuals' well-being and health.

One way that self-esteem change has been conceptualized is by examining intraindivdiual changes in personality. More specifically, this way of conceptualizing self-esteem change is to compare levels of self-esteem to the individuals' own average, over time. By examining within-person change, we can better understand the function of self-esteem and how it responds to environmental challenges (Butler, Hokanson, & Flynn, 1994; Leary, 1999). Research along these lines suggests that self-esteem can change in response to both external and internal events, such as stressful circumstances, social cues and internal moods (Leary, 1999; Crocker et al., 2006). In this way, within-person variations in self-esteem can serve as a barometer for detecting problems in the environment, which may signal to people to use coping skills to adapt to the environment and facilitate self-regulation (Crocker, Brook, Niya & Villacorta, 2006). In support of this assumption, individual increases in self-esteem have been associated with adaptive functioning, such as adaptive physiological functioning among adults perceiving high levels of stress (Liu et al., 2014) and greater tendencies to engage in coping behaviours (Crocker et al., 2006). This literature also speaks to the promising possibility that experimentally increasing individuals' self-esteem can be beneficial; however, the consensus appears to be that more research is needed to substantiate any effects of self-esteem interventions (Baumeister, 2003).

Self-esteem change has also been conceptualized by examining mean-level differences in self-esteem over time. These *normative* changes in self-esteem can help to indicate whether the population as a whole is increasing or decreasing in self-esteem. Indeed, there is mounting research to show that self-esteem changes across the lifespan (Robins et al., 2002; for a review, see Orth, 2018). More specifically, this research suggests that there is an inverted U-shaped trajectory of self-esteem over the life course. Like a rollercoaster, self-esteem levels steadily

increase throughout childhood and during young adulthood, plateaus in midlife, and declines in older adulthood (Orth et al., 2018; Robins et al., 2002). As young and older adulthood are both age periods in which individuals are susceptible to personality changes, given the transitory events and stressful circumstances experienced during these times, there are possibilities for why self-esteem exhibits normative changes throughout adulthood.

Referencing the expectancy-value framework described above, in younger adulthood, increases in self-esteem could signal that individuals accomplish age-normative roles and expectations, and match their developmental trajectory with respect to most of age peers. In contrast, a decline in self-esteem during this developmental stage could signal difficulties in meeting age-normative events that could be associated with further negative impacts on young adults' psychological and physical well-being. In older adulthood, self-esteem declines may reflect age normative expectations of losses during this developmental period and may provide a protective function against occurring developmental losses across domains, including the self. Although there is some research on how self-esteem changes and develops through adulthood (e.g., Robins et al,, 2002; Orth et al., 2018), less is known about the impact of these changes and whether it can be adaptive for successful aging. This is a gap in the literature that needs to be addressed to help us clarify the role of self-esteem levels and changes throughout the adult lifespan.

Limitations of Previous Research

The personality and lifespan developmental literature on self-esteem changes has identified self-esteem as an adaptive personality factor that changes across the lifespan. However, less is known about the impact of these self-esteem changes on individuals' well-being. While targeting individuals' self-esteem has been suggested as a way to improve well-being, there remains a discussion about whether self-esteem matters. This points to limitations in the literature that this dissertation aims to address:

1. While self-esteem has been identified as a personality factor that changes across the lifespan and across situational contexts, less is known about what these changes mean. In addition, there is limited research on examining intraindividual changes in self-esteem.
2. Although mounting research suggests that self-esteem changes across the lifespan, there is a paucity of research investigating the impact of these self-esteem changes – and more

specifically, their impact on physical health across the lifespan. It is important to examine the consequences of self-esteem changes during vulnerable developmental periods (e.g., young and older adulthood).

3. Self-esteem has been the target of many interventions and marketing campaigns in efforts to improve people's self-esteem, yet there is a paucity of research examining experimental changes in self-esteem and whether age-appropriate interventions are warranted.

The Present Research

This dissertation aims to contribute to the personality change literature by taking a lifespan developmental approach to investigate the impact of self-esteem changes across the adult lifespan. It does so by using a multi-method approach in three studies to conceptualize change in self-esteem. The three studies investigate whether self-esteem changes matter in terms of their associations with psychological and physical well-being, and whether these associations are moderated by age. More specifically, the three studies examine longitudinal associations between self-esteem change (conceptualized using three different change methodologies) and indicators of psychological and physical health (e.g., stress, regret intensity, chronic disease, biological indicators of stress, and emotional well-being) across the adult lifespan.

Research Objectives:

Objective 1: To increase our understanding of the moderating role of self-esteem by examining both within-person changes and between-person levels of self-esteem and their effect on mitigating the impact of stress and regret intensity in older adulthood.

Objective 2: To expand our understanding of normative changes in self-esteem across the adult lifespan, and what these normative changes mean in terms of adults' physical health.

Objective 3: To examine experimental efforts in improving young and older adults' self-esteem, and to contribute to the discussion on whether self-esteem levels or changes are more important in predicting positive outcomes in physical and psychological well-being, and whether these associations are moderated by age.

Each objective is addressed by a separate study, and all three studies are based on different sets of longitudinal data. Each study also utilizes a different methodology to conceptualize change in self-esteem.

Study 1: Within-Person Changes in Regret Intensity Among Older Adults: The Role of Perceived Stress and Self-Esteem

The first study examines whether within-person changes in self-esteem, and levels of self-esteem, can buffer the within-person associations between stress and regret intensity for older adults. This study expands upon previous research by investigating within-person changes in stress, regret intensity and self-esteem. Furthermore, this study illustrates how using a longitudinal framework to examine within-person changes in perceptions of stress and regret intensity allows us to identify adaptive personality factors for successful aging. The specific hypotheses for this study are:

Hypothesis 1.1: We expect that there is a within-person association between older adults' perceived stress and regret intensity such that older adults experiencing higher than usual levels of stress would report higher levels of regret intensity.

Hypothesis 1.2: We expect that both within-person increases in self-esteem and those reporting higher levels of self-esteem will be protected from higher than usual levels of stress and regret intensity.

Study 2: Changes in Self-Esteem and Chronic Disease Across Adulthood: A 16-Year Longitudinal Analysis

The second study investigates cross-lagged and reciprocal effects of normative changes in self-esteem and chronic disease in young and older adulthood. This study extends previous research by investigating the associations between *changes* in self-esteem and physical health, and whether these associations are moderated by age. The hypotheses are:

Hypothesis 2.1: We expect a reciprocal association between self-esteem changes and changes in chronic disease over time, such that declines in self-esteem predicts subsequent increases in chronic diseases over time, and vice versa.

Hypothesis 2.2: We expect that these reciprocal associations are moderated by participants' age. However, we do not have specific hypotheses about the direction of the age effects.

Study 3: Self-Esteem Change and Well-Being Across Adulthood: Attempts to Improve Self-Esteem Through Writing

The third study examines experimental changes, naturally occurring changes, and baseline levels of self-esteem, on indices of well-being and health-related functioning for both young and older adults. The study aimed to develop a brief writing intervention that could experimentally increase young and older adults' self-esteem. The purpose of the study was also to investigate baseline levels and naturally occurring changes in self-esteem on individuals' perceived stress, cortisol responses to acute stress, and emotional well-being, and whether these associations were moderated by participants' age.

Hypothesis 3.1: We expect that our writing intervention would improve self-esteem levels among young and older adults.

Hypothesis 3.2: We expect that experimentally improved self-esteem levels among young and older adults in the intervention group will predict less perceived stress, more adaptive cortisol responses to an in-lab stressor, and greater emotional well-being, as compared to those young and older adults in the control group.

Hypothesis 3.3: We expect that high levels of self-esteem and overall self-esteem increases throughout the duration of the study, will also predict adaptive outcomes, such as declines in perceived stress, adaptive cortisol responses, and greater emotional well-being for both young and older adults. We also expect these associations to be maintained over time, and as such, findings between experimental increases, high baseline levels, and overall increases in self-esteem on stress and well-being will be maintained over time and predict three-month follow-up levels of psychological and emotional well-being.

CHAPTER TWO: STUDY ONE

Abstract

Perceptions of stress may reflect failure experiences and can trigger intense feelings of regret. Research has identified high levels of, and increases in, self-esteem as protective personality processes that can buffer the negative consequences of stressful circumstances, and therefore could also ameliorate regret intensity. We investigated this possibility in a longitudinal sample of 167 community-dwelling older adults and expected that both inter- and intraindividual differences in self-esteem would moderate the intraindividual association between stress perceptions and regret intensity. We analyzed six waves of data, collected in two-year intervals. Results indicated that intraindividual increases in perceived stress, and decreases in self-esteem, predicted increased levels of regret intensity. In addition, intraindividual increases in self-esteem protected older adults from experiencing intense regret when they reported higher than usual levels of stress. Interindividual differences in self-esteem were generally associated with less regret intensity, but did not affect the association between participants' stress perceptions and their regret experiences. These results suggest that intraindividual increases in self-esteem represent a protective personality process that can reduce the intensity of older adults' regret experiences in stressful life circumstances.

Keywords: older adulthood, perceived stress, regret intensity, self-esteem.

Intraindividual Changes in Regret Intensity Among Older Adults: The Roles of Perceived Stress and Self-Esteem

If only I had… exercised more or had a better diet, reconciled with my old friend before he passed away, or travelled more when I still was physically capable. These kinds of upward counterfactual thoughts often elicit regret-related negative affect (i.e., regret intensity, Gilovich, Medvec, & Kahneman, 1998; Roese, 1997; Wrosch, Bauer, & Scheier, 2005). Although intense regret can motivate corrective actions when the consequences of a regretted behaviour can be undone (Roese & Summerville, 2005), it has also been shown to jeopardize well-being and health in older adulthood when individuals have reduced opportunities to address their regrets (Wrosch et al., 2002, 2005). As such, research is needed to identify the psychological processes that can elicit intense regret in older adulthood as well as the personality processes that can buffer such an effect. To address these issues, we investigated whether regret intensity may become paramount during times when older adults perceive high levels of stress. Since stress has been conceptualized as a process during which individuals attempt to understand and cope with problematic life circumstances (Folkman & Lazarus, 1986), we assumed that stress perceptions may trigger regret experiences. In addition, we examined whether high levels of, and increases in, self-esteem may play a protective role in the association between older adults' stress perceptions and their regret intensity. This could be the case as self-esteem is an adaptive personality variable that can prevent adverse psychological consequences of stressful life circumstances (Crocker, 2002; Greenberg et al., 1992). Individuals with high self-esteem have been shown to engage in effective coping and alter their perceptions of stress (Watson, Suls, & Haig, 2002; Greenberg et al., 1992; Brown, 2010), which could protect them from experiencing intense regret in stressful life circumstances.

Regret Intensity and Stress Perceptions in Older Adulthood

Life regrets relate to evaluations of individuals' past events, behaviours, or decisions that are commonly associated with commissions or omissions in major developmental domains, such as work, education, or personal relationships (Gilovich & Medvec, 1995; Roese & Olson, 1993; Roese & Summerville, 2005). The experience of regret may prompt individuals to re-evaluate their behaviours and life decisions by eliciting counterfactual thoughts (e.g., "What would have happened if…" Kahneman, 1995; and "if only" scenarios, Roese & Olson, 1993) and are accompanied by the experience of specific negative emotions (e.g., regret intensity associated

with anger or despair, Gilovich et al., 1998).

Regret is experienced by the majority of adults (Landman, 1987) and exerts different functions (Heckhausen, Wrosch, & Schulz, 2019). When opportunities for engaging in alternative, corrective actions are favourable, intense regret can motivate individuals to learn from their failures and undo the regret-related consequences (future opportunity principle, Roese, & Summerville, 2005). Alternatively, when individuals had sufficient opportunities to undo a regretted behaviour in the past, but these opportunities have since vanished (lost opportunity principle, Beike, Markman, & Karadogan, 2009), intense regret may jeopardize psychological well-being and physical health (Lecci, Okun, & Karoly, 1994; Wrosch et al., 2005, 2007).

Taking a lifespan perspective, theory and research suggests that regret can exert age-related functions. In particular, it may become increasingly difficult for older adults to undo or correct regretted behaviours as time constraints exert age-related increases and available resources and opportunities for overcoming a regretted event become reduced. As such, intense regret may become a risk factor for older adults experiencing declining well-being and health. Supporting this assumption, research has shown that opportunities for addressing regretted behaviours decline in older adulthood, and that regret intensity can jeopardize well-being and health as individuals advance in age (Heckhausen, Wrosch, & Schulz, 2010, 2019; Wrosch et al., 2005; Wrosch & Heckhausen, 2002). Older adults may thus be particularly likely to regret behaviours or decisions that can no longer be addressed, ruminate about regret-related circumstances, and experience adverse psychological consequences that could exert downstream consequences on their physical health (Heckhausen et al., 2019; Wrosch et al., 2005, 2007).

However, despite documenting the adverse consequences of regret intensity in older adulthood, the psychological processes that elicit regret experiences are still not well understood. To this end, earlier experimental studies on life regrets asked individuals to engage in upward counterfactual thoughts with respect to recently experienced, negative life events. This research showed that creating a counterfactual scenario that would have resulted in a better (than experienced) outcome triggered negative regret-related emotions (Roese, 1994). Considering that negative life events frequently instigate stress experiences, our approach assumes that the perception of stress could play a role in eliciting intense regret. Stressful encounters typically involve a process during which individuals attempt to understand and cope with problematic life circumstances (Lazarus & Folkman, 1984). As a consequence, the perception of stress could

trigger counterfactual scenarios and associated increases in regret intensity. For example, the diagnosis of a chronic illness in older adulthood may result in increased perceptions of stress, which could prompt individuals to engage in regret-related counterfactual thoughts (e.g., about poor nutrition or lack of exercise) and enhance their regret intensity.

An implication of the previous discussion is that a person may have different regret experiences with varying intensity over time, pointing to the importance of examining intraindividual variability of regret. From our perspective, the experience of regret may be context-dependent and change over time as a function of a person's stress experiences in important life domains (Mandel, 2003, Vasunilashorn et al., 2015). This possibility is consistent with research showing that individuals tend to report high regret intensity particularly in personally important situations that can increase the salience of regretted behaviours (Leach & Plaks, 2009; Mandel, 2003). In addition, research has documented that even over a relatively short period of time (e.g., four months), individuals can report different life regrets, potentially activated by environmental cues that are related to, or remind individuals of, problematic life circumstances (Bauer, Wrosch, & Jobin, 2008).

The Moderating Role of Self-Esteem

Research has begun to identify adaptive psychological processes that can help older adults mitigate the intensity of regret. This body of work suggests that self-protective control processes can reduce regret intensity and prevent adverse consequences on older adults' well-being and health (e.g., downward social comparisons, goal disengagement, Bauer et al., 2008; Bauer & Wrosch, 2011; Wrosch et al., 2005, 2007). Given that such control processes are thought to protect a person's self-esteem in the context of failure events (Heckhausen, Wrosch, & Schulz, 2010), we reasoned that self-esteem itself may also be an important psychological variable that could be associated with a reduction of older adults' regret intensity.

Self-esteem has been identified as an adaptive personality factor, broadly defined as a reflection of individuals' general feelings of self-worth across multiple, personally relevant domains of life (Rosenberg, 1989). Individual differences in self-esteem could be particularly important for buffering older adults' regret intensity in stressful life circumstances. Given that individuals' most severe life regrets are often associated with domains closely related to the self and their identity (e.g., work, personal relationships, or self-improvement, Roese & Summerville, 2005), perceptions of stress may contribute to a lesser extent to regret intensity among

individuals with high, as compared to low, self-esteem. This could be the case if individuals with high self-esteem feel less threatened by occurring stress-related setbacks, which should reduce the psychological implications of stress-related events. In addition, high self-esteem may forecast effective coping in stressful life circumstances, which could further ameliorate regret intensity. In support of these assumptions, individuals with high self-esteem have been shown to engage in adaptive coping and alter their perceptions of stress, thereby buffering the negative consequences of stressful encounters (Watson, Suls, & Haig, 2002; Greenberg et al., 1992; Brown, 2010).

Research has yet to explore the role of older adults' self-esteem in the association between stressful experiences and regret intensity. In addition, most of the extant work has focused on examining interindividual differences in self-esteem, and research on the effects of intraindividual changes is limited. To this end, it is important to note that self-esteem changes across the lifespan and exhibits a normative decline during older adulthood (Robins et al., 2002). Despite these age-normative changes, however, some older adults maintain or increase their self-esteem over time (Liu et al., 2014; Wagner et al., 2013), suggesting the existence of intraindividual variability in older adults' self-esteem. In a similar vein, self-esteem has been shown to fluctuate in response to certain experiences and life events (e.g., boosts or dips in self-esteem, Crocker & Wolfe, 2001), which could facilitate adaptive self-regulation (Crocker, Brook, Niya, & Villacorta, 2006). In support of this possibility, research has linked both, inter- and intraindividual increases in self-esteem with adaptive physiological functioning among adults who perceived high levels of stress (Liu et al., 2014; Pruessner et al., 1999). As a consequence, we suggest that both older adults with generally high levels of self-esteem, and also those who experience a boost in their self-esteem (i.e., higher than usual levels of self-esteem) may be less affected by stressful life circumstances and engage in effective coping (e.g., reframing stressful events, Crocker et al., 2006), which could in turn protect them from experiencing high levels of regret intensity.

Present Study

This study examined the longitudinal associations between changes in stress perceptions and regret intensity in six waves from a longitudinal study of community-dwelling older adults. We hypothesized that, across waves, intraindividual increases in older adults' stress perceptions would be associated with increased levels of regret intensity. In addition, we expected that the association between perceived stress and regret intensity might differ as a function of older

adults' self-esteem. Given that both inter- and intraindividual differences in self-esteem have been shown to exert adaptive function, we expected that higher (as compared to lower) interindividual levels of self-esteem, and intraindividual increases (as compared to declines) in self-esteem, would protect older adults from experiencing high levels of regret intensity in life circumstances that are perceived as stressful.

Methods

Participants

Data were collected as part of an ongoing longitudinal project that included community-dwelling older adults, called the "Montreal Aging and Health Study" (MAHS). The MAHS collected sociodemographic and psychological information of 215 older adults starting in 2004 (T1). Subsequent assessments were conducted approximately every two years (T2, $M = 1.89$, $SD = .08$, range = 1.73 to 2.13 years; T3, $M = 3.78$, $SD = .22$, range = 3.28 to 4.77 years; T4, $M = 6.05$, $SD = .18$, range = 5.52 to 6.40 years; T5, $M = 7.78$, $SD = .16$, range = 7.39 to 8.28 years; T6, $M = 9.76$, $SD = .15$, range = 9.45 to 10.53 years), over a period of ten years. Study attrition from T1 to T6 was attributable to death ($n = 43$), refusal in study participation ($n = 17$), lost contact ($n = 21$), participants unable to follow directions ($n = 4$), or withdrawal due to personal reasons ($n = 9$). Of the 215 participants, 48 were further excluded because they did not provide at least two time-points of regret intensity. Older participants ($M = 73.82$, $SD = 6.78$) were more likely than younger participants to drop out of the study over the six waves ($M = 71.61$, $SD = 5.21$; $t[129.14] = 2.49$, $p = .01$). The final analytic sample consisted of 167 older adults between the ages of 64 and 94 years at baseline ($M = 71.83$, $SD = 5.59$). Study attrition was not significantly associated with baseline measures of any other study variables.

Procedure

Participants were recruited through newspaper advertisements. The only eligibility criterion was a minimum age of 60 years as we were interested in recruiting a normative sample. At each wave, if participants were unable to visit the laboratory, they were assessed in their homes. After obtaining informed consent (see Appendix A), participants were asked to respond to a questionnaire that included all reported study measures (see Appendix C). Upon completion of study measures at each visit, all materials were collected, and participants were compensated $50 for their participation in each of the first three waves and $70 for their participation in each of the subsequent waves. The Concordia University Research Ethics Board approved all

procedures.

Materials

The main study variables included measures of participants' life regrets, self-esteem, and perceived stress (see Appendix C). To minimize the possibility of confounding associations with the main study constructs, the analysis also included sociodemographic covariates (i.e., age, sex, socioeconomic status [SES], partnership status).

Life Regrets. Across assessments, participants were asked to report their most severe life regret. In addition, they reported how many years ago the regretted event occurred and whether the regret was an omission or a commission. Regret intensity was assessed by asking participants to report the intensity of their emotions associated with the experience of the identified life regret. Specifically, we asked participants to report the extent to which they experienced each of the six emotions during the past few months when they thought about their regrets. Each of these emotions were rated on a 5-point Likert-type scale (1 = *very slightly or not at all*, 5 = *extremely*). The six emotions were selected on the basis of Gilovich and colleagues' work (Gilovich et al., 1998) and included hot emotions (angry, irritated, embarrassed) and despair-related emotions (helpless, desperate, sorrow). Given that hot and despair-related emotions were significantly correlated at T1 to T6 (rs = .64 – .79, ps < .01) and have shown comparable effects in previous research (Wrosch et al., 2002, 2005, 2006), we averaged the six emotions at each measurement point to serve as an indicator of regret intensity (α*s* > .61). Participants' regret intensity scores were correlated across waves (*rs* = .38 to .69, *ps* < .01).

Self-esteem was measured across assessments by administering the Rosenberg self-esteem scale (Rosenberg, 1986), which is a 10-item self-report questionnaire using 4-point Likert-type scales (*strongly disagree* = 0 to *strongly agree* = 3). Participants were asked to respond to statements such as "I feel that I have a number of good qualities" or "All in all, I am inclined to feel that I am a failure." Participants' self-esteem was assessed at each wave by computing a sum score of the 10 items, after reverse coding of negatively formulated items (*α*s = .78 to .82). Participants' reported self-esteem scores were correlated across waves (*rs* = .57 to .78, *ps* < .01).

Perceived stress was measured across assessments by asking participants to respond to the 10-item version of the perceived stress scale (Cohen et al., 1983). They rated how frequently they experienced 10 different circumstances over the past month by using 5-point Likert-type

scales (*never* = 1 to *very often* = 5). Items included "How often have you felt that things were going your way?" and "How often have you felt nervous and stressed?" Positively formulated items were reversed coded and indicators of perceived stress were obtained at each wave by averaging the ratings of the 10 items (αs = .86 to .90). Participants' perceived stress scores were correlated across waves (*rs* = .52 to .77, *ps* < .01).

Sociodemographic covariates were measured at baseline (see Table 2.1). The covariates included participants' age, sex, SES, and marital status. SES was indexed by averaging the standardized scores of participants': 1) reported annual family income (six levels: 0 = *less than $17,000* to 5 = *more than $85,000*), 2) highest level of education (five levels: 0 = *no education* to 4 = *master's or doctorate degree*), and 3) perceived social status (Adler, Epel, Castellazzo, & Ickovics, 2000). These three SES variables were significantly correlated with each other (*r*s = .37 to .54, *p*s < .01). Self-reported partnership status was measured by categorizing participants into two groups: 1) married or living with a partner; or 2) single, separated, or widowed.

Data analyses

Preliminary analyses were conducted to describe the sample (by calculating means and frequencies), examine mean level differences across time (by using ANOVAs), and explore associations between the main constructs (by calculating correlations using averaged scores of main constructs across all six study assessments). In addition, intra-class correlation coefficients (ICCs) were calculated for the main study constructs, regret intensity, stress, and self-esteem to indicate the amount of intraindividual variability across waves. The main analyses were conducted by estimating three hierarchical linear models, using HLM 6.0. The models were estimated using restricted maximum likelihood estimation with robust standard errors. Prior to conducting all analyses, Level-1 main effect and interaction variables were person-centred and Level-2 variables were standardized. All models were controlled for intraindividual (Level-1) changes in time since the regretted event.[1] The model testing the interindividual (Level-2) effect of self-esteem further controlled for averaged time since the regretted events and sociodemographic covariates (i.e., age, sex, SES, and partnership status).

[1] Note that because of lack of degrees of freedom, we controlled our analyses only for time since the regretted event and not for type of regret (i.e., omission versus commission). We decided to exclude type of regret from the analysis because it was statistically unrelated to regret intensity in both intraindividual (*B* = .04, *SE* = .09, *t* = .46, *p* = .65) and interindividual analyses (*B* = .01, *SE* = .05, *t* = .13, *p* = .89).

The first Level-1 model tested the hypothesis that intraindividual increases in perceived stress would predict increased levels of regret intensity (Model 1). To this end, we estimated variation in participants' regret intensity as a function of an intercept, person-centred scores of perceived stress, self-esteem, time since regretted events, and a residual term. The intercept represented participants' average regret intensity across study assessments. The slopes indicated the extent to which interindividual changes in the predictor variables were associated with participants' regret intensity.

The second Level-1 model tested the hypothesis that intraindividual increases in self-esteem could buffer the association between intraindividual changes in perceived stress and regret intensity (Model 2a). This model was estimated by adding the interaction term between intraindividual changes in perceived stress and self-esteem to Model 1. A significant interaction effect was followed up by calculating the simple slopes, examining the within-person associations between perceived stress and regret intensity at within-person low, average, and high levels of self-esteem (averaged lower quartile, person mean, and averaged upper quartile of the distribution).

The final model examined the hypothesis that interindividual differences in self-esteem could also buffer the intraindividual association between intraindividual changes in perceived stress and regret intensity (Model 2b). To test this possibility, we built on Model 1 and added interindividual differences in averaged levels (across waves) of self-esteem and the covariates (age, sex, SES, partnership status, and averaged years since regret) as Level-2 predictors. A potential cross-level interaction effect between intraindividual changes in perceived stress and interindividual differences in self-esteem was followed up by estimating the simple slopes for participants who were high, average, and low on the Level-2 moderator variable (using the average upper quartile, sample mean, and average lower quartile of the distribution of self-esteem).

Results

Preliminary Analyses

The sample characteristics are presented in Table 2.1. Participants' life regrets occurred on average approximately 32 years earlier and 33.38% of reported regrets were related to commissions (65.80% omissions). At baseline, participants were on average 72 years old, approximately half of the sample was married or living with a partner, and 47% of the sample

were men. The participants had on average, a collegial or trade education, and reported $34,000 to $51,000 in annual household income. The sociodemographic characteristics of the sample were within the normative range of known distributions among older adults residing at home (Aging National Advisory Council on Aging [NACA], 2006).

Repeated measurement ANOVAs showed that self-esteem significantly decreased from T1 to T6, F (1, 78) = 10.16, p = .002 (see Table 2.1). Levels of perceived stress increased from T1 to T6, F (1,76) = 5.68, p = .02. Regret intensity did not significantly change in the entire sample from T1 to T6, F = .27, p = .93.

The zero-order correlations between the averaged main study variables are presented in Table 2.2. Higher levels of averaged regret intensity were associated with lower socioeconomic status, number of years since regret, lower levels of self-esteem, and higher levels of perceived stress. In addition, age was positively associated with the number of years since the regret took place, indicating that older individuals reported greater time intervals since their regretted event occurred. In addition, higher levels of averaged perceived stress were associated with lower levels of self-esteem and SES, while higher levels of averaged self-esteem were associated with higher SES and being married to or living with a partner. Females were more likely than males to be single, and participants with higher (as compared to lower) levels of socioeconomic status were more likely to be married or living with a partner. Participants who were single reported higher levels of average regret intensity. The ICC values for the main study variables indicated the proportion of variance accounted for by intraindividual variability, ICC = .52 for regret intensity, ICC = .65 for perceived stress, and ICC = .64, suggesting that at 52% to 65% of the variability can be found within the individual.

Intraindividual Association between Perceived Stress and Regret Intensity

The first Level-1 model predicted participants' levels of regret intensity by intraindividual changes in perceived stress, self-esteem, and years since the regretted events occurred (Model 1, see Table 2.3). The Level-1 intercept, which reflects participants' average levels of regret intensity across measurements, was significantly different from zero (B = 1.84, SE = .05, t = 34.20, p < .01). In addition, Model 1 showed that the number of years since the regretted events occurred significantly predicted variability in regret intensity (B = -.01, SE = .00, t = -2.99, p < .01), indicating that in waves where participants reported regrets that occurred a longer (as compared to a shorter) time ago, they also reported lower levels of regret intensity.

In addition, self-esteem predicted variability in regret intensity (B = -.02, SE = .01, t = -1.93, p = .03), suggesting that participants reported lower levels of regret intensity in waves where they reported higher, as compared to lower, than usual levels of self-esteem. Of importance and in support of our hypotheses, intraindividual changes in perceived stress also predicted significant variability in regret intensity (B = .17, SE = .08, t = 2.17, p = .03). Participants reported higher levels of regret intensity in waves where they reported higher, as compared to lower, than usual levels of perceived stress. Note that there was considerable variability around the intercept and the slopes for years since regret, perceived stress, and self-esteem, indicating the potential presence of individual differences in some of these estimates, χ^2s = 61.73 to 605.78, ps < .01 to .50.

The Moderating Role of Intraindividual Changes in Self-Esteem

To examine whether intraindividual changes in self-esteem would moderate the obtained within-person associations between stress perceptions and regret intensity, we added to the previous Level-1 model (Model 1) the interaction term between intraindividual changes in perceived stress and self-esteem (Model 2a, see Table 2.3). Controlling for the main effects and covariates, Model 2a demonstrated that the Level-1 interaction term between perceived stress and self-esteem significantly predicted variability in participants' regret intensity (B = -.05, SE = .03, t = -2.10, p = .04).

We illustrated the significant interaction effect in Figure 1.1, by plotting the intraindividual associations between perceived stress and regret intensity, separately for low, average, and high within-person levels of self-esteem (using the averaged upper quartiles, person means, and lower quartiles of the self-esteem and perceived stress distributions). The shape of the obtained interaction effect suggests that the highest levels of regret intensity were observed in waves participants perceived higher than usual levels of stress and reported lower than usual levels of self-esteem. By contrast, levels of regret intensity were generally low in waves individuals perceived lower than usual levels of stress, and in waves they reported higher than usual levels of stress, but concurrently higher than usual levels of self-esteem. Simple slope analyses supported this interpretation of the data by indicating that intraindividual increases in perceived stress were significantly associated with higher levels of regret intensity in waves participants reported lower than usual levels of self-esteem (B = .31, SE = .10, p < .01) and average within-person levels of self-esteem (B = .16, SE =.08, p =.05). Intraindividual increases

in perceived stress did not significantly predict regret intensity in waves participants reported intraindividual increases in self-esteem (B = .01, SE = .05, p =.96).

The Moderating Role of Interindividual Levels of Self-Esteem

To examine whether interindividual differences in levels in self-esteem would also moderate the obtained intraindividual association between stress perceptions and regret intensity, we added to the first Level-1 model (Model 1) different Level-2 variables (Model 2b, see Table 2.3). More specifically, Model 2b predicted variability in the Level-1 intercept and slope coefficients (obtained in Model 1) by incorporating average levels of self-esteem and the covariates (age, sex, SES, partnership status, and averaged years since regretted event) at Level-2. The results of Model 2b indicated significant Level-2 effects on the intercept (representing higher average levels of regret intensity), but only for years since the regretted events occurred and average levels of self-esteem (none of the remaining covariates exerted significant effects). A higher average number of years since the regretted events occurred was associated lower average levels of regret intensity (B = -.11, SE = .05, t = -2.17, p = .03), and higher average levels of self-esteem predicted lower average levels of regret intensity (B = -.16, SE = .05, t = -3.14, p < .01). With respect to predicting the obtained slope coefficients, Model 2b showed that neither average levels of self-esteem nor the included covariates significantly predicted the obtained associations between perceived stress and self-esteem with participants' levels of regret intensity. These findings indicated that interindividual differences in average levels of self-esteem did not moderate the intraindividual association between participants' stress perceptions and their regret intensity (B = -.03, SE = .09, t = -.37, p = .71).[2]

Discussion

The present study investigated the associations between intraindividual changes in older adults' perceived stress and regret intensity, and the moderating role of interindividual differences, and intraindividual changes, in self-esteem. The results indicated that intraindividual

[2] Interindividual self-esteem did not moderate the within-person association between stress and regret intensity, even when controlling for average levels of perceived stress (B = -.04, SE = .09, t = -.45, p = .65). However, there were significant Level-2 effects on the intercept, suggesting that those with high average levels of perceived stress had higher than usual levels of regret intensity (B = .34, SE = .06, t = 5.65, p < .01). Those participants who were single, separated or widowed also reported higher than usual levels of regret intensity (B = .12, SE = .05, t = 2.41, p = .02).

increases in perceived stress predicted higher intensity of older adults' regret experiences. Further, intraindividual changes, but not interindividual differences, in self-esteem moderated the association between intraindividual changes in perceived stress and regret intensity. More specifically, older adults who exhibited intraindividual increases in their self-esteem, were protected from experiencing higher than their usual levels of regret intensity in waves they perceived increases in stress, as compared to those older adults who exhibited intraindividual declines in self-esteem. The obtained pattern of results was significant after controlling for demographic covariates such as, age, sex, SES, partnership status, and the number of years since regretted event.

Our results identified older adults' intraindividual increases in perceptions of stress as a psychological process that contributes to their levels of regret intensity. Investigating the variability in older adults' regret intensity sheds light on how older adults may experience varying regret intensity over time, given that over half of the variability in regret intensity was located within the individual (ICC = .52). This significant amount of intraindividual variability could imply that older adults' regret experiences may be context-dependent (Mandel, 2003). In this regard, our results support the hypotheses that older adults' stress-perceptions may play a role in time-varying changes in regret intensity. This could be the case, because regrets can become dormant and less intense over time but may be activated by external events (Wrosch et al., 2007). To this end, previous research has shown that external cues can bring past regrets to the forefront (Mandel, 2003; Leach & Plaks, 2009). In this way, increased stress perceptions (greater than usual) could indicate a problematic circumstance that may exceed one's capacity to cope (Folkman & Lazarus, 1986), or serve as a cue toward a missed opportunity to undo certain regrets or take corrective actions (Beike et al., 2009), thereby triggering regret-related thoughts (e.g., counterfactual thinking, rumination) and an associated increase in regret intensity.

The obtained association between enhanced stress perceptions and regret intensity can have important implications for older adults' well-being and health, and it would be important to identify protective factors that may help older adults to mitigate stress-related consequences on their regret intensity. To this end, the study's findings suggest that intraindividual changes in self-esteem can play a moderating role in the intraindividual associations between older adults' perceived stress and regret intensity, and was apparent only for intraindividual changes in self-esteem, and not interindividual associations of self-esteem. This finding partially supports our

hypotheses, suggesting that intraindividual changes in self-esteem may be an important adaptive process that may not be apparent if our analyses had only investigated interindividual differences in self-esteem.

The identification of intraindividual changes in self-esteem as a moderator contributes to the existing literature on how adaptive self-protective control processes can protect individuals from experiencing intense regrets. There may be a meaningful relationship between self-esteem and other self-protective control strategies, particularly in the context of stressful circumstances, as self-esteem is an important resource that can influence the way people appraise stressful circumstances and respond to manage the problem at hand (e.g., Greenberg et al., 1999; Orth et al., 2009). More specifically, an intraindividual increase in self-esteem could facilitate the use of self-protective control strategies that previous research has indicated to be adaptive in the management of regret experiences (i.e., downward social comparisons, goal disengagement, Bauer et al., 2008; Bauer & Wrosch, 2011; Wrosch et al., 2005, 2007). In other words, older adults experiencing a boost in their usual levels of self-esteem could prompt the use of additional adaptive strategies, which subsequently can help to reframe stressful circumstances (Crocker et al., 2006) and elicit the use of self-protective control processes to mitigate intense regret experiences. Further research to examine the possibility that self-protective control strategies and intraindividual increases in self-esteem may mediate the relationship between stress and regret intensity could expand our understanding of adaptive regulation of regret intensity in older adulthood.

Although the results suggested that interindividual differences in self-esteem did not exert a moderating effect, there was a statistically significant effect on the intercept, suggesting that older adults who reported higher average levels of self-esteem experienced lower average levels of regret intensity. This finding is consistent with previous research documenting that high self-esteem levels are typically associated with individuals' well-being, including lower levels of regret intensity (Roese & Olson, 1997; Sanna et al., 2001). However, we note here that our findings did not support the hypothesis that interindividual differences in self-esteem would also moderate the intraindividual association between stress and regret intensity. This highlights that generally high levels of self-esteem may not always elicit adaptive processes and may sometimes require a boost in self-esteem to motivate individuals to cope with their regret experiences.

Our results also indicated covariate effects on regret intensity such that a longer time

period since the regretted event was associated with less regret intensity. This is consistent with previous research showing that individuals reported less regret intensity about a regretted event with the passage of time (Gilovich & Medvec, 1994). As such, we controlled for time since the regretted event and not whether older adults' regrets were related to omissions or commissions. While our study asked participants to report omissions and commissions of their regretted events, we did not have hypotheses about these differences, and the analyses showed that they were statistically unrelated to regret intensity in our data (see footnotes in Data Analyses section). This may be the case as categorizing omission or commission of regret in older adulthood may not matter as much in terms of the intensity of the regret, as there may be limited opportunities to correct any regretted behaviour, and thus would be less associated with the intraindividual fluctuations in our main study variables.

Overall, our findings have important implications for research in personality functioning and contribute to the literature on how older adults can effectively manage their regret experiences. First, they fill a gap in the regret literature by identifying older adults' perceptions of stress as a predictor to regret intensity. Given that the extant literature has well-documented the adverse consequences of regret intensity in older adulthood, identifying perceptions of stress as a psychological process that elicits regret intensity further provides information regarding the variability of regret experiences in older adulthood. Second, using an intraindividual approach provides the opportunity to control for habituation effects of stress, and other individual difference factors that may be related to the main study variables. More specifically, when levels of stress and regret intensity among older adults are compared to their own average levels, we can control for possible habituation effects of stress, and thus be well-suited to identify protective factors. Examining intraindividual changes in self-esteem can also allow us to account for individual differences in maladaptive levels of self-esteem such as narcissism, which has been associated with unhelpful tendencies that may exacerbate negative psychological experiences (Baumeister, Campbell, Krueger, & Vohs, 2003; Neff, 2011).

Third, the study's findings contribute to the mounting literature on self-esteem change in older adulthood (Orth, Erol, & Luciano, 2018) and point to the conclusion that there is considerable variability in older adults' self-esteem over time. Specifically, the results demonstrate that intraindividual changes in self-esteem can be associated with adaptive outcomes, independent of interindividual differences in self-esteem. These findings highlight the

possibility that even individuals with high levels of self-esteem may not always be protected under stressful circumstances. In addition, these findings contribute to the self-esteem literature by pointing to the importance of additionally considering changes in self-esteem as an adaptive psychological process that can react to external events (e.g., Crocker, 2002) which may also be related to, and kick start, other self-protective processes to help mitigate regret intensity. Finally, our findings support the idea that self-esteem can be malleable in older adulthood and could have implications for interventions aimed at increasing older adults' personality functioning and psychological well-being. Effective interventions in this context could focus on re-appraisals of stressful events to protect a person's self-esteem and reduce intense negative emotional responses to stressful events.

Limitations and Future Research

There are limitations to the present study. First, while it is a strength of our study to examine longitudinal associations between older adults' stress, regret intensity and self-esteem in a naturalistic setting, our data stems from a relatively small longitudinal project on community-dwelling older adults in Montreal, which may limit the generalizability of the study's conclusions. Thus, future research should replicate the reported findings in larger and representative studies. Second, while our results have provided valuable information on adaptive processes in an aging population, future studies should extend these investigations to younger individuals. Such a life-span approach may be important in that it can highlight age-related processes in the dynamic relationship between self-esteem, stress and regret intensity. It would also be interesting to investigate the moderating role of self-esteem changes in this context, particularly as there are different normative trajectories in self-esteem in young adulthood (Robins et al., 2002). We would expect to find similar moderating effects of self-esteem on young adults' perceived stress and experiences of regret, particularly since there are generally more opportunities to address regrets in young adulthood (Wrosch & Heckhausen, 2002), a boost in self-esteem could activate young adults into managing the stressful circumstance and address the regret thereby mitigating regret intensity.

Third, our study used subjective measures of stress which can be prone to self-report biases. Although our hypotheses were based on theories that emphasized perceptions of stress (Folkman & Lazarus, 1986; Crocker, 2002), we suggest that future studies should additionally examine more objective measures of stressors. These objective measures could examine

situational factors and include the use of daily diary methods to more closely assess individuals' levels of stress and regret intensity. Fourth, our study did not consider other psychological factors, from an acceptance-based framework, that could be associated with self-esteem and may also protect older adults from adverse consequences of stress and regret intensity (e.g., self-compassion, Herriot, Wrosch, & Gouin, 2018). As such, future studies could include other evaluations of the self that may tap into older adults' level of self-acceptance and self-compassion under stressful circumstances.

Conclusions

This study identified intraindividual increases in self-esteem as a moderator in the intraindividual associations between older adults' stress perceptions and regret intensity. The reported findings suggest that person-person related boosts in older adults' self-esteem may contribute to an important adaptive process in protecting them from experiencing the adverse effects of enhanced stress perceptions on their regret intensity. The findings may be used to develop interventions that target changes in older adults' self-esteem, to alleviate adverse consequences of increased regret intensity and improve their quality of life.

Table 2.1.

Means, Standard Deviations, and Frequencies of Main Study Variables (N = 167)

Constructs	M (*SD*) or Percentage [a]	Range
Male (%)	46.70	
Socioeconomic Status (T1)	.00 (.83)	-1.89 – 2.28
Education [b]	2.07 (1.07)	0 – 4
Yearly family income [c]	1.51 (1.31)	0 – 5
Perceived social status	6.15 (1.81)	0 – 10
Married/living with partner (T1) (%)	50.90	
Age	71.83 (5.59)	64 – 94
Average time since regret in years (T1 to T6)	32.17 (16.76)	.33 – 82.33
Average regret of commission (T1 to T6) (%)	33.38%	
Average regret of omission (T1 to T6) (%)	65.80%	
Average regret intensity (T1 to T6)	1.83 (.69)	1 – 4.27
T1	1.77 (.80)	1 – 4.33
T2	1.90 (.90)	1 – 4.50
T3	1.80 (.82)	1 – 4.67
T4	1.85 (.92)	1 – 4.67
T5	1.80 (.90)	1 – 4.50
T6	1.91 (.92)	1 – 5.00
Average perceived stress (T1 to T6)	2.49 (.57)	1.08 – 4.02
T1	2.44 (.63)	1 – 4.90
T2	2.46 (.65)	1 – 4.30
T3	2.49 (.73)	1 – 4.70
T4	2.42 (.65)	1 – 4.20
T5	2.52 (.70)	1 – 4.80
T6	2.49 (.62)	1.20 – 4.30
Average self-esteem (T1 to T6)	22.07 (3.60)	13 – 29.83
T1	22.53 (4.14)	12 – 30
T2	22.12 (4.34)	9 – 30
T3	22.28 (4.39)	11 – 30
T4	22.03 (4.10)	12 – 30
T5	22.25 (3.99)	10 – 30
T6	21.69 (4.40)	11 – 30

Notes. M = mean, *SD* = standard deviation.

[a] *M* and *SD* are presented for continuous variables. [b] Education was indexed as 0 = no education, 1 = high school, 2 = trade or collegiate, 3 = bachelors, and 4 = masters or doctorate. [c] Yearly family income was index as 0 = less than $17,000, 1 = up to $34,000, 2 = up to $51,000, 3 = up to $68,000, 4 = up to $85,000, and 5 = more than $85,000.

Table 2.2.

Zero-Order Correlations Between Main Study Variables (N = 167)

	1.	2.	3.	4.	5.	6.	7.	8.
1. Average regret intensity (T1 to T6)								
2. Average number of regret years (T1 to T6)	-.20**							
3. Average perceived stress (T1 to T6)	.49**	-.14						
4. Average self-esteem (T1 to T6)	-.34**	.01	-.60**					
5. Age (T1)	-.13	.35**	-.03	.06				
6. Sex (T1) [a]	.11	.04	.13	-.08	-.01			
7. Socioeconomic status (T1)	-.23**	.10	-.30**	.30**	-.06	-.14		
8. Partnership status (T1) [b]	.19**	-.09	.03	-.20**	-.05	.22**	-.27**	

Notes. [a] Sex was coded as 1 = male, 2 = female. [b] Partnership status was coded as 1 = Married/Living with partner, 2 = Single/Separated/Divorced/Widowed.

* $p < .05$. ** $p < .01$.

Table 2.3. *HLM Analyses Results Examining Within-Person Associations between Perceived Stress and Regret Intensity across Six Waves of Assessment, Separately for High, Average and Low Self-Esteem*

	Model 1								Model 2a	
	Intercept		Years since Regrets Slope		Perceived Stress (PS) Slope		Self-Esteem (SE) Slope		PSXSE Interaction Slope	
	β (*SE*)	T-ratio	β (*SE*)	T-ratio	β (*SE*)	T-ratio	β (*SE*)	T-ratio	β (*SE*)	T-ratio
Level-1	1.84 (.05)	34.20**	-.01 (.00)	-2.99**	.17 (.08)	2.17*	-.02 (.01)	-1.93*	-.05 (.03)	-2.10*
Model 2b (Level 2)										
Age	-.06 (.05)	-1.35	.00 (.00)	.12	-.01(.08)	-.09	.02 (.01)	1.27	---	---
Sex	.04 (.05)	.77	-.00 (.00)	-.22	-.10 (.07)	-1.32	.02 (.01)	1.31	---	---
SES	-.06 (.05)	-1.07	-.00 (.00)	-.68	-.12 (.10)	-1.22	.00 (.01)	.13	---	---
Partnership Status	.08 (.05)	1.38	.00 (.00)	.91	.08 (.09)	.84	-.02 (.01)	-1.28	---	---
Years since Regret	-.11 (.05)	-2.17*	.01 (.00)	1.69	.06 (.10)	.59	-.01 (.01)	-.71	---	---
Average Self-Esteem (T1 to T6)	-.16 (.05)	-3.14**	.00 (.00)	.12	-.03 (.08)	-.38	-.00 (.01)	-.07	---	---

Notes. The intercept represents participants' average levels of regret intensity, and the slopes represent person-centered main effects and interaction effect of perceived stress and self-esteem on regret intensity. The Level-1 models had 166 *dfs*, and the Level-2 models had 160 *df*s. * $p < .05$. ** $p < .01$

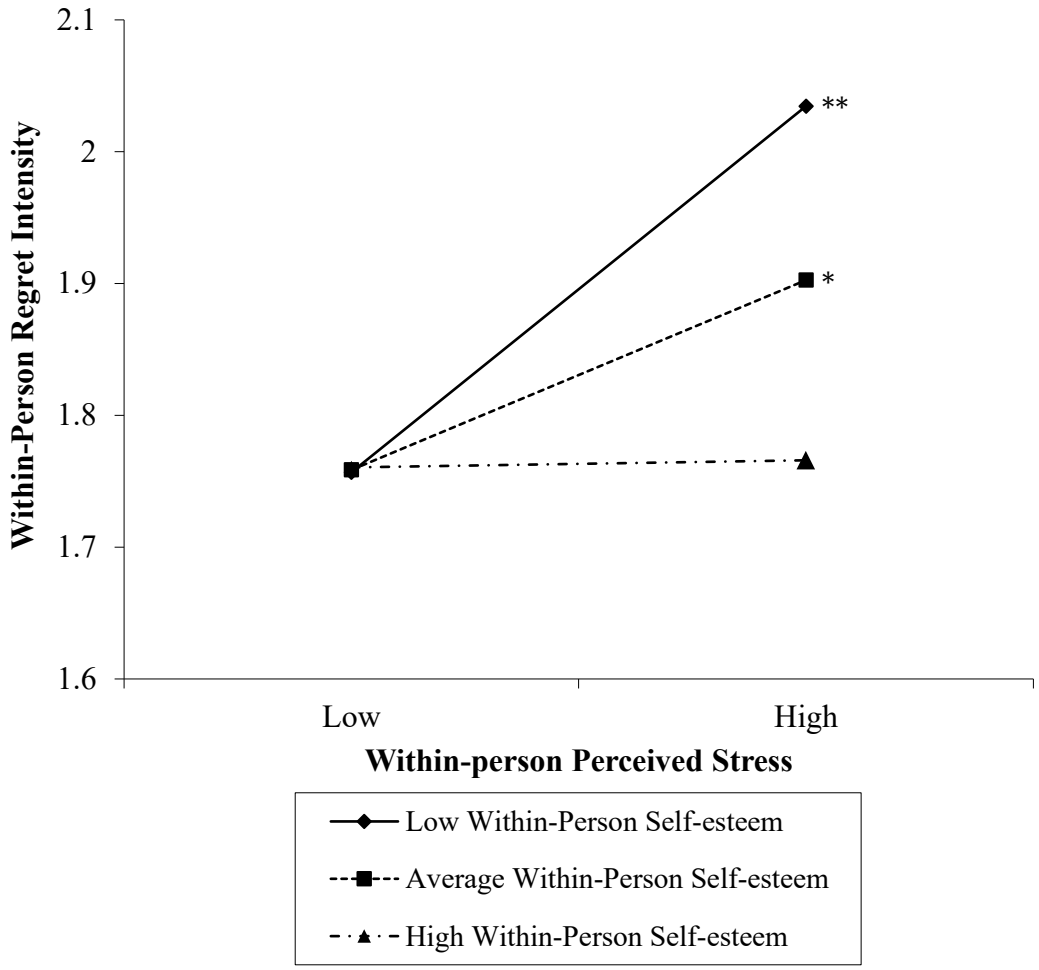

Figure 2.1. Within-person associations between perceived stress and regret intensity, separately for those reporting low, average and high within-person levels of self-esteem. Associations were plotted for the averaged lower quartiles, person means, and higher quartiles of self-esteem and perceived stress. * $p < .05$. ** $p < .01$.

CHAPTER THREE: STUDY TWO

Abstract

Rationale: Self-esteem is an adaptive personality factor that has been associated with good physical health. While research has observed that self-esteem and physical health typically decline in older adulthood, there is a paucity of research investigating the associations between changes in self-esteem and physical health across the adult lifespan. **Objective:** The present study examined whether changes in self-esteem and chronic disease exert reciprocal effects on subsequent changes in self-esteem and disease. In addition, it investigated whether individuals' age would moderate these associations. **Methods:** The study analyzed data from 14,117 adult (18+) Canadians who completed surveys over 16 years, from cycles 1 to 9 of the National Population Health Survey (NPHS). Self-esteem, chronic diseases, and demographic information were collected. **Results:** Cross-lagged panel analyses indicated reciprocal age-related associations between changes in self-esteem and chronic disease. Initial decline in self-esteem predicted subsequent increases in chronic disease, and initial increases in chronic disease predicted subsequent declines in self-esteem, only among young adults, and not middle-aged or older adults. **Conclusion:** These results suggest that age may qualify the associations between declines in self-esteem and physical health and that adverse changes in both factors may be particularly problematic for young adults' prospective personality functioning and physical health.

Keywords: self-esteem; self-esteem change; chronic disease; health; adult lifespan; longitudinal analyses; cross-lagged panel analyses.

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Changes in Self-Esteem and Chronic Disease Across Adulthood: A 16-year Longitudinal Analysis

Individuals' self-esteem and their physical health can influence each other over time. This process most likely occurs in a recursive fashion, in which low self-esteem can jeopardize a person's physical health, and vice versa (Reitzes & Mutran, 2006; Sowislo & Orth, 2013). In addition, life-span developmental research has documented significant changes in self-esteem and physical disease as individuals advance in age. Both self-esteem and physical health remain relatively protected during adulthood, but decline in old age (Heckhausen, Wrosch & Schulz, 2010; Orth, Erol, & Luciano, 2018; von Soest, Wagner, Hansen, & Gerstorf, 2017). However, there is a paucity of research on the longitudinal associations between such changes across the lifespan. Here we address this gap by capitalizing on a 16-year longitudinal study. We apply a developmental approach focusing on how changes in psychological processes, such as self-esteem, and changes in the experience of chronic disease can influence one another across the lifespan. On the one hand, we reasoned that declines in self-esteem and increased chronic disease could be most influential in predicting subsequent decreases in self-esteem and health during life periods when they are most likely to occur, such as older adulthood. On the other hand, we considered that declines in self-esteem and increases in chronic disease are non-normative and least expected in young adulthood, and could reflect underlying developmental difficulties (Heckhausen et al., 2010; Neugarten, Moore, & Lowe, 1968). Thus, declines in self-esteem and increases in chronic disease could also become paramount at younger ages and predict a subsequent deterioration of individuals' self-esteem and physical health.

Self-Esteem and Chronic Disease

Global self-esteem is considered an important psychological variable that reflects individuals' general feelings of self-worth across different areas of life (Rosenberg, 1986). Research has identified various effects of self-esteem on physical health outcomes. For example, low self-esteem has been associated with physiological dysregulation in the context of stress (Liu, Wrosch, Miller, & Pruessner, 2014; Pruessner, Hellhammer, & Kirschbaum, 1999; Rector & Roger, 1997) and physical health problems (Cott, Gignac, & Badley, 1999). Such effects of self-esteem on physical health may be observed because low self-esteem can contribute to psychological consequences and lead to maladaptive coping behaviours (Orth, Robins, & Meier, 2009; Watson, Suls, & Haig, 2002), which in turn is likely to exert downstream implications by

enhancing a person's physiological risk of experiencing chronic disease (Cohen, Janicki-Deverts, & Miller, 2007; Lazarus & Folkman, 1984; Liu et al., 2014).

Chronic disease may also have a significant impact on individuals' self-esteem. Indeed, research has identified recursive effects of poor physical health on low self-esteem (Reitzes & Mutran, 2006). For example, among individuals diagnosed with chronic pain, those who experienced their condition as uncontrollable and experienced a depletion of resources reported particularly low levels of self-esteem (Skevington, 1993). As such, self-esteem may also be influenced by changes in physical health (Rector & Roger, 1997). Moreover, the presence of chronic disease may disrupt coping activities and contribute to undesired outcomes, which may exert negative influences on individuals' self-esteem (Sowislo & Orth, 2013). Thus, associations between self-esteem and physical health are likely reciprocal, suggesting that low self-esteem may not only forecast health declines, but the occurrence of chronic disease can also compromise a person's self-esteem.

Changes in Self-Esteem and Chronic Disease Across the Adult Lifespan

Age-related biological changes can contribute to physical health across the adult lifespan. While early development is characterized by increased physical functioning, physical health remains relatively stable throughout adulthood, until it tends to deteriorate in old age and is associated with a number of chronic diseases (Gerstorf et al., 2010; Heckhausen et al., 2010). Similarly, a growing body of research has examined the lifespan trajectory of self-esteem suggesting that self-esteem increases during young adulthood, plateaus in midlife, and declines throughout older adulthood (Orth et al., 2018; Robins et al., 2002). Note that there is considerable variability around these trajectories, suggesting that self-esteem and physical health can also increase or decline for individuals at any age (Heckhausen et al., 2010; Robins et al., 2002).

As there is a body of literature that discusses the various mechanisms through which social determinants are associated with physical health and aging (Jones et al., 2019; Ross & Wu, 1996), age-related changes in self-esteem may also be impacted by psychological and social factors. In this regard, the management of developmental tasks and age-normative expectations about their own and others' development could influence a person's lifespan trajectory of self-esteem by providing a frame of reference for assessing their own developmental status (Heckhausen & Krueger, 1993). Given that individuals frequently evaluate their self-esteem

within a social context (Rosenberg, 1986), they may compare their own development with normative expectations and the development of their peers. As such, they may experience age-related changes in self-esteem as a consequence of perceiving their developmental status as "on-time" versus "off-time" (Neugarten et al., 1968).

In young adulthood, increases in self-esteem may be related to age-normative gains, such as the establishment of new social roles or occupying positions of power and status (Robins et al., 2002). Young adulthood is a period where individuals are expected to, and typically accomplish, a number of developmental tasks that contribute to patterns of successful development (Baltes, 1987; Heckhausen et al., 2010). As young adults continue to meet age-normative expectations by making progress with developmental tasks, self-esteem typically increases and peaks during midlife when high levels of achievement, mastery, and control over the self and the environment begin to plateau (for midlife development, see Lachman, 2004). In older adulthood, declines in self-esteem may reflect the expectation and experience of developmental losses, such as reductions of personal resources, withdrawal from social roles (e.g., retirement), or increases in health problems (Baltes, 1987; Heckhausen, 1999; Robins et al., 2002). Here, self-esteem declines may be observed particularly if older adults experience, but do not expect for themselves, significant developmental losses (Heckhausen & Krueger, 1993).

Age Effects of Changes in Self-Esteem and Chronic Disease

There is a paucity of research investigating the longitudinal associations between changes in self-esteem and chronic disease across the adult lifespan. As such, it is important to examine how declines in self-esteem and physical health influence each other over time across different age segments. One possibility is that the reciprocal associations between self-esteem and chronic disease may become particularly evident in older adulthood, when a considerable proportion of individuals experience both the onset of a number of chronic diseases and a reduction in self-esteem (Orth et al., 2018). It is important to note, however, that lifespan approaches have also documented that older adults are generally well-prepared to effectively cope with developmental challenges, such as chronic disease. This age-related improvement of self-regulation capacities could prevent declines in self-esteem and physical health from influencing each other over time (e.g., through self-protection, emotion regulation, or goal adjustment, Carstensen, Issacowitz, & Charles, 1999; Heckhausen et al., 2010; Wrosch, Scheier, & Miller, 2013).

Another possibility is that reciprocal associations between declines in self-esteem and

physical health could be more pronounced when they are less likely to occur, for example among young adults. In young adulthood, normative conceptions about development emphasize individuals' potential for gains and push them towards the accomplishment of important developmental tasks (e.g., finishing an educational degree, transitioning into the work force, or finding a partner; Havighurst, 1972). Given that individuals compare their achievements with age peers and normative expectations, a decline in self-esteem during this period could reflect a failure in achieving developmental tasks, which may affect individuals' psychological functioning and health (Heckhausen et al., 2010; Wrosch, Heckhausen & Lachman, 2000). Similarly, the experience of chronic disease is normatively less expected in young adulthood and may put some young adults at risk of feeling "off-time," which in turn could compromise their self-esteem. In addition, many young adults did not yet develop the coping capacities needed to effectively adjust to circumstances that involve losses or unexpected and uncontrollable events (e.g., through self-protective strategies or goal adjustment capacities, Heckhausen et al., 2010; Wrosch et al., 2013). As such, young adults who experience self-esteem declines and physical health problems may have difficulty adjusting to these challenges, which could jeopardize their physical health and self-esteem over time.

The Present Study

This study builds on previous research documenting significant age-related changes in adults' self-esteem and physical health over time. As such, we attempted to investigate the effects these changes can exert onto each other across the adult lifespan. To this end, this study examined reciprocal associations between changes in self-esteem and chronic disease across the adult lifespan from a Canadian national survey conducted over 16 years. We hypothesized that there would be a reciprocal association between changes in self-esteem and changes in chronic disease over time, in that declines in self-esteem would predict subsequent increases in chronic diseases, and vice versa. Second, we examined whether participants' chronological age moderated these associations. Because the above literature review suggested different possibilities, the direction of age effects was not specified.

Methods

Sample

Data were drawn from the National Population Health Survey (NPHS), which is a longitudinal panel survey of Canadian residents. As a nationally representative sample, the

NPHS targeted household residents of the 10 Canadian provinces; excluding individuals residing in health institutions, Canadian Forces bases, Indian Reserves and Crown lands, and those residing in remote areas of Quebec and Ontario. The NPHS collected socio-demographic, physical health and psychological characteristics of 17, 276 individuals starting in 1994/1995 (T1). Subsequent surveys were collected every two years for a total of 9 cycles over 16 years: 1996/1997 (T2), 1998/1999 (T3), 2000/2001(T4), 2002/2003 (T5), 2004/2005 (T6), 2006/2007 (T7), 2008/2009 (T8) and 2010/2011 (T9); the attrition rates (compared with prior cycles) were 9.3%, 6.6%, 7.1%, 7.6%, 7.5%, 5.4%, 9.2% and 6.9% respectively. Cumulatively, after nine cycles, 46.2% of the initial sample either had partial responses, refused to participate, could not be interviewed due to mental or physical health problems (including being institutionalized), or to repeated absences, moved outside of Canada, or were deceased. However, after excluding children (<18 years old, n = 3159), the reliance on full information maximum likelihood estimation procedures (FIML, Enders, 2010) to handle missing data allowed us to analyze 14,117 adults. This final analytic sample included 6456 males and 7661 females, with a mean age of 45.83 years (SD = 18.11 years; 43.9% were between the ages of 18 – 39, 36.7% were between the ages of 39 – 64, and 19.4% were 65 years or older). Study participants included a representative proportion of individuals in advanced old age. Statistics Canada does not permit the release of the exact age ranges to protect participant confidentiality. There were missing data for some of the study variables across the three waves, ranging from 0.20% to 10.84%. More specifically, of those participants who responded at each of the wavers, some did not provide data for level of education at T1 (0.30%), self-esteem scores at T1 (7.60%), T4 (6.54%) and T9 (10.84%), and number of chronic diseases at T1 (0.20%), T4 (2.63%) and T9 (6.07%).

Procedure

Interviews were conducted by Statistics Canada, and the households were selected at the first-time point (1994/1995). One individual over the age of 12 years was randomly selected from each household to be the respondent for all nine assessments. At each assessment, respondents completed a series of questionnaires. These questionnaires were approved by Statistics Canada and developed by expert committees from Health Canada, the Public Health Agency of Canada, and other Canadian government departments. The analyses presented in this paper were conducted at a Canadian Research Data Centre Network (CRDCN) site. Access to the data was obtained through an agreement with the Research Data Centre of Statistics Canada.

Statistics Canada analysts reviewed the analyses to verify confidentiality and appropriate use of the study's sampling weight.

Materials

Self-esteem. A subset of six items from the Rosenberg Self-Esteem Scale (Rosenberg, 1986) was used to assess self-esteem at T1, T4, and T9. The six items formed a single dimension (Pearlin & Schooler, 1978) and include the items: "I feel I have a number of good qualities," "I feel that I am a person of worth at least equal to others," "I am able to do things as well as most other people," "I take a positive attitude towards myself," "On the whole I am satisfied with myself," "All in all, I am inclined to feel like a failure." Respondents' answers were provided on a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*). Negative items were reverse scored and self-esteem was calculated by computing a sum score of the 6 items (αs > .85). Higher values indicated greater self-esteem. Statistically significant positive associations were observed among self-esteem scores across the three measurement points (rs > .28, p < .01).

Chronic disease. Assessed at T1, T4 and T9, participants were asked to indicate the presence of 22 chronic diseases (e.g., arthritis, asthma, diabetes, heart disease, high blood pressure). Respondents' index of chronic disease was calculated as the sum of "yes" responses. Higher values indicated greater numbers of chronic disease. There were statistically significant positive correlations between number of chronic diseases across time points (rs > .51, p < .01).

Sociodemographic variables. Covariates at baseline were included in the analyses (see Table 2.1). Sex was self-reported (1 = *male*, 2 = *female*). Education level was assessed by highest level of education attained (1= *less than secondary school graduation* to 4 = *post-secondary graduation*). Self-reported partnership status was measured by categorizing participants into two groups: 1) married/lives with partner or 2) single/divorced/separated/widowed. Participants also reported their total household income.

Data Analyses

We conducted preliminary analyses using IBM SPSS Statistics software, to describe the sample (by calculating means), examine mean level differences across time (by using ANOVAs), and explore associations between the main constructs (by calculating correlations). Prior to the main analysis, change in self-esteem and chronic disease were calculated as standardized residuals in regression analyses (using IBM SPSS). Change scores for self-esteem and chronic disease from T1 to T4 (and from T4 to T9) were obtained in separate regression analyses by

predicting T4 scores from T1 scores (and T9 from T4 scores) and saving the standardized residuals for further analysis. Standardized residuals have been shown to involve fewer psychometric problems than differences scores (Peter, Churchill Jr., & Brown, 1993; Edwards, 1994). We further note that computing residualized change scores prior to the analyses prevents the possibility that certain covariates associated with levels of the main variables could potentially create suppression effects.

Our main hypotheses were tested using standardized change residual variables in cross-lagged panel models that controlled for relevant covariates. These analyses were performed with MPlus 8.0 (Muthén & Muthén, 2017) and the robust Maximum Likelihood estimator, which provided standard errors, tests of statistical significance and model fit indices that are robust to the non-normality of item response and to the complex design (i.e., sampling weights) of the study. Longitudinal sampling weights were provided by the NPHS based on participants in Cycle 1 and adjusted to appropriately reflect the Canadian population (Statistics Canada, 2012). The reliance on sampling weights implies that the results can be representative at the national level. All analyses controlled for relevant socio-demographic covariates such as, sex, education level, total household income, partnership status, and baseline levels of self-esteem and chronic disease.

A cross-lagged panel analysis was conducted to investigate the reciprocal associations between self-esteem changes and chronic disease (from T1 to T4, and from T4 to T9). Given the known oversensitivity of the chi-square test of exact fit to sample size and minor model misspecification (Marsh, Hau & Grayson, 2005), goodness of fit was assessed using the root-mean-square error of approximation (RMSEA), the Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI).

We then tested whether the reciprocal associations between changes in self-esteem and chronic disease would be moderated by age, using cross-lagged tests of interaction effects. Specifically, interaction terms between age and changes in self-esteem (from T1 to T4), and age and chronic disease (from T1 to T4) were used to predict subsequent changes in self-esteem and chronic disease (from T4 to T9). Significant interaction effects were followed up with simple slope analyses, examining the associations between self-esteem change and chronic disease at specific age points corresponding to young (*SD* = -1.15, age 25), middle (*SD* = -.05, age 45) and older (*SD* = 1.06, age 65) adulthood. These point estimates of the continuous age distribution

were selected to facilitate the interpretation of the findings. In our analyses, we used age as a continuous variable.

Results

Preliminary Analyses

Sample characteristics are presented in Table 3.1. At baseline, participants were on average 46 years old, approximately half of the sample were female, more than half of the sample was married or living with a partner, approximately 55% of the participants had some post-secondary education or higher, and approximately 56% of the participants reported total household incomes of up to $39,999, with approximately 18% reporting an income greater than $60,000. Repeated measurement ANOVAs indicated that overall mean levels of our main study variables exhibited a linear pattern from T1 to T9 (see Table 3.1). Self-esteem declined from T1 to T9, $F(1, 5983) = 624.841$, $p < .01$, and number of chronic diseases increased from T1 to T9, $F(1, 6720) = 3269.718$, $p < .01$.

The zero-order correlations between the main study variables and covariates are presented in Table 3.2. Overall, declines in self-esteem were associated with increases in chronic disease. In addition, females were less likely to be married or living with a partner, and reported lower levels of income, than males. Those who were married or living with a partner, compared to those who were single, were more likely to have higher levels of education and reported higher levels of income. Older participants were more likely to be female and reported lower levels of education and income, than younger participants. Younger, as compared to older, participants and those with higher, as compared to lower, levels of education and income reported relatively fewer declines in self-esteem (T1 to T4, and T4 to T9) and chronic disease (T1 to T4; and T4 to T9 for younger participants only). Women, as compared to men, were more likely to exhibit declines in self-esteem (from T4 to T9) and reported larger increases in chronic disease (T1 to T4 and T4 to T9).

Reciprocal Associations between Changes in Self-esteem and Chronic Disease

We specified a cross-lagged panel model to examine the reciprocal relations between earlier changes (T1 to T4; across 6 years) and subsequent changes (T4 to T9; across 10 years) in self-esteem and chronic diseases, controlling for age, sex, education level, partnership status, income, and levels of self-esteem and chronic disease at baseline. The standardized cross-lagged model coefficients are presented in Table 3.3. Significant associations with subsequent changes

in self-esteem and chronic disease were evident among the covariates at baseline. Specifically, older participants and participants with lower levels of income, reported greater increases in the number of chronic diseases and greater declines in self-esteem ($|\beta s| > .037$, $SEs < .024$, $ps < .022$). Female participants, compared to males, reported greater increases in number of chronic diseases ($\beta = .040$, $SE = .014$, $p < .01$). Participants with higher levels of education reported greater increases in self-esteem ($\beta = .096$, $SE = .017$, $p < .01$). In addition, baseline (T1) levels of self-esteem predicted subsequent increases in self-esteem (from T4 to T9; $\beta = .216$, $SE = .018$, $p < .01$), and baseline (T1) levels of chronic disease predicted subsequent increases in chronic disease (from T4 to T9; $\beta = .131$, $SE = .020$, $p < .01$).

The cross-lagged panel model testing the associations between changes in self-esteem and chronic disease is depicted in Figure 2.1. The results indicated a good fit of the data ($\chi^2 = 4656.810$, $df = 55$, $p < .01$; RMSEA = .000; CFI = 1.000; TLI = 1.000). Early increases in self-esteem made it less likely to experience similar increases later ($\beta = -.106$, $SE = .020$ $p < .01$). Similarly, early increases in chronic disease made it less likely to experience similar increase later ($\beta = -.203$, $SE = .019$, $p < .01$). Changes in self-esteem and chronic disease were negatively correlated with one another across both time intervals (from T1 to T4: $r = -.053$, $p < .01$; from T4 to T9: $r = -.069$, $p < .01$).

In addition, the results suggested that the reciprocal main effect of earlier changes in self-esteem on subsequent changes of chronic disease, and vice versa, were not significant ($\beta s < -.032$, $SEs = .016 - .018$, $ps > .060$). That said, there was a trend effect that approached significance for the association between earlier changes in self-esteem and later changes in chronic disease ($\beta = -.031$, $SE = .016$, $p = .061$), explaining approximately 4% of the variance in changes in chronic disease (T4 to T9). The latter result suggests a cross-lagged trend effect in the entire sample, indicating that declines in self-esteem over the first six years of the study may be associated with subsequent increases in chronic disease over time.

Age Effects of Changes in Self-esteem and Chronic Disease

The next model included interaction terms into the cross-lagged models, examining whether associations between changes in self-esteem and chronic disease differed as a function of age. The results indicated that this model had a satisfactory level of fit to the data ($\chi^2 = 4632.160$, $df = 78$, $p < .01$, RMSEA = .023, CFI = .997, TLI = .877). The model revealed two statistically significant interactions: a) age interacted with earlier self-esteem changes in

predicting subsequent changes in chronic disease (β = .050, *SE* = .021, *r* = .255, *p* = .020); and b) age interacted with earlier changes in chronic disease in predicting subsequent changes in self-esteem (β = .047, *SE* = .023, *r* = .228, *p* = .038). Overall, the predictors accounted for 14.60% of the variance in self-esteem changes (from T4 to T9; R^2 = .146, *SE* = .013, *p* < .01), and 15.5% of the variance in changes in chronic disease (from T4 to T9; R^2 = .157, *SE* = .013, *p* < .01).

Figure 2 (left panel) depicts the association between T1 to T4 changes in self-esteem and T4 to T9 changes in chronic disease for ages, 25, 45, and 65. Simple slope analyses (Aiken & West, 1991) indicated that earlier declines in self-esteem significantly predicted subsequent increases in chronic disease among young adults (β = -.075, *SE* = .019, *p* < .01), but not among middle-aged (β = -.016, *SE* = .020, *p* = .428) or older adults (β = .044, *SE* = .039, *p* = .265). Figure 2 (right panel) depicts the association between T1 to T4 changes in chronic disease and T4 to T9 changes in self-esteem for ages 25, 45, and 65. Simple slope analyses indicated that earlier increases in chronic disease significantly predicted subsequent decreases in self-esteem among young adults (*B* = -.079, *SE* = .032, *p* = .015), but not middle-aged (*B* = -.024, *SE* = .018, *p* = .174) or older adults (*B* = .031, *SE* = .029, *p* = .278).

Discussion

This study investigated the reciprocal association between changes in self-esteem and chronic disease across the adult lifespan. The results suggested relatively small reciprocal and time-lagged associations between changes in self-esteem and chronic disease. These effects, however, were moderated by age, and observed only among young adults, and not among their middle-aged and older counterparts. More specifically, among young adults, earlier declines in self-esteem significantly predicted a subsequent increase in the occurrence of chronic disease; and earlier increases in chronic disease significantly predicted subsequent declines in self-esteem. As such, research on the associations between changes in self-esteem and chronic disease may consider a person's position in the life course to identify how declines in self-esteem can affect subsequent health declines, and vice versa. Of note, this pattern of results was significant after controlling for potential covariates such as sex, partnership status, level of education, total household income, and baseline levels of the included change variables.

The main effects of the cross-lagged panel analyses did not lend much support to the hypothesis that changes in self-esteem and chronic disease would exert reciprocal main effects on one another over time. In the entire sample, the analyses only indicated a small trend effect of

earlier declines in self-esteem on subsequent increases in chronic disease, while the reversed main effect was minimal and not significant. This pattern of findings does not provide strong evidence for the possibility that changes in self-esteem and health problems are generally associated with each other (e.g., Orth, Robins, & Widaman, 2012), or that individuals with low self-esteem often experience health-related problems (Trzesniewski et al., 2006, Cott et al., 1999; Sowislo & Orth, 2013).

An explanation for the observed small or non-significant main effects may relate to the inclusion of sociodemographic covariates that can play significant roles in the associations between changes in self-esteem and chronic disease (e.g., Adler et al., 1994). To this end, our results indicated that higher baseline levels of income and education were associated with declines in participants' reported number of chronic diseases and increases in self-esteem. In addition, supplemental analyses suggested that the obtained trend effect of earlier changes in self-esteem on later changes in chronic disease would have been significant (β = -.033, SE = .016, r = .285, p = .046) if income level was not included in the analyses. As such, it may be difficult to identify significant main effects if a person's low income affects both declines in self-esteem as well as subsequent increases in physical health problems.

Furthermore, we acknowledge that other socio-economic variables, such as employment status, may also play a significant role in the association between self-esteem changes and chronic disease (Leana & Feldman, 1988). Given that older adults normatively retire and employment status is therefore naturally confounded with age, we did not include employment status as a covariate because it could have masked the obtained age effects. We further note that supplemental analyses showed that all reported effects remained significant if our analyses would have controlled for employment status.

The analyses incorporating age as a moderating factor, however, documented more reliable associations between changes in self-esteem and chronic disease. In fact, our analyses showed that age could qualify the strength of the longitudinal associations between declines in self-esteem and increases in chronic disease. More specifically, our findings revealed reciprocal effects of self-esteem decline on increased physical health problems, and vice versa. However, such an association was found only in young adulthood, and not in midlife or old age. The obtained age effects suggest that it could be particularly problematic for young adults to experience declines in self-esteem or physical health. Such a pattern may occur because young

adults who experience self-esteem declines may perceive their development as "off-time," which could exert negative psychological consequences and contribute to the development of chronic disease (Cohen et al., 2007).

In addition, a discrepancy between young adults' normative expectations, compared to their current self-esteem (Lachman Röcke, Rosnick, & Ryff, 2008), could have a particularly adverse impact on their physical health, since young adults are typically less equipped to effectively cope with circumstances that involve losses (Heckhausen et al., 2010). Such a process may be the starting point of a cascade of maladjustment associated with declines in physical health and self-esteem. Similarly, self-esteem declines may also occur as a function of young adults' health problems, as the onset of chronic disease during this developmental period are least expected or likely to occur. Such non-normative life events could create a negative discrepancy between individuals' expectation and their actual experience (Carver & Scheier, 1990; Higgins, 1987), and jeopardize self-esteem and physical well-being over time if young adults engage in stress-induced psychological processes (e.g., appraising challenges as out of their control, Orth et al., 2009, Rector & Roger, 1997). These results support the hypothesis that age provides a context that qualifies the influence of changes in self-esteem and physical health on subsequent outcomes. This conclusion is consistent with research arguing that contextual changes may influence personality deviations from the normative developmental trajectory, which may contribute to maladaptive personality development and compromise trajectories of physical health (cf. Terracciano, McCrae, Brant & Costa, 2005).

Of note, reciprocal associations between changes in self-esteem and chronic disease were not observed among middle-aged or older adults. Midlife has been identified as a period where many individuals use adaptive motivational strategies and focus on the maintenance and stability of functioning (Lachman, 2004), which could potentially explain the lack of observed effects. Self-esteem declines or increases in chronic disease also did not seem reciprocally related among older adults, even though these two phenomena commonly occur (Robins et al., 2002). This could be the case if declines in self-esteem and the experience of chronic disease are generally more expected in older adulthood and thus become more normative. As such, older adults may be protected if they do not perceive much of a discrepancy between their expectations and personal experiences of loss (cf. Carver & Scheier, 1990; Higgins, 1987). The latter possibility is supported by developmental studies suggesting that older adults' physical health may be

protected when they have a "healthy dose of realism" (Chipperfield et al., 2018). In addition, older adults may rely on other adaptive motivational strategies that protect their psychological and physical well-being (e.g., self-protective self-other comparisons, cognitive reappraisals, or goal adjustment, Heckhausen et al., 1993; 2010; John & Gross, 2004). These interpretations are consistent with findings suggesting that although older adults are often faced with developmental declines (Gerstorf et al., 2010, Robins et al., 2002), health-relevant processes, such as their psychological well-being, are typically protected well into the 8th decade of life (e.g., Sutin et al., 2013).

We note that our analyses also showed negative autoregressive associations between changes in the main study variables over time (see Table 3.2 and Figure 3.1). These results suggest that the pattern of changes in self-esteem (or physical health) over time may not be linear or cumulative. Instead, they indicate that individuals who experienced much change in self-esteem (or physical health) early in the study were less likely to experience similar changes in self-esteem (or physical health) later on. In this regard, it is interesting to speculate if negative autoregressive associations would continue to emerge if our study had an even longer time frame. For example, participants who experienced much change early on, but not at follow-up, may experience more change again subsequently. This possibility is consistent with our framework, which would predict that the adverse effects of self-esteem changes on physical health, and vice versa, could subsequently reduce individuals' physical health and self-esteem.

Overall, our findings have important implications for research in personality functioning and health within a lifespan developmental context. First, examining normative and non-normative changes in levels of self-esteem and physical health across the adult lifespan illustrate the role of the self as a psychological construct that could be influenced by age-contextual events, such as health problems, and exert influence on important developmental outcomes. To this end, the observed results point to age-differentiated reciprocal effects between changes in self-esteem and chronic disease in young adulthood. As young adults are at an age where the accomplishment of developmental tasks and good health are generally expected (Heckhausen & Krueger, 1993; Neugarten et al., 1968), undesired deviations from these normative trajectories or expectations (Lachman et al., 2008) could create lasting effects on their personality and health.

Second, our results contribute to literature on self-esteem that calls attention to vulnerable periods in the adult lifespan. Although concerns have been expressed regarding the problematic

effects of self-esteem declines in older adulthood (von Soest et al., 2017), the present study suggests that these changes may not be particularly influential. Perhaps there are other processes in older adulthood that are more important for successful development, such as the adjustment of expectations, effective coping or emotion regulation (Carstensen et al., 1999; Heckhausen et al., 2010).

Third, our findings complement the literature on the effects of interindividual differences in self-esteem levels by providing empirical data on the effects of changes in self-esteem. This may be important, considering that literature reviews have challenged the widely held assumption that high levels of self-esteem are an important predictor of positive life outcomes (Baumeister, Campbell, Krueger, & Vohs, 2003). Our results suggest that changes in self-esteem may represent another important phenomenon that should be further investigated in future research. In addition, it adds to a balanced discussion on the adaptive value of self-esteem (Baumeister et al., 2003) by documenting that self-esteem declines can predict adverse physical health outcomes in some segments of the population (i.e., young adults), but not in others (i.e., middle-aged and older adults).

Finally, our findings could have implications for the timing of interventions that aim to increase individuals' personality functioning and health (Orth et al., 2012). Given the age-related differences in the impact of changes in self-esteem and chronic disease, it seems important to protect young adults' self-esteem by facilitating adaptive coping with non-normative challenges (such as an onset of chronic illness or other unexpected setbacks). Effective interventions could likely result in more positive appraisals of difficult life circumstances, push individuals to seek out external resources, and protect them from potentially entering a downward spiral that could compromise their long-term personality functioning and health. Such interventions, however, may be less effective among older adults, as health problems often become increasingly intractable and many elderly individuals have developed effective skills for coping with age-related losses (Heckhausen et al., 2010).

Limitations and Future Research

Although there are strengths to utilizing a large, longitudinal data set, the present study also presents limitations. First, although the design of our study prevents us from drawing causal inferences, the reported cross-lagged analyses provided some evidence for potential directional effects. To overcome limitations associated with correlational data, experimental studies should

be conducted to examine in a developmental context whether self-esteem could be improved and whether such manipulations could be related to increased physical health. Such research may further benefit from measuring objective health-related processes to shed light on the biological mechanisms involved in several chronic diseases (e.g., inflammatory cytokines or cortisol secretion, Cohen et al., 2007).

Second, data from a population-based study frequently rely on a broad array of measures, which only allowed us to speculate about some of the events and processes that could contribute to changes in self-esteem and physical health. Future research should thus include more frequent assessments of specific behavioural and cognitive processes (e.g., expectations or coping) and different developmental events that individuals face across the lifespan (Heckhausen, 1999).

Third, examining age effects involves a potential confound between age and birth cohort. As such, future research should use sequential designs to investigate age and cohort effects (Baltes, 1968). In addition, our analyses only controlled the effects of baseline covariates, and some of these covariates could change over time. To this end, follow-up analyses indicated that time-varying covariates did not impact the interaction analyses such that: a) age interacted with earlier self-esteem changes in predicting subsequent changes in chronic disease (β = .048, *SE* = .021, *p* = .023); and b) age interacted with earlier changes in chronic disease in predicting subsequent changes in self-esteem (β = .047, *SE* = .023, *p* = .040). Nonetheless, future work may examine associations with other sociodemographic variables, as our results indicated effects of sociodemographic covariates on both changes in self-esteem and chronic disease. For example, females, participants who reported lower income levels experienced relatively steep increases in chronic disease and declines in self-esteem, and those participants with less education experienced declines in self-esteem. Although these patterns are consistent with previous studies and thus provide validity information to our data (Jones et al., 2019; Robins et al., 2002; Orth et al., 2012; Matud, 2004; Ross & Wu, 1996), investigating the influence of factors other than age on changes in self-esteem and health could provide additional information for explaining the observed relations between self-esteem and physical health. Research along these lines may further illuminate how normative and non-normative changes in self-esteem and disease may influence successful development across the lifespan.

Conclusions

This study examined associations between changes in self-esteem and chronic disease

across the adult lifespan. Reciprocal longitudinal associations between declines in self-esteem and increases in chronic disease were identified, but only among young adults, and not among middle-aged and older adults. These findings suggest that self-esteem declines or the experience of chronic disease can become most important when they are not normatively expected, as in young adulthood, and may be used to develop age-appropriate interventions that target self-esteem and physical health to improve successful development across the adult lifespan.

Table 3.1. *Means, Standard Deviations, and Frequencies of Main Study Variables* (*N* = 14,117*)*

Constructs	M (*SD*) or Percentage [a]			
Age (T1)	45.83 (18.11)			
Young adults: 18 – 39 years old (%)	43.90			
Middle-aged: 40 – 64 years old (%)	36.70			
Older adults: 65+ years old (%)	19.40			
Female (%)	54.30			
Education Level (%; T1)				
Less than secondary school graduation	29.60			
Secondary school graduation	15.20			
Some post-secondary	25.00			
Post-secondary	29.90			
Not stated/missing data	0.30			
Partnership Status (%; T1)				
Married/Common-law/Living with partner	58.20			
Single/Separated/Divorced/Widowed	41.80			
Income (%; T1)				
< $15, 000	18.20			
Up to $39,999	38.40			
Up to $59,999	21.00			
> $60,000	17.80			
Not stated/missing data	4.50			
		Young adults	Middle-aged	Older adults
Self-Esteem				
T1; *n* = 13,048	19.97 (3.01) [b, d]	19.96 (3.01)	20.08 (3.08)	19.77 (2.89)
T4; *n* = 10, 268	19.30 (2.69) [b, c]	19.55 (2.75)	19.16 (2.64)	18.86 (2.51)
T9; *n* = 6,687	19.13 (2.70) [c, d]	19.56 (2.83)	18.79 (2.50)	17.81 (2.08)
Chronic disease				
T1; *n* = 14,092	1.21 (1.50) [b, d]	.80 (1.16)	1.25 (1.49)	2.06 (1.78)
T4; *n* = 10, 698	1.52 (1.65) [b, c]	1.05 (1.31)	1.71 (1.70)	2.48 (1.92)
T9; *n* = 7,045	2.17 (1.92) [c, d]	1.60 (1.61)	2.65 (2.01)	3.31 (2.01)

Notes. *M* = mean, *SD* = standard deviation. [a] *M* and *SD* are presented for continuous variables. [b] significant mean level difference between T1 and T4 variables, |t*s*| > 22.03, *p*s < .01. [c] significant mean level difference between T4 and T9 variables, |t*s*| > 9.70, *p*s < .01. [d] significant mean level difference between T1 and T9 variables, |t*s*| > 58.20, *p*s < .01.

Table 3.2.

Zero-Order Correlations Between Main Study Variables (*N* = 14,117)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Age											
2. Female	.057**										
3. Education level	-.256**	-.003									
4. Partnership status [a]	-.030**	.079**	-.035**								
5. Income	-.209**	-.102**	.323**	-.344**							
6. Self-esteem (T1)	-.017	-.031**	.117**	-.063**	.134**						
7. Chronic disease (T1)	.322**	.134**	-.098**	.075**	-.165**	-.108**					
8. Δ Self-esteem (T1 to T4)	-.101**	-.001	.112**	-.016	.104**	.000	-.095**				
9. Δ Self-esteem (T4 to T9)	-.199**	-.035**	.125**	.021	.109**	.219**	-.090**	-.064**			
10. Δ Chronic disease (T1 to T4)	.192**	.129**	-.056**	-.001	-.077**	-.030**	.000	-.053**	-.071**		
11. Δ Chronic disease (T4 to T9)	.232**	.057**	-.068**	-.015	-.058**	-.029*	.175**	-.057**	-.124**	-.129**	

Notes. [a] Partnership status was coded as 1 = Married/Living with partner, 2 = Single/Separated/Divorced/Widowed.

* $p < .05$. ** $p < .01$.

Table 3.3.

Standardized Cross-lagged Model Coefficients (*N* = 14,117)

	Δ Chronic disease (T4 to T9)		Δ Self-esteem (T4 to T9)	
	β	SE	β	SE
Model 1: Main effects				
Age (T1)	.315**	.021	-.267**	.024
Female	.041**	.014	.000	.017
Education level (T1)	-.025	.016	.095**	.017
Partnership status [a] (T1)	.014	.016	-.015	.020
Income (T1)	-.037*	.016	.059**	.020
Self-esteem (T1)	-.018	.016	.216**	.018
Chronic disease (T1)	.131**	.020	-.020	.022
Δ Self-esteem (T1 to T4)	-.031	.016	-.106**	.020
Δ Chronic disease (T1 to T4)	-.203**	.019	-.026	.018
Model 2: Interactions				
Δ Self-esteem T1-T4 X Age	.050*	.021	---	---
Δ Chronic disease T1-T4 X Age	---	---	.047*	.023

Notes. Partnership status was coded as 1 = Married/Living with partner, 2 = Single/Separated/Divorced/Widowed. * p <.05. ** p < .01.

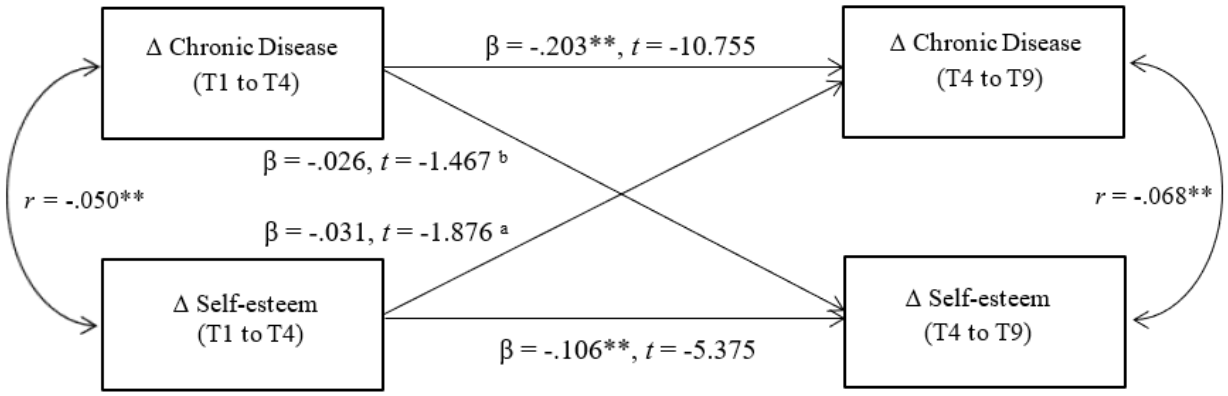

Figure 3.1. Standardized coefficients in a cross-lagged panel model testing the reciprocal associations between changes in self-esteem and chronic disease, controlling for sex, education level, income level, partnership status, and baseline levels of self-esteem and chronic disease (*see* Table 3.3 for covariate effects). [a] Effect size calculated with t value, $df = 77$, $r = .209$. [b] Effect size calculated with t value, $df = 77$, $r = .027$. * $p < .05$. ** $p < .01$.

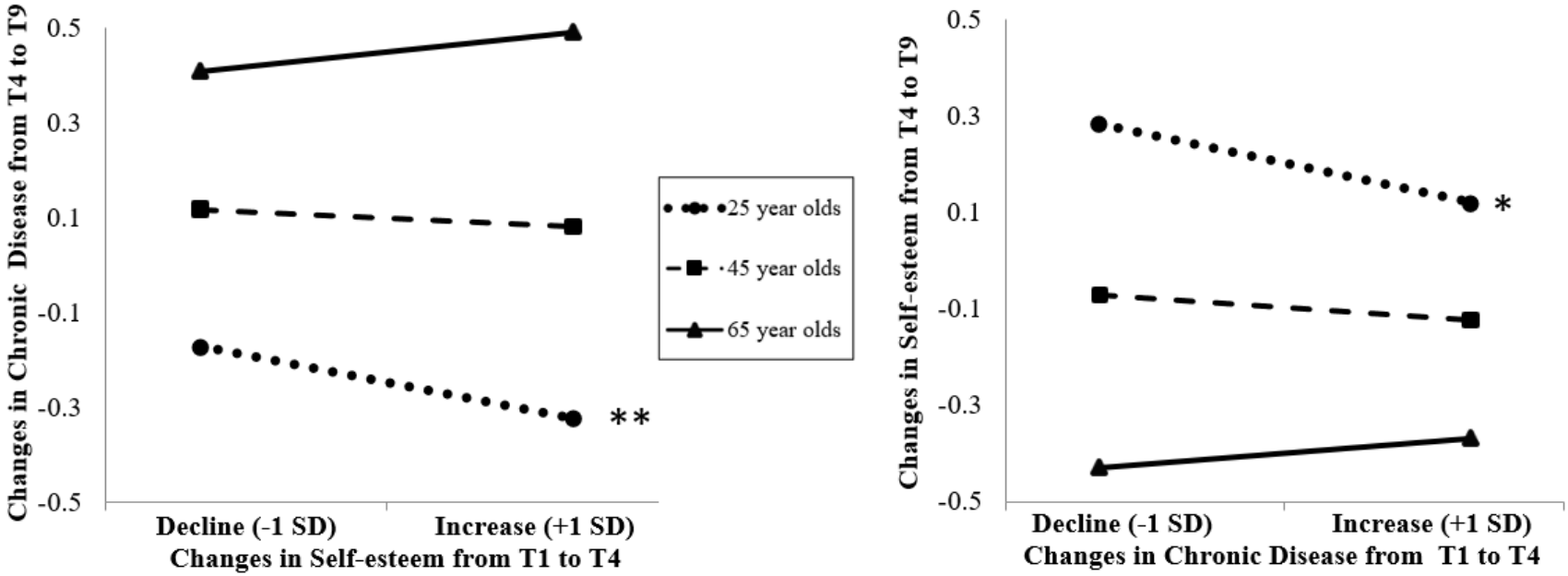

Figure 3.2. Left panel: Association between self-esteem change (T1 to T4) and changes in chronic disease (T4 to T9). Right panel: Association between changes in chronic disease (T1 to T4) and self-esteem changes (T4 to T9), estimated for young (25 years), middle-aged (45 years), and older (65 years) participants. *$p < .05$. **$p < .01$

CHAPTER FOUR: STUDY THREE

Abstract

Self-esteem increases, and high levels of self-esteem, can be associated with decreased stress experiences and overall emotional well-being. We developed a positive self-reflection writing intervention to increase self-esteem among young and older adults. We also investigated the effects of intervention changes in self-esteem, baseline levels of self-esteem and observed self-esteem change, on indices of stress and emotional well-being. Finally, we tested whether these associations were moderated by age. **Methods:** The study included 53 young and 53 older adults, who engaged in three consecutive days of writing. Those in the intervention group were assigned writing topics aimed to increase self-esteem. Participants attended two in-lab sessions, and self-esteem, and indicators of well-being were collected at three time points. All participants completed an in-lab stress task and cortisol data was also collected. **Results:** Repeated measures ANOVA analyses indicated that our writing intervention did not significantly increase young and older adults' self-esteem. However, high baseline levels of self-esteem and observed increases in self-esteem, predicted positive outcomes, only for the older adults. **Conclusions:** These results suggest that this particular writing intervention was not effective in improving self-esteem. However, consistent with previous research, our results highlight age differences in the association between self-esteem, stress and emotional well-being, which may also suggest that future self-esteem interventions could be more tailored to each specific age group.

Keywords: self-esteem intervention, self-esteem change, self-esteem levels, expressive writing, adult lifespan, stress, emotional well-being.

Self-Esteem Change and Well-Being Across Adulthood: Attempts to Improve Self-Esteem Through Writing

Self-esteem has been advertised as an antidote to a variety of social problems (Brown, 2006). This assumption is based on research that has identified high levels of self-esteem as predicting better overall psychological well-being and physical health across the adult lifespan (e.g., Pyszczynski, Greenberg, Solomon, Arndt, & Schimel, 2004). Bolstering individuals' self-esteem has been the target of many marketing campaigns and intervention programs over the last few decades. Yet there is a paucity of research examining how self-esteem can be improved, and whether these improvements can actually predict positive outcomes for adults across the lifespan. Developmental research has also documented that self-esteem changes across the lifespan (Robins et al., 2002), highlighting the importance of investigating the effects of age-differences of both self-esteem changes and levels on individuals' psychological and emotional well-being. We designed a positive self-reflection writing intervention aimed at increasing young and older adults' self-esteem, as we suspected that increasing their self-esteem would be associated with psychological and emotional well-being. To that end, we investigated whether self-esteem levels, and experimentally induced increases in self-esteem as well as naturally occurring changes in self-esteem, predicted decreases in stress and emotional well-being, and whether these associations were moderated by age.

Self-Esteem, Stress, and Well-Being

Self-esteem is considered an important psychological variable that reflects individuals' general feelings of self-worth across different areas of life, which may include self-comparisons with others and does not necessarily reflect an individual's objective abilities or accomplishments (Rosenberg, 1986). Previous research has identified various correlates of self-esteem that relate to adults' psychological and emotional well-being, and physical health (Pyszczynski et al., 2004). For example, high self-esteem has been associated with increases in relationship and job satisfaction (Orth, Robins & Widaman, 2012), greater emotional well-being (Watson et al., 2002), adaptive biological regulation in the face of stress (Dedovic et al., 2009; Liu, Wrosch, Miller, & Pruessner, 2014; Pruessner et al., 1999), and fewer physical health problems (Cott, Gignac, & Badley, 1999). Such effects of self-esteem on psychological and physical well-being may be observed as stress can influence biological processes that increase a person's risk of experiencing physical disease and further negative outcomes (Cohen, Janicki-

Deverts, & Miller, 2007; Lazarus & Folkman, 1984).

More specifically, research has shown that individuals' perceptions of stress can have adverse effects on their biological regulation, such as the overproduction or dysregulation of the hormone cortisol (Kirschbaum et al., 1993; Miller et al., 2007). The dysregulation of cortisol is associated with problems in immune system functioning, which can ultimately have long-term effects on physical health (Miller et al., 2007). In turn, cortisol dysregulation can exert further adverse effects on psychological and emotional well-being (Cohen et al., 2007). This process has been examined in studies that use stress-inducing laboratory tasks (e.g., Tier Social Stress Test, Kirschbaum, Pirke, & Hellhammer, 1993), documenting that individuals who were subjected to a stressor also indicated dysregulated patterns of cortisol secretion (Kirschbaum et al., 1993). As stress represents a risk factor for negative psychological and physical health outcomes, research has identified both high levels of and increases in self-esteem as adaptive factors that have been shown to buffer increased levels of cortisol among individuals who perceive stress (Liu et al., 2014; Pruessner et al., 1999). This process is also supported by previous research suggesting that high levels of and increases in self-esteem can promote effective coping (Baumeister et al., 2003), and are associated with less threatening appraisals of problematic or stressful situations (Orth et al., 2009; Watson et al., 2002), which can further contribute to more positive outcomes in the long term (Orth et al., 2012).

Self-Esteem Change Across the Adult Lifespan

A growing body of research has examined the lifespan trajectory of self-esteem (for a review see, Orth, Erol, & Luciano, 2018), suggesting an inverted U-shaped trajectory of self-esteem across the adult lifespan. Specifically, self-esteem seems to increase during young adulthood, plateaus in midlife, and declines in older adulthood (Orth et al., 2018; Robins et al., 2002). Using a lifespan developmental framework to explain these naturally occurring changes in self-esteem, individuals may compare their own development with normative expectations and those of their peers (Heckhausen & Krueger, 1993). As such, individuals can experience changes in self-esteem as a consequence of perceiving their developmental status as "on-time" versus "off-time" (Neugarten, Moore, & Lowe, 1968; Heckhausen, 1999).

In young adulthood, self-esteem is expected to increase as this period is often associated with age-normative gains such as new social roles or occupying positions of power and status (Havighurst, 1972; Heckhausen, 1999). However, declines in self-esteem in young adulthood

could reflect a failure in achieving developmental tasks, which may impact an individual's psychological functioning and physical health. In older adulthood, self-esteem declines are normative (Robins et al., 2002) and such declines could also be a part of a negative downward spiral often experienced in the context of age-related challenges (Heckhausen, 1999). While there is limited research documenting the impact of age-related changes in self-esteem on indices of well-being, we have conducted recent longitudinal analyses, suggesting that young adults who report declines in self-esteem over time reported subsequent increases in chronic disease later on in life (Liu et al., manuscript submitted for publication). It is important to build on this research to further document the impact of both experimentally induced and observed, naturally occurring changes in self-esteem on indices of well-being and health-related functioning across the adult lifespan.

Given that individuals' self-esteem may deviate from normative self-esteem trajectories and that self-esteem can increase or decline for individuals at any age (Robins & Trzesniewski, 2005), there is variability in the way self-esteem can change. In addition, it is possible that self-esteem may be particularly malleable during certain developmental periods such as in young or older adulthood. Because of potential age effects on individuals' well-being due to occurring changes in self-esteem, improving young adults' self-esteem may prove particularly helpful—young adults reporting declines in self-esteem could experience difficulty in managing stressful life circumstances. In addition, for older adults experiencing overall age-related challenges and declines in self-esteem, self-esteem improvements in older adulthood could also be protective during this stage of life.

Improving Self-Esteem Using a Writing Intervention

Increasing self-esteem has been the target of many marketing campaigns and initiatives, which has led to a wide range of self-esteem interventions, including weekend workshops, full-semester programs, and creative and expressive writing programs (Chandler, 1999; for a review, see Kolubinski, Frings, Nikčević, Lawrence, & Spada, 2018). One cost-effective method that has been identified to increase young and older adults' self-esteem relates to engaging individuals in expressive writing. Based on seminal work done by Pennebaker and Beall (1986), expressive writing about emotional experiences, or personally relevant events, has been shown to be a therapeutic process associated with both psychological well-being and physical health (Pennebaker, 1997; King, 2001; Burton & King, 2004). These writing interventions, particularly

when participants are engaged in both cognitive and emotional processing, have been related to adaptive immune function and reduced health problems (Broderick, Junghaenel, & Schwartz, 2005). Research has also suggested that any type of writing for example, writing about positive events (Burton & King, 2004) or even imaginary traumas (Greenberg, Wortman, & Stone, 1996) can have the same benefits. The adaptive process associated with expressive writing has been identified as increasing insight (Pennebaker, 1997), thereby enhancing one's skills at coping with stressful circumstances (e.g., Burton & King 2008; Lepore, Greenberg, Bruno, & Smyth, 2002).

In this particular context, expressive writing through increasing insight may help to improve young and older adults' self-esteem, as expressive writing could relate to the development of a self-narrative (Pennebaker, 1997), which in turn could be associated with self-regulatory skills (Pennebaker & Seagal, 1999). Asking individuals to focus on and engage in cognitive-emotional processing of positive aspects of the self may help to improve general feelings of self-worth, regardless of any previous negative self-events or failures. In addition, writing interventions based on Pennebaker's work, involving 20-minute writing blocks over three consecutive days, have been successfully administered in previous studies at the Personality, Aging and Health laboratory (e.g., Wrosch et al., 2007). Given the potential adaptive benefits of improving self-esteem for both young and older adults, implementing a brief, cost-effective writing intervention can contribute to the existing literature on self-esteem interventions and help to document the impact of self-esteem changes on stress and well-being for successful adult development.

Present Study

This study builds on previous developmental research documenting observed age-related changes in self-esteem, and investigates the impact of self-esteem changes on young and older adults' psychological and emotional well-being. As such, we attempted to investigate whether experimental increases, naturally occurring increases in self-esteem, and high levels of self-esteem would be associated with decreases in perceived stress, reduced cortisol responses, and greater emotional well-being.

In this quasi-experimental study, we first developed a writing intervention to investigate whether self-esteem could be improved among young and older adults. Second, we investigated whether experimentally induced increases in self-esteem were associated with decreases in stress and greater emotional well-being, and whether these associations were moderated by age. Third,

we investigated age-differences in the associations between baseline self-esteem levels and, observed changes in self-esteem over the course of the study, particularly with respect to stress indicators and emotional well-being. We hypothesized that those young and older adults who completed the writing intervention, as compared to those in the control group, would report increases in self-esteem over the three consecutive days of writing, and that these increases would be associated with decreases in stress, indicating adaptive stress responses and greater emotional well-being. In addition, we expected that participants with high baseline levels of self-esteem and naturally occurring increases in self-esteem would also experience more positive outcomes. Finally, we expected these results to be maintained over time. As such, participants were asked to complete questionnaires on perceived stress and emotional well-being three months after the initial in-lab assessments.

Methods

Participants

This study included a sample of young (aged 18–35) and older adults (60 years and older) from the greater Montreal area. Participants were recruited through newspaper advertisements and public postings, both online and in the community (see Appendix B). The inclusion criteria consisted of: adults (aged 18–35 or 60 years and older) who were fluent in spoken and written English, and available to come to the lab twice, one day apart. A power analysis indicated that to achieve a power of .80 at a significance level of $p < .05$ to examine differences between two dependent means (repeated measurement), we aimed to test a total sample of 118 participants.

Our final sample included 106 young and older adults. Fifty-three participants were between 18 and 34 years old ($M = 23.15$, $SD = 3.92$), and 53 participants were between 61 and 87 years old ($M = 69.72$, $SD = 5.92$). Within each age group, participants were randomly assigned to either the Intervention group ($n = 26$) or the Control group ($n = 27$). Approximately half of the sample was female (52.80%); over half the participants were single, divorced or widowed (61.40%); and on average participants had a bachelor's degree, reporting $17,000 – $34,000 as their yearly incomes, indicating that the sample was of moderate socioeconomic status. Of the total sample, 82 individuals (35 young adults and 47 older adults) completed the three-month follow-up questionnaire. These participants did not significantly differ from participants who did not complete their follow-up questionnaire with respect to baseline levels in

main study predictors, except for age. Older participants were more likely to complete the follow-up questionnaire than younger participants ($t = -2.79$, $p < .01$).

Procedure

Upon initial contact with our lab, participants were informed of the study's purposes and asked to schedule their two lab visits. Informed consent was obtained during the first lab visit (see Appendix A), and participants were randomly assigned to two different groups: intervention or control. Participants were asked to complete writing exercises on three consecutive days (including the first in-lab session, see Appendix D). At the first lab visit (T1), participants were asked to complete baseline questionnaires, were provided with instructions for the writing exercise based on their group assignment (see Materials and Appendix D), and completed their first 20-minute writing exercise in-lab. Participants were then asked to complete the second writing exercise at home. At the second lab visit (scheduled for one day apart from their first lab visit, and in the afternoon), participants completed their final writing exercise prior to completing additional questionnaires (T2). At T2, the Montreal Imaging and Stress Task (MIST; Dedovic, Mahani, Engert, Lupien, & Pruessner, 2005) was administered and five saliva samples were collected as part of the stress task. At the end of the stress task, participants were asked to respond to additional questionnaires (T3) and were debriefed at the end of the study. Participants received $50 for participating in the study. Participants were also contacted again after approximately three months and asked to respond to a follow-up questionnaire (T4), where upon completion and mailed back to our lab, participants were entered into a draw for an additional $50. The Concordia University Research Ethics Board approved all procedures.

Materials

The main study variables included age group, participants' group assignment, self-report questionnaires for participants' self-esteem, perceived stress, emotional well-being, and cortisol responses to a stress task (see Appendix C). To minimize the possibility of confounding associations with the main study constructs, the analysis included sociodemographic covariates (i.e., partnership status, sex, and socioeconomic status [SES]).

Self-esteem was measured at baseline (T1), at the beginning of the second lab visit (T2), after the stress task at the end of the second lab visit (T3), and at the three-month follow-up (T4), using the Rosenberg self-esteem scale (RSES; Rosenberg, 1986), The RSES is a 10-item self-

report questionnaire using four-point Likert-type scales (*strongly disagree* = 0 to *strongly agree* = 3). Sample items included statements such as "I feel that I have a number of good qualities" or "All in all, I am inclined to feel that I am a failure." Indicators of participants' global self-esteem were obtained by computing a sum score of the 10 items, after reverse coding negatively formulated items (αs = .91 to .94). Change in self-esteem from T1 to T2, and overall self-esteem changes from T1 to T3, were obtained in a regression analyses, predicting T2 (and T3) self-esteem scores from T1 self-esteem scores, and saving the standardized residuals for further analysis.

Perceived stress was measured at T1, T2, T3 and T4. Participants were asked to respond to the 10-item version of the Perceived Stress Scale (Cohen, Kamarck, Mermelstein, 1983). They rated how frequently they experienced 10 different situations during the past month (for T1 and T4), in the past two days (for T2), and in the past 20 minutes (for T3), by using five-point Likert-type scales (*never* = 1 to *very often* = 5). Items included, "How often have you felt that things were going your way?" and "How often have you felt nervous and stressed?" Positively formulated items were reversed coded and indicators of perceived stress were obtained by averaging the ratings of the 10 items (αs = .89 to .92).

Emotional well-being was assessed at T1 and at the three-month follow-up (T4), using the 20-item Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). Participants were asked to indicate the extent (using 5-point Likert-type scales where 0 = *very slightly or not at all* to 4 = *extremely*) to which they experienced 10 negative and 10 positive emotions, at the present moment. We obtained satisfactory scale characteristics for both positive affect (T1; M = 3.63, SD = .83, α = .92, T4; M = 3.61, SD = .70, α = .90) and negative affect (T1; M = 2.31, SD = .87, α = .91, T4; M = 2.28, SD = .91, α = .93).

Sociodemographic covariates such as, age, sex and partnership status were measured at baseline. SES was indexed by averaging the standardized scores of participants' reported annual family income, highest level of education, and perceived social status (rs = .40 to .56, ps < .001). Self-reported partnership status was measured by categorizing participants into two groups: 1) single/separated/widowed or 2) married/lives with partner.

Writing exercise. Participants were asked to complete 20-minute continuous writing exercises on three consecutive days, and competed their first writing exercise in lab. Participants were given a timer, and recorded the date and time at which they began and stopped writing in

order to ensure compliance. Furthermore, all participants were instructed that their writing is completely confidential and not to worry about spelling, sentence structure, or grammar. Participants were given the same instructions to complete these writing exercises at home, and asked to bring all materials with them for their second lab visit. Writing topics per group are depicted in Appendix A. The intervention group was given topics related to the self (e.g., list 3 qualities about yourself) and asked to write about them. If a participant had difficulties on a particular topic, they were given the option to select another topic from the Alternate Topics sheet (see Appendix A). In addition, participants were asked to rate on a five-point Likert type scale, how challenging it was to write about themselves (0 = *not at all challenging* to 4 = *extremely challenging*). The control group was asked to write down the details of their day as accurately as possible and to leave out emotions, feelings or opinons (e.g., some participants listed what time they woke up, and what time they got out of bed to brush their teeth).

Stress task. Following the completion of the questionnaires at T2, a protocol to investigate stress in the laboratory was administered: the Montreal Imaging and Stress Task (MIST; Dedovic, Mahani, Engert, Lupien, & Pruessner, 2005; see Appendix E). This stress testing took place only in the afternoon (starting at 1:00 pm)[3] and five saliva samples were collected during the task (see below for timing of saliva sample collection). The MIST is a Mac OS X computer program comprised of a series of computerized mental arithmetic tasks with an induced failure component. The MIST displays mental arithmetic questions, a rotary dial for submission of responses, a text field that provides immediate feedback on the submitted response (e.g, "correct," "incorrect," or "timeout") and two performance indicators, one for the participant's performance and one for the average performance of all subjects. The protocol also incorporates social evaluative threat components, which are built into the program and brought on by the investigator (see Appendix E). Specifically, if the participant answers 3 consecutive questions correctly, the program reduces the time limit to answer the question. The participant is instructed to maintain their performance to the "average" performance of all subjects by checking the performance indicator bar. The MIST incorporates minor deception, as the average performance of all subjects does not actually exist. This is meant to elicit a stressful circumstance

[3] Testing took place in the afternoon to ensure that the collection of cortisol secretion during the stress task did not overlap with any naturally occurring diurnal cortisol patterns, such as peak cortisol production periods particularly after awakening (e.g., Dedovic et al., 2009).

for the participant to answer math questions correctly and on time. Further, the researcher interrupts the participant three times during the task to increase the induction of stressful circumstances (e.g., participant reminded that there is a need for standard performance, informed that their performance does not match up to the "average" performance, and told that the research supervisor is observing their performance, see Appendix E). Participants were debriefed at the end of the study and informed of the deceptive elements of the stress task (see Appendix A), following their last saliva sample collection.

Saliva sampling procedure

To collect the saliva samples, the participants were provided with salivettes (using cotton dental rolls in sterile plastic containers called salivettes, Sarstedt, Quebec City, Canada). The participants were instructed to take out the cotton dental roll and place it in their mouth until it is saturated with saliva (approximately one minute). The participants were then instructed to return the dental roll to the tube and seal it. A total of five saliva samples were taken during the MIST: five minutes prior to the start of the MIST, 10 and 20 minutes into the MIST. Two additional saliva samples were taken 40 and 60 minutes after completion of the MIST. During this time, participants were asked to complete additional questionnaires (see Appendix C). If participants completed the additional questionnaires before giving the final saliva sample, they were invited to read magazines or rest until the final saliva sample was taken. The saliva samples were frozen until completion of the study and analyzed at the University of Trier. The analysis involved the use of a time-resolved fluorescence immunoassay with a cortisol-biotin conjugate as a tracer. The cortisol analysis indicated intra-assay coefficients of variation that ranged between 0.00 to .31 (M = .05, SD = .04, 0.0% to 30.60%).

Cortisol responses to the in-lab stress task were assessed by computing cortisol volume by the area-under-the-curve with respect to ground and increase (AUCg, AUCi; Pruessner et al., 2003). We chose these indices to assess each participant's total cortisol volume (AUCg) and cortisol reactivity to the in-lab stress task (AUCi). Because of potential contamination with blood or food, cortisol values that were more than three standard deviations (SDs) above the sample mean for a certain time of day were excluded (.07%). In addition, three participants' cortisol responses were also excluded as their samples were missing. Missing values of AUC were replaced with the mean (n = 14).

Data Analyses

There were four measurement points: T1, baseline measures collected at the first study visit; T2, measures collected post intervention and prior to stress task; T3, measures collected after stress task; and T4, three-month follow-up measures. Preliminary analyses were conducted to describe the sample (by calculating means), explore associations between the main constructs (by calculating correlations), and examine differences between the main study variables by condition and age (by conducting t-tests). We used repeated measures ANOVAs to determine whether self-esteem improved among young and older adults following our writing intervention. The strength of the experimental effect was indexed with the Pearson correlation coefficient, *r*. This measure was chosen because it is constrained to lie between 0 and 1, and can be easily interpreted (Field, 2001).

For the main analyses, we tested our hypotheses using standardized predictor variables in hierarchical linear regression models that controlled for relevant sociodemographic covariates. We investigated age differences in the effects of: 1) changes in self-esteem by intervention, 2) baseline levels of self-esteem and 3) naturally occurring changes in self-esteem, on outcomes during the stress task. We conducted three separate sets of regression analyses for each predictor, and used AUCg, AUCi and changes in perceived stress during the stress task (T2-T3), as dependent variables. In the first step of each regression analyses, the main effects of age group, self-esteem change by intervention (T1-T2), baseline self-esteem (T1), and overall changes in self-esteem (T1-T3), and the covariates (sex, SES, partnership status), were tested for significance. The second step of each analysis examined separately whether the interaction terms of self-esteem change by intervention, baseline self-esteem and overall change in self-esteem, with age group, would predict additional variance in the stress outcomes. Significant interaction effects were followed-up with simple slope analyses (Aiken & West, 1991), examining the associations between age group, and the outcome variables, one standard deviation above and below the mean of the self-esteem indices.

In a separate set of three regression analyses, we tested our hypotheses that the age-related effects of self-esteem change by intervention (T1-T2), baseline self-esteem (T1) and overall changes in self-esteem (T1-T3), would predict three-month follow-up (T4) effects on perceived stress, and negative and positive affect. In the first step of each regression analysis, the main effects of age group, self-esteem change by intervention (T1-T2), baseline self-esteem (T1), and overall changes in self-esteem (T1-T3), and the same covariates were tested for

significance. In these analyses, we also controlled for the baseline levels of each outcome variable (i.e., baseline levels of perceived stress, negative and positive affect). The second step of each regression analysis examined the same interaction terms between age group, and self-esteem change by intervention, baseline self-esteem and overall changes in self-esteem, on the follow-up outcomes. Similarly, significant interaction effects were followed-up with simple slope analyses.

Results

Preliminary Analyses

Sample characteristics are presented in Table 4.1. At baseline, participants in the younger adult group were on average 23 years old, participants in the older adult group were on average 70 years old, approximately half of the overall sample were female, over half the participants were single, divorced or widowed (61.40%) and on average participants had a bachelor's degree, reporting $17,000 – $34,000 in yearly income, indicating that the sample was of moderate socioeconomic status.

The zero-order correlations between the main study variables are presented in Table 4.2. Overall, older adults as compared to younger adults, reported higher baseline levels of self-esteem and positive affect, lower levels of perceived stress and negative affect at baseline and at the three-month follow-up. Higher baseline levels of self-esteem were associated with lower baseline and follow-up levels of perceived stress and negative affect and higher levels of positive affect at baseline and at follow-up. Increases in self-esteem from T1 to T2, and from T1 to T3, were associated with lower levels of perceived stress at baseline, declines in perceived stress during the stress task, lower negative affect and perceived stress at follow-up, and higher levels of positive affect at follow-up. Higher baseline and follow-up levels of perceived stress were associated with higher levels of negative affect (at T1 and T4), and lower levels of positive affect (at T1 and T4). Increases in perceived stress before and after the stress task were associated with lower levels of positive affect at the three-month follow-up. Participants' negative and positive affect, and perceived stress at baseline and at follow-up showed significant positive associations over time, indicating stability in these variables. In addition, lower levels of negative affect were associated with higher levels of positive affect.

The mean values of our main study variables by age group and by condition are presented in Table 4.1. A series of *t*-tests were conducted to assess differences in self-esteem and our

dependent variables, across conditions and age group. There were no significant differences in any of the study variables by conditions. However, there were significant differences between the means of the main study variables by age group. More specifically, older as compared to younger participants reported higher levels of, baseline self-esteem (t (104) = 4.79, $p < .01$) and self-esteem at the three-month follow-up (T4), and overall increases in self-esteem from baseline to follow-up (t (104) = -2.82 $p < .01$). Older participants, as compared to younger, also reported lower levels of perceived stress at baseline and at the three-month follow-up (t (104) = 5.15, $p < .01$, t (77) = 5.55, $p < .01$) and lower levels of negative affect at baseline and follow-up (t (104) = 3.68, $p < .01$, t (77) = 6.47, $p < .01$). Finally, older participants also reported higher levels of positive affect at baseline and at the three-month follow-up (t (104) = -4.46, $p < .01$, t (77) = -3.69, $p < .01$).

Manipulation checks. We conducted repeated measures ANOVAs to assess whether our self-esteem intervention was successful. First, our results indicated that there was no significant change in participants' self-esteem, in that self-esteem levels before and after the intervention did not significantly differ (F [1, 105] = .07, partial η^2 = .00, r = 0.03, p = .79). In addition, self-esteem levels before and after the intervention period did not differ by condition (F [1, 104] = .18, partial η^2 = .00, r = .04, p = .67) or by age group (F [1, 104] = .86, partial η^2= .01, r = .12, p = .36). These results suggested that our writing intervention did not significantly change participants' levels of self-esteem.

In terms of manipulation checks for the in-lab stress task, individuals reported significant increases in perceived stress before (T2) and after the task (T3; F [1, 103] = 62.76, partial η^2 = .38, r = .62, $p < .01$), and reported on average moderate levels of stress (M = 3.42, SD = 1.16) when asked, "how stressed were you at the end of the task, on a scale of 1 to 5, 1, being not stressed at all to 5 being very stressed." The mean cortisol responses during the MIST are plotted in Figure 4.1, by age group and by experimental group. Overall, there was a significant increase in cortisol between baseline (M = 3.49, SD = 1.70) and post-task values (M = 4.60, SD = 3.10; t (95) = -3.37, $p < .01$). In addition, the participants showed a typical cortisol response over the course of the stress task, suggesting that the stress task did indeed elicit a stress response from our participants. More specifically, statistical analysis revealed a significant increase in cortisol levels in response to the MIST (from sample 1 – 4, F (1, 95) = 11.35, partial η^2 = .11, r = .32, $p < .01$), and a significant decline after the resting period (from sample 4 – 5, F (1, 96) = 24.89,

partial $\eta^2 = .21$, $r = .45$, $p < .01$).

Effects of Changes in Self-Esteem by Intervention (T1-T2)

The results of the regression analyses in predicting stress outcomes during the stress task are presented on the left side of Table 4.3. In the first step of the analyses, the main effects of self-esteem change by intervention (T1-T2), age group, or any of the incorporated covariates were not significantly associated with AUCg, AUCi or changes in perceived stress throughout the course of the stress task (T2-T3), Fs < 3.71, rs < .18, ps > .06. However, self-esteem change (T1-T2) significantly predicted changes in perceived stress throughout the course of the stress task (T2-T3), $F = 4.40$, $r = .20$, $B = -.21$, $p = .04$. The negative sign of the regression coefficient demonstrates that to the extent participants experienced an increase to their self-esteem over the intervention period, they reported declines in perceived stress over the duration of the stress task. In addition, the second step of the analysis showed that the interaction term between self-esteem change (T1-T2) with age group did not predict significant changes in participants' AUCg, AUCi or changes in perceived stress (T2-T3), Fs < 1.05, rs < .05, ps > 31.

The results of regression analyses in predicting 3-month follow-up outcomes are presented on the right side of Table 4.3. In the first step of this set of analyses the main effect of self-esteem change by intervention (T1-T2) was not significantly associated with T4 levels of perceived stress, negative and positive affect, Fs < 2.82, rs < .14, ps > .10. However, there was a main effect for age group, such that older adults, reported lower levels of perceived stress and negative affect at follow-up, βs < -.26, SEs = .06, Fs > 17.90, rs < .42, ps < .01, and higher levels of positive affect at follow-up, $\beta = .05$, $SE = .06$, $F = 51.26$, $p < .01$. The main effects also indicated that baseline variables of the outcomes predicting their respective follow-up levels (βs < |.41|, SEs = .06, Fs > 51.26, ps < .01,). In the second step of this set of analyses, the interaction term between self-esteem change (T1-T2) with age group did not predict significant changes in participants' perceived stress, negative affect or positive affect at the 3-month follow-up, Fs < 2.82, rs < .14, ps > .10.

Effects of Baseline Self-Esteem

The results of the regression analyses investigating the age effects of baseline self-esteem on outcomes during the stress task are presented on the left side of Table 4.4. In the first set of these analyses, the main effects of baseline self-esteem, age group, or any of the incorporated covariates were not statistically significant in predicting AUCg, AUCi, or changes in perceived

stress throughout the course of the stress task (T2-T3), *F*s < 3.71, *r* = .18, *p*s > .06. In the second step, while the interaction term between baseline self-esteem with age group in predicting participants' AUCg (*F* = .10, *r* = .03, *p* = .75), and changes in perceived stress (*F* = .34, *r* = .06, *p* = .56) were not statistically significant, there was a small effect size in predicting participants' AUCi (*F* = 3.29, *r* = .17, *p* = .07). As such, we calculated the simple slopes for the association between AUCi and age group, separately for participants' reported baseline self-esteem levels one standard deviation above and below the mean of self-esteem. The simple slope analyses, depicted in Figure 2 (left panel), indicated that for the older adults, as compared to the younger adults, lower levels of baseline self-esteem were associated with greater AUC increases during the stress task (-1 *SD:* β = .66, *p* = .04; +1 *SD*: β = -.17, *p* = .60).

The results of regression analyses in predicting three-month follow-up outcomes by baseline levels of self-esteem, are presented on the right side of Table 4.4. In the first step of this set of analyses baseline self-esteem, age group or any of the covariates were not associated with positive affect, or negative affect at follow-up, *Fs* < .71, *r*s < .01, *p*s > .40. However, baseline levels of the outcome variables were positively associated with their respective follow-up levels, *Fs* < 28.92, *r* = .52, βs < .37, *SE* = .06, *ps* < .01. In addition, older adults as compared to younger adults, reported with lower levels of perceived stress at follow-up, β = -.15, *SE* = .06, *F* = 6.05, *r* = .24, *p* = .02.

In the second step of this set of analysis, while the interaction term between baseline self-esteem with age group in predicting participants' negative affect (*F* = .95, *r* = .03, *p* = .33), and positive affect (*F* = 1.28, *r* = .06, *p* = .26) were not statistically significant, there was a significant interaction effect between age group and baseline self-esteem in predicting 3-month follow-up levels of perceived stress, *F* = 4.02, *r* = .20, *p* = .05. The simple slope analyses, depicted in Figure 2 (right panel), indicated that for the older adults, as compared to the younger adults, higher levels of baseline self-esteem were associated with lower levels of perceived stress at the 3-month follow-up (-1 *SD:* β = -.02, *p* = .83; +1 *SD*: β = -.27, *p* < .01).

Effects of Overall Changes in Self-Esteem (T1-T3)

The results of the regression analyses investigating the observed naturally occurring changes in self-esteem on outcomes during the stress task are presented on the left side of Table 4.5. In the first set of these analyses, the main effects of age group, or any of the incorporated covariates, were not statistically significant in predicting AUCg, AUCi, or changes in perceived

stress throughout the course of the stress task (T2-T3), *F*s < 3.21, *r* = .17, *p*s > .08. However, there was a significant main effect such that increases in self-esteem over the duration of the study (T1-T3) was associated with declines in perceived stress throughout the stress task, *F* = 22.64*, r* = .43*,* β = -.44, *SE* = .09, *p* < .01. In the second step of these analyses, the interaction term between changes in self-esteem (T1-T3) and age group did not significantly predict any of the outcome measures taken during the stress task, *Fs* < 3.55, *r*s < .18, *p*s > .06.

The results of regression analyses in predicting 3-month follow-up outcomes by overall changes in self-esteem (T1-T3), are reported on the right side of Table 4.5. In the first step of this set of analyses, the main effects of overall self-esteem changes or any of the covariates were not significantly associated with perceived stress at follow-up, *Fs* < .71, *r*s < .01, *p*s > .40. However, there were some covariate effects such that older adults, as compared to younger adults, reported lower levels of perceived stress (*F* = 6.43, β = -.15, *SE* = .06), and baseline levels of the outcome variables predicted higher levels at follow-up, *Fs* < 36.17*, r* < .52*,* βs < .24, *SE* = .06, *ps* < .01. There were, however, significant main effects of age group and overall changes in self-esteem, in predicting follow-up levels of negative and positive affect, *F*s < 16.75, βs < .24, *SE*s < .05, *p*s < .01. Specifically, older adults, and those participants who exhibited overall increases in self-esteem, were associated with higher levels of positive affect at the three-month follow-up.

The interaction between overall self-esteem changes and age group was not associated with 3-month follow-up levels of perceived stress or negative affect, *Fs* < .71, *r*s < .01, *p*s > .40. The interaction between age group and overall changes in self-esteem was marginally associated with 3-month follow-up levels of positive affect, *F* = 4.02, *r* = .18, *p* = .07. The simple slope analyses, depicted in Figure 4.3, indicated that for the older adults, as compared to the younger adults, increases in self-esteem over the course of the in-lab sessions were more strongly associated with higher levels of positive affect at the 3-month follow-up (-1 *SD:* β = .07, *p* = .40; +1 *SD*: β = .27, *p* < .01).

Discussion

The present study investigated whether self-esteem could be improved in young and older adults with a writing intervention, and whether these increases in self-esteem could protect them from experiencing negative biological responses to stress. First, our results suggested that the writing intervention did not work, as indicated by statistically insignificant changes in participants' levels of self-esteem before and after the manipulation period. Second, we did not

find any buffering effects of self-esteem changes (by intervention) for young or older adults. As such, our study hypotheses concerning experimental changes in self-esteem were not supported. However, our analyses revealed some age differences in the effects between baseline self-esteem and naturally occurring changes in self-esteem, and participants' psychological and emotional well-being. More specifically, our results suggested that, only for the older adults, higher levels of baseline self-esteem were associated with lower levels of cortisol during the stress task, and lower levels of perceived stress three months later. In addition, overall increases in self-esteem predicted higher levels of positive affect at the follow-up, and this effect as particularly pronounced among the older adults. All analyses controlled for relevant socio-demographic covariates such as sex, partnership status and SES.

Our results suggested that there were no significant differences in self-esteem levels between the intervention and control conditions, for both young and older adults. There are a few possibilities as to why our intervention was not effective in increasing participants' self-esteem levels. First, our intervention group sample size could have been too small to detect experimental effects. Second, the specific type of writing intervention we created could have had other kinds of effects on participants that we could not measure or did not expect. For example, we asked participants in the intervention group to write about the self, and while on average participants did not indicate that it was challenging to write about the self (M = 1.24, SD = .87, Range = 0 – 3.33, 0 = not challenging at all; 4 = extremely challenging), the expressive nature of the writing task could elicit varied topics that may not have been on target. Third, while we did not explicitly ask participants to write or repeat positive statements about themselves, it is possible that participants may have recited to themselves certain positive self-affirmations (e.g., "I am lovable") – an act shown to only work for certain people, such as individuals with high self-esteem, and has been ineffective for individuals reporting low self-esteem (Wood, Penuovic, & Lee, 2009).

Finally, the duration of time for writing, 20 minutes over three consecutive days may not have been long enough to elicit any change that could be captured within the timing of self-report questionnaires. There is research to suggest that changing beliefs about the self can range from intense one-day workshops to 12 sessions of individual psychotherapy (for a review see, Kolubinski et al., 2018). The latter findings suggest that perhaps brief expressive writing tasks may not be appropriate for improving an individuals' self-esteem.

There is another possibility as to why our self-esteem intervention did not work, and could also explain why our analyses investigating self-esteem changes (by intervention) were not associated with changes in stress outcomes during the stress task, or any measures of perceived stress and positive and negative affect at follow-up. In the experimental literature, self-esteem change has been elicited using social-evaluative feedback methods. For example, participants are often given positive feedback regarding their "personality" or introduced to a laboratory threat to their self-esteem through failure-inducing tasks (e.g., Greenberg et al., 1992). Given that our participants also experienced a social-evaluative stress task, it is possible that there may have been overlapping effects from the stress task on any potential changes to participants' self-esteem.

Although we did not improve self-esteem for our young and older adult participants, our results indicated some age-related differences in the effects of baseline self-esteem and naturally occurring changes in self-esteem on stress and emotional well-being. More specifically, we found that high levels of self-esteem were marginally associated, indicating a small effect size, with lower levels of AUCi and statistically significant associations with lower levels of perceived stress at the three-month follow-up. These associations were more pronounced among the older adults as compared to the young adults. In addition, we also found that naturally occurring increases in self-esteem predicted higher levels of positive affect three months later. Again, this effect was more pronounced for the older adults as compared to the younger adults. Taken together, these findings are consistent with extant research suggesting that high self-esteem levels and increases in self-esteem are associated with improved emotional well-being (Watson, Suls, & Haig, 2002), and that self-esteem may have a stress-buffering function (Greenberg et al., 1992). These findings support the idea that there may be prospective relations between affect and self-esteem (Orth, Robins, & Widaman, 2012), and that there is an adaptive process to self-esteem that allows individuals to cope with stress and mitigate any biological consequences to stressful circumstances (e.g., Liu et al., 2014; Pruessner et al., 1999)

Overall, our results suggest that baseline and increases in self-esteem were associated with adaptive outcomes, and were more pronounced among the older adults, and not the younger adults. One possibility for explaining these findings is that the young adult participants in our study may have been too stressed to begin with. This possibility is supported by our t-tests, showing that younger adults reported significantly higher levels of perceived stress, negative

affect and lower levels of positive affect at baseline. In addition, our sample of young adults were almost all undergraduate students at Concordia University, and our session times were during the period between mid-term and final exams. In addition, the young adults in our sample exhibited lower cortisol volume throughout the stress task, potentially suggesting that there may be habituation effects of stress or that they were chronically stressed (Miller et al., 2007).

There were also statistically significant main effects in our analyses of baseline self-esteem and naturally occurring self-esteem changes. Specifically, older adults, and participants reporting higher levels of SES, were associated with lower levels of perceived stress and positive affect at the three-month follow-up. Furthermore, overall increases in self-esteem were associated with higher levels of positive affect three months later. These results contribute to the discussion in developmental research on how well-being and positive outcomes can be preserved in older adulthood, despite having objectively negative events or age-related challenges (*see* well-being paradox, Mroczek & Kolarz, 1998; Staudinger et al., 1995). In addition, these results provide validity to the study, as they are consistent with previous research on SES and stress (Cohen et al., 2007), and positive associations between self-esteem and overall well-being (e.g., Orth et al., 2012).

Although our main hypothesis about improving self-esteem through a brief writing intervention was not met, the present study has a number of research and clinical implications that could add to the self-esteem and personality development literature. First, while we cannot answer the question of whether changes or baseline self-esteem is more predictive of adaptive outcomes for people, the results can still be informative. The age-related effects of self-esteem on stress and emotional well-being suggest that high levels of and increases in self-esteem may still be beneficial for older adults. This finding differs from our previous work suggesting that normative declines in self-esteem may have less of an impact on older adults' experience of chronic disease (Liu et al., manuscript submitted for publication). This may be the case as declines in self-esteem and increased experiences in chronic disease may be normative for older adults, and thus may have nominal effects on any further personality and health functioning. However, self-esteem increases may still be beneficial for older adults in certain contexts, such as for the management of stress and emotional well-being.

Second, the findings indicate effects that are more pronounced among the older adults and not the younger adults, which can suggest that perhaps young adults' self-esteem may be too

difficult to increase if they are encountering too many stressors. These results highlight a possibility that certain interventions may be better for certain groups and not others. Third, although our intervention did not improve self-esteem levels among young and older adults, we think that the expressive writing method is still valuable, and our results can inform future intervention endeavors. For example, we can still use the insight-oriented framework to encourage people to increase awareness of any unhelpful thoughts and feelings about stressful situations at hand, to boost problem solving skills and activate those coping processes that individuals with high self-esteem have been shown to use (Greenberg et al., 1993). Fourth, our results further support the idea that any self-esteem intervention should be aimed at specific individuals, such as tailoring age-appropriate interventions, or creating interventions for people based on their baseline self-esteem levels.

Limitations and Future Directions

There are limitations in the present study that could be addressed in future investigations on experimental increases in self-esteem and its potential benefits across the adult lifespan. First, our study design was based on a relatively small sample of young and older adults. Increasing sample sizes in both groups may help to increase power in the experimental study to capture any possible intervention effects. Second, it may be helpful to compare different kinds of writing interventions that focus on increasing individuals' self-esteem – this could include longer periods of writing, therapist-assisted writing (Kolubinski et al., 2018), or incorporate a one-day workshop on expressive writing on aspects of the self (Horrell et al., 2014). These kinds of avenues for writing may help to target those who reported lower self-esteem levels at baseline, as it has been shown that writing positive self-affirmations can sometimes backfire for this population (Wood et al., 2009). Third, investigating different groups in addition to age, such as SES or baseline levels of self-esteem or stress, would help to answer some of the questions about the effectiveness in increasing individuals' self-esteem. It should be noted, however, that the young adults in our intervention group had lower self-esteem as compared to older adults, and the intervention still did not significantly improve these participants' self-esteem levels. This again points to the possibility that it may be more about the ineffectiveness of writing interventions rather than changing people's beliefs about themselves. Fourth, although not explicitly measured, some participants in the control group provided feedback to the researchers,

indicating that writing about their day (without emotions or opinions) helped to decrease their levels of stress. This could also suggest that our control group had unmeasured benefits as well.

Conclusions

The present study attempted to improve self-esteem levels among young and older adults; however, our results indicated that our expressive writing task did not significantly change any of the participants' self-esteem levels. Our results did indicate though, that there are age-related differences in the association between high self-esteem and increases in self-esteem, stress responses, and emotional well-being.

Table 4.1. *Means, Standard Deviations, and Frequencies of Covariates, and Main Study Variables by Group and by Age (N = 106)*

	***M* (*SD*) or Percentage [a]**			
Covariates				
Age (T1)				
18 – 34 years old	23.15 (3.92)			
60+ years old	69.72 (5.92)			
Female (%)	52.80			
Socioeconomic Status (T1)	.01 (.74)			
Education Level [b]	2.29 (.97)			
Yearly family income [c]	2.20 (1.67)			
Perceived social status [d]	6.25 (1.85)			
Partnership Status (%; T1)				
Married/Common-law/Living with partner	38.70			
Single/Separated/Divorced/Widowed	61.40			
Main Study Variables by group and by age	*Group*		*Age*	
	Intervention *n* = 52	Control *n* = 54	Young *n* = 53	Old *n* = 53
Self-esteem (T1)	21.15 (5.32)	22.07 (6.04)	19.23 (5.45)	24.02 (4.89)
Δ Self-esteem (T1-T2) by intervention	.30 (1.05)	-.03 (.97)	-.13 (1.02)	.13 (.98)
Δ Self-esteem (T1-T3) overall	.08 (.88)	-.08 (1.11)	-.17 (.91)	.17 (.91)
Stress outcomes (during stress task)				
AUCi	.34 (1.83)	.49 (2.21)	.14 (1.94)	.69 (2.08)
AUCg	4.34 (1.67)	4.81 (2.22)	4.41 (1.96)	4.74 (1.99)
Δ Perceived Stress (T2 – T3)	.06 (1.12)	-.06 (.88)	.01 (1.08)	-.01 (.93)
Follow-up outcomes (T4)				
Perceived stress	2.55 (.81)	2.43 (.76)	2.99 (.61)	2.15 (.70)
Negative Affect	2.34 (.98)	2.23 (.85)	2.94 (.74)	1.84 (.74)
Positive Affect	3.57 (.66)	3.64 (.74)	3.28 (.63)	3.83 (.66)

Notes. M = mean, *SD* = standard deviation. T1 = baseline. T2 = start of second in-lab visit. T3 = end of the second in-lab visit. T4 = 3-month follow-up.
[a] *M* and *SD* are presented for continuous variables.
[b] Education was indexed as 0 = no education, 1 = high school, 2 = trade or collegiate, 3 = bachelors, and 4 = masters or doctorate.
[c] Yearly family income was index as 0 = less than $17,000, 1 = up to $34,000, 2 = up to $51,000, 3 = up to $68,000, 4 = up to $85,000, and 5 = more than $85,000.
[d] Ranges from 1 – 10, higher values indicated higher levels of perceived social status.

Table 4.2. *Zero-Order Correlations Between Main Study Variables* (*N* = 106)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Age Group [a]													
2. Self-esteem (T1)	.42**												
3. Δ Self-esteem (T1-T2)	.13	-.00											
4. Δ Self-esteem (T1-T3)	.17	-.00	.65**										
5. Perceived Stress (T1)	-.45**	-.76**	-.18	-.21*									
6. Perceived Stress (T4)	-.54**	-.59**	-.21	-.29*	.69**								
7. Δ Perceived Stress (T2-T3)	-.01	-.03	-.22*	-.46**	.16	.14							
8. AUC Increase	.15	.08	-.03	-.07	-.05	-.18	-.03						
9. AUC Ground	.09	-.10	-.02	.00	.05	-.15	-.05	.57**					
10. NA (T1)	-.34**	-.66**	-.17	-.12	.72**	.56**	.11	-.02	.15				
11. NA (T4)	-.59**	-.62**	-.27*	-.33**	.69**	.83**	.20	-.23	-.11	.74**			
12. PA (T1)	.40**	.58**	.11	-.01	-.58**	-.48**	-.08	.13	.03	-.31**	-.41**		
13. PA (T4)	.39**	.58**	.23*	.23*	-.58**	-.62**	-.22	.17	.10	-.36**	-.53**	.75**	

Notes. [a] Age group was coded as 1 = Younger adults, 2 = Older adults. T1 = baseline. T2 = start of second in-lab visit. T3 = end of the second in-lab visit. T4 = 3-month follow-up. NA = Negative affect. PA = Positive affect. AUC = Area under the curve. * $p < .05$. ** $p < .01$.

Table 4.3. *Hierarchical Regression Analyses Predicting Stress Outcomes and Follow-up Outcomes by Changes in Self-Esteem by Intervention and by Interaction with Age (N* = 106)

	Stress outcomes						Follow-up Outcomes (T4)					
	AUC_i		AUC_g		Δ Perceived stress (T2 to T3)		Perceived Stress		Negative Affect		Positive Affect	
Predictors	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β
Main effects												
Sex	.00	-.03	.01	.15	.03	-.20	.00	-.03	.00	-.00	.01	-.06
SES	.01	-.22	.02	-.34	.00	-.03	.02	-.10	.00	-.05	.00	-.02
Partnership status	.02	-.34	.02	-.31	.00	-.02	.01	-.08	.01	-.10	.00	.00
Baseline levels of T4 outcomes	--	--	--	--	--	--	.14**	.29**	.22**	.40**	.29**	.36
Age group [a]	.02	.28	.01	.21	.00	.02	.04*	-.16*	.09**	-.26**	.00	.05
Δ Self-esteem by intervention (T1 to T2)	.00	-.04	.00	.02	.04*	-.22*	.00	-.03	.01	-.08	.02	.09
Interaction												
Δ Self-esteem (T1-T2) x Age	.00	-.02	.00	-.10	.01	-.10	.00	.00	.00	.03	.01	.06

Notes. [a] Age group was coded as 1 = Younger adults, 2 = Older adults. T1 = baseline. T2 = start of second in-lab visit. T3 = end of the second in-lab visit. * $p < .05$. ** $p < .01$.

Table 4.4. *Hierarchical Regression Analyses Predicting Stress Outcomes and Follow-up Outcomes by Baseline Levels of Self-Esteem and by Interaction with Age (N* = 106)

	Stress outcomes						Follow-up Outcomes (T4)					
	AUC_i		AUC_g		Δ Perceived stress (T2 to T3)		Perceived Stress		Negative Affect		Positive Affect	
Predictors	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β
Main effects												
Sex	.00	-.02	.01	.17	.04	-.19	.00	-.03	.00	-.01	.01	-.06
SES	.01	-.25	.02	-.29	.01	-.09	.02	-.10	.00	-.06	.00	-.01
Partnership status	.02	-.34	.02	-.30	.00	-.04	.01	-.08	.02	-.10	.00	.01
Baseline levels of T4 outcomes	--	--	--	--	--	--	.14**	.24**	.12**	.37**	.16**	.31**
Age group [a]	.01	.24	.02	.31	.00	.01	.04*	-.15*	.07**	-.24**	.00	.03
Self-esteem (T1)	.00	.10	.01	-.25	.00	-.02	.00	-.08	.01	-.10	.02	.11
Interaction												
Self-esteem (T1) x Age	.03†	-.42†	.00	-.07	.00	-.07	.02*	-.12*	.01	-.06	.01	.06

Notes. [a] Age group was coded as 1 = Younger adults, 2 = Older adults. T1 = baseline. T2 = start of second in-lab visit. T3 = end of the second in-lab visit. * $p < .05$. ** $p < .01$. † $p = .07$.

Table 4.5. *Hierarchical Regression Analyses Predicting Stress Outcomes and Follow-up Outcomes by Overall Changes in Self-Esteem and by Interaction with Age (N* = 106)

	Stress outcomes						Follow-up Outcomes (T4)					
	AUC_i		AUC_g		Δ Perceived stress (T2 to T3)		Perceived Stress		Negative Affect		Positive Affect	
Predictors	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β
Main effects												
Sex	.00	.02	.01	.18	.01	-.09	.00	-.01	.00	.00	.02	-.10
SES	.01	-.20	.02	-.34	.00	-.02	.02	-.10	.00	-.05	.00	-.02
Partnership status	.02	-.34	.02	-.31	.00	-.04	.01	-.08	.02	-.11	.00	.01
Baseline levels of T4 outcomes	--	--	--	--	--	--	.13**	.28**	.22**	.40**	.31**	.38**
Age group [a]	.02	.30	.01	.22	.00	.06	.04*	-.15*	.08**	-.24**	.00	.03
Δ Self-esteem (T1 to T3)	.01	-.19	.00	-.05	.19**	-.46**	.01	-.08	.04**	-.15**	.05**	.15**
Interaction												
Δ Self-esteem (T1-T3) x Age	.00	-.14	.00	.02	.00	.04	.01	-.07	.01	-.06	.02*	.09*

Notes. [a] Age group was coded as 1 = Younger adults, 2 = Older adults. T1 = baseline. T2 = start of second in-lab visit. T3 = end of the second in-lab visit. * $p < .05$. ** $p < .01$.

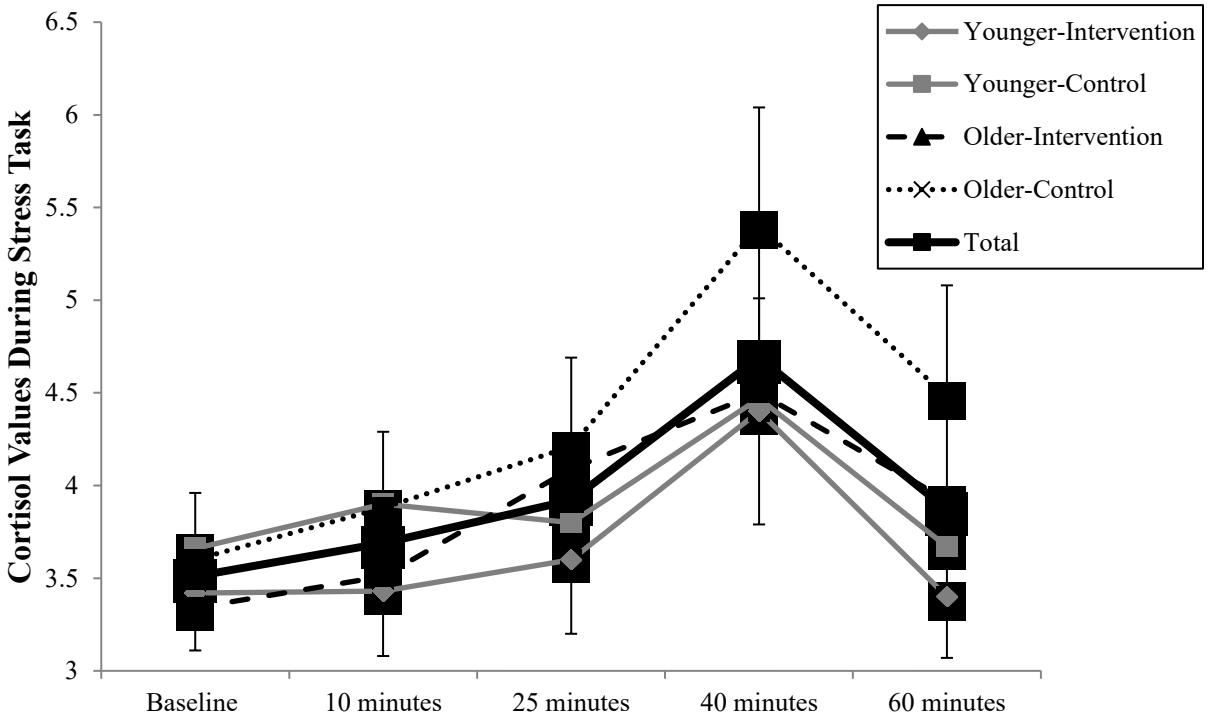

Figure 4.1. Mean salivary cortisol values during laboratory stress testing by age group and condition group (Total number of cortisol samples = 496). Younger-Intervention = Younger adults assigned to intervention group (123 samples). Younger-Control = Younger adults assigned to control group (130 samples). Older-Intervention = Older adults assigned to intervention group (121 samples). Older-Control = Older adults assigned to control group (122 samples). Error bars are standard error of the mean.

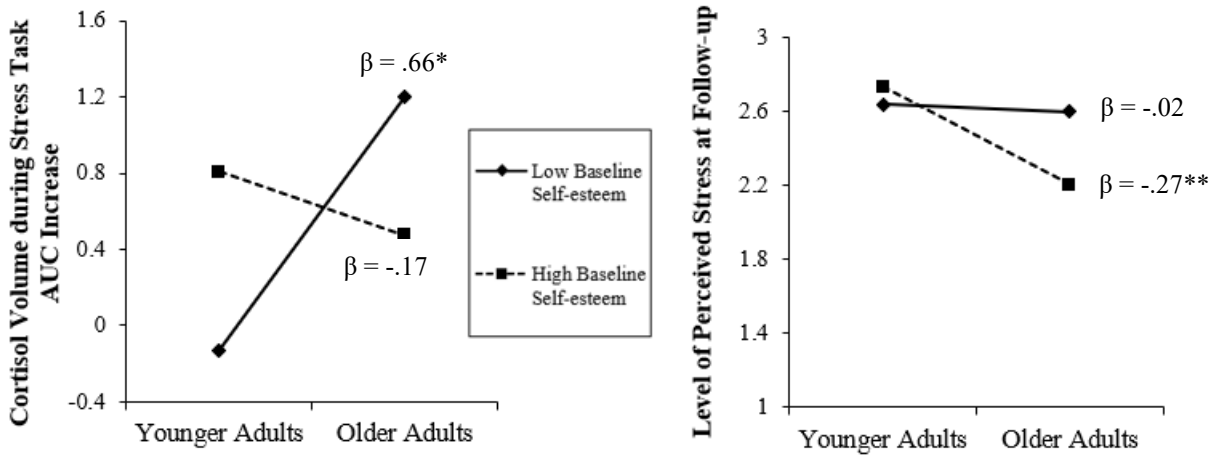

Figure 4.2. Left panel: Association between age group and AUC increase. Right panel: Association between age group and level of perceived stress at the three-month follow-up estimated for -1 and +1 standard deviation of baseline self-esteem. * $p < .05$. ** $p < .01$.

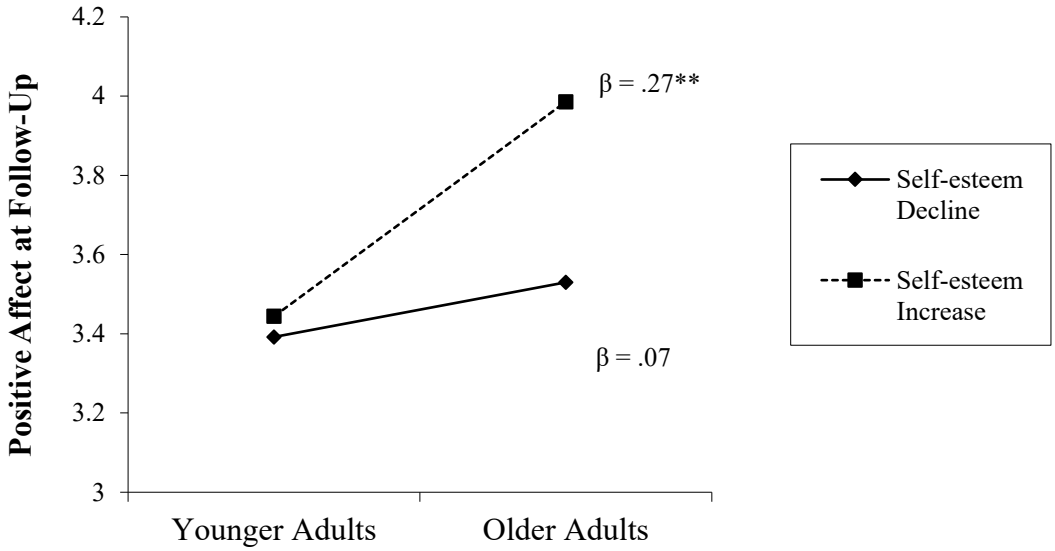

Figure 4.3. Association between age group and positive affect at the three-month follow-up estimated for -1 and +1 standard deviation of overall changes in self-esteem (T1 to T3). * $p < .05$. ** $p < .01$.

CHAPTER FIVE: GENERAL DISCUSSION

The aim of this dissertation was to expand our current understanding of changes in personality in the context of lifespan development by addressing the limitations of the self-esteem literature and investigating self-esteem changes across the adult lifespan. The three studies in this dissertation accomplished this aim by conceptualizing self-esteem change in three different ways and by examining the impact of these changes on indices of well-being for young and older adults. The studies in this dissertation also sought to contribute to the discussion on whether levels or changes in self-esteem were important for young and older adults with respect to predicting adaptive outcomes. Study 1 examined intraindividual changes in self-esteem stress and regret intensity among older adults, and it was hypothesized that both high levels of, and intraindividual increases in self-esteem could protect older adults from experiencing increases in regret intensity, particularly when experiencing higher than usual levels of stress. Study 2 examined normative changes in self-esteem across the adult lifespan and investigated the reciprocal relationship between normative self-esteem changes and individuals' experience of chronic disease over time, and whether these associations were moderated by age. Study 3 investigated experimental changes in self-esteem, and whether self-esteem could be improved through a writing intervention. In addition, Study 3 explored whether there were age-related differences in the associations between baseline levels and overall changes and levels of self-esteem on indices of stress and emotional well-being.

Summary of Research Findings

The first objective of this research, conceptualized in Study 1, was to increase our understanding of the moderating role of self-esteem in examining both intraindividual changes and levels of self-esteem, and how it can mitigate older adults' stress and regret intensity. The results of Study 1 highlighted that intraindividual increases in self-esteem can be a protective personality process for older adults, as intraindividual increases buffered older adults' experiences of regret intensity, particularly when experiencing higher than usual levels of stress. The results of Study 1 also identified that older adults' intraindividual increases in perceptions of stress contributed to intraindividual increases in regret intensity. However, our hypotheses in Study 1 were not fully supported, as interindividual levels of self-esteem did not significantly buffer the within-person associations between older adults' stress perceptions and their regret intensity. Nonetheless, interindividual differences in self-esteem were generally associated with

less regret intensity, suggesting that high levels of self-esteem can be beneficial in older adulthood.

Study 2, targeting our second objective, used 16-year longitudinal data to investigate normative changes in self-esteem across the adult lifespan and how these normative changes could have lasting impact on adults' experiences of chronic disease. The results of Study 2 indicated that only for young adults, and not middle-aged or older adults, earlier declines in self-esteem were associated with subsequent increases in chronic disease, and vice versa. These findings suggested that age can qualify the association between declines in self-esteem and physical health, and that adverse changes in both self-esteem and chronic disease may be particularly problematic for young adults' prospective personality functioning and physical health. This study also met the objective of examining personality changes in a lifespan developmental context.

The third objective of the research program was carried out in Study 3, where we developed a writing intervention to examine experimental changes in self-esteem for both young and older adults, contributing to the discussion on whether personality changes or levels are more predictive of adaptive outcomes for successful aging. The results of Study 3 indicated that our main objective, examining experimental changes in self-esteem, was not met. The writing intervention did not significantly change self-esteem levels for either young or older adults. However, our secondary hypotheses were partially supported. The analyses investigating baseline self-esteem levels, and naturally occurring changes in self-esteem, indicated that older adults (compared to younger adults) reported high baseline levels of self-esteem, and participants with increases in self-esteem (compared to those indicating decreases in self-esteem) over the course of the study, were associated with positive outcomes such that they indicated declines in perceived stress, reduced cortisol responses and increases in positive affect three months later.

Overall, the pattern of findings across the three studies illustrates that changes in self-esteem can be protective and exert age-related effects on the well-being and physical health of both young and older adults. Further, the pattern of results provides some information on the importance of self-esteem changes and levels in a developmental context, and supports the idea that age can provide a context in which to examine personality changes from normative developmental trajectories (cf. Terracciano et al., 2005). For young adults, our results suggest that self-esteem declines can contribute to compromised trajectories of physical health, which

may further instigate maldaptive personality changes. While the results from Study 2 also suggests that increases in self-esteem can foster young adults' physical health, we were not able to test the hypothesis that experimental increases in self-esteem would be beneficial to young adults' well-being, as our attempt to improve young adults' self-esteem did not work (in Study 3). It may be the case that the sample of young adults in the study (e.g., going through mid-term exam periods) were already too stressed, suggesting that they may already be on a loop of stress-inducing psychological processes (Orth et al., 2009, 2016; Skevington, 1993; Sowislo & Orth, 2013), which may also contribute to self-esteem declines and provide additional support for the interpretations of our findings in Study 2. Since we did not have a young adult comparison group in Study 1, we cannot make conclusions about the effects of young adults' intraindividual changes in, or levels of, self-esteem in the context of stress and regret. We would expect, however, that boosts in self-esteem among young adults would also help them to manage unexpected stressful circumstances and mitigate regret intensity.

For older adults, the pattern of findings suggesting that high levels and increases in self-esteem were associated with adaptive outcomes (Studies 1 and 3) did not hold when investigating normative changes in self-esteem (Study 2). More specifically, Study 1 and Study 3 show the benefits of increases in and high levels of self-esteem for older adults in the context of psychological and emotional well-being (e.g., stress, negative/positive affect) while self-esteem changes were not associated with older adults' experience of chronic disease (Study 2). Self-esteem change was conceptualized differently in each study, involving different measurement points and information about change, particularly with regards to short-term and long-term changes in self-esteem. For example, normative changes that were investigated in Study 2 were of a long-term longitudinal nature (a study over 16 years), which is quite different from the changes in self-esteem we investigated in Studies 1 and 3 (i.e., intraindividual changes and experimentally induced changes in self-esteem). Short-term changes in self-esteem highlight possible adaptive processes that allow individuals to manage problematic cirucmstances, while longer-term normative changes in self-esteem may align with expected declines in older adulthood. On the one hand, as per our theoretical framework, declines in self-esteem and increased chronic disease may be normative for older adults and thus have less of an impact on any further personality and health functioning over the long term. On the other hand, self-esteem

increases would still be beneficial for older adults and could matter again in situational contexts – such as when stress is higher than usual.

That being said, there is also a body of literature that investigates the impact of short-term changes in self-esteem across the lifespan (i.e., self-esteem variability; Kernis, Cornell, Sun, Berry, & Harlow, 1993). Self-esteem variability is defined as the extent to how much an individual experiences short-term fluctuations on their level of self-esteem in response to daily events (Kernis et al., 1993). Greater self-esteem variability (i.e., instability of self-esteem) has been shown to predict negative outcomes such as symptoms of depression and increased negative emotions (Kernis et al., 1993; 1998). This adds some nuance to our interpretation of our results of Study 1. As there was a significant amount of within-person variability, there is a possibility that some participants may have experienced greater fluctuations in their self-esteem and thus may be more likely to experience dips in their self-esteem in response to stress. While boosts in self-esteem over a number of years may be benficial, self-esteem fluctuations over shorter periods of time may not exert the same buffering effects to mitigate conseqeunces of stress. However, since we did not measure self-esteem in short range assessments (e.g., changes in self-esteem within a day), we are unable to substantiate any conclusions about the role of self-esteem variability in how young and older adults may navigate non-normative events or stressful circumstances.

Contributions to Personality and Lifespan Developmental Research

Personality was once considered as stable and unchanging throughout the lifespan (Allport, 1961; McCrae & Costa, 1994), meaning that the typical thoughts feelings and corresponding behaviours of someone at age 15 could carry through to age 75. However, there is mounting evidence in the personality literature that personality does change over time, that it can be seen has both relatively stable and changeable, and that the degree of change in personality is specific to each person (Mroczek & Spiro, 2003; Roberts & Mroczek, 2008; Terracciano et al., 2006). The implications of this dissertation from the personality literature are that it may be possible to identify what kind of change is important for us to consider and how personality can be improved to mitigate the consequences of difficult circumstances. This dissertation focused on examining changes in self-esteem, which is a debated personality construct, particularly regarding its predictive value of adaptive outcomes, and the extent to how it changes for individuals across the lifespan and across different situational contexts (i.e., stressful

circumstances). The current research helps to address a gap in the literature where less is known about the impact of self-esteem changes on indices of well-being. As such, the results from the three studies investigating self-esteem change have important implications for personality and lifespan developmental research.

First, examining and conceptualizing different types of change in self-esteem contributes to understanding why some individuals can maintain or increase their self-esteem as they age. Clarifying why there is variability around self-esteem change can be an important contribution to the self-esteem and personality literature, given that changes in personality could matter specifically when they occur outside of an individual's "status quo" (i.e., higher or lower than usual levels of self-esteem), or normative expectations (i.e., deviations from normative changes in self-esteem). In Study 1, intraindividual increases in self-esteem exerted an adaptive function and provided a boost for older adults in mitigating the negative consequences of stressful circumstances on experiences of regret intensity. These results bolster the idea that self-esteem can be malleable in older adulthood (von Soest et al., 2017; Wagner et al., 2013), and that even for people with already high levels of self-esteem, boosts in self-esteem under more stressful-than-usual circumstances can be beneficial (Crocker & Wolfe, 2001; Crocker et al., 2006). In Study 2, examining normative and non-normative changes in levels of self-esteem and chronic disease across the adult lifespan illustrates the role of the self as a construct that can be influenced by age-related events (e.g., health problems), which could have lasting impact on a young adult's personality and health later on in life. These results contribute to the consensus in the literature, which suggests that personality traits change over the life course (e.g., Robins et al., 2002), and that important systemic changes may be meaningfully connected to particular life experiences and events (Crocker & Wolfe, 2001; McCrae et al., 2000; Mroczek & Spiro, 2003; Orth et al., 2012; von Soest et al., 2017). Second, while changes in self-esteem can be attributed to a variety of situational and normative developmental factors, the results across the three studies highlight that age can be an important context through which to consider personality change. The present research on personality uses a lifespan developmental framework to support the idea that changes in personality matter and are meaningful. More specifically, the results of this dissertation highlight vulnerable periods in the adult lifespan, and how personality processes such as self-esteem impact how people may navigate age-related demands and challenges. Although there is literature to suggest that older adulthood is riddled with declines in self-esteem

and well-being (e.g., von Soest et al., 2017), the results suggest that if the declines are normative, then they may not be particularly influential. In fact, there are perhaps other adaptive personality processes in older adulthood that may contribute further to successful development, such as boosts in self-esteem (as highlighted in Study 1), adjustment of expectations, or other effective self-regulation strategies (Heckhausen et al., 2010). This possibility is consistent with theoretical speculations, suggesting that personality changes and maintenance that can occur during adulthood, as personality changes in older adulthood show movement toward acceptance and adjustment (Damian et al., 2018; McCrae et al., 2000; Wagner et al., 2013). In young adulthood there exist many transitory events and challenges requiring major life-changing decisions (e.g., to marry, positions in one's career, having children; Baltes, 1987), which in turn may contribute to the development of self-esteem increases. However, non-normative events that have the potential to impact self-esteem changes can have long-lasting implications for young adults' personality functioning.

Third, as individuals typically experience an increasing number of relatively intractable stressors in a variety of life domains, which are likely to compromise psychological and physical health (Wrosch et al., 2006), as they age, it is important to identify factors that can help them adapt to these challenging events. To this end, our results provide support for the predictive value of self-esteem as an adaptive personality factor associated with psychological and physical well-being (Brown, 2010; Orth et al., 2012). This is contrary to some of the criticism that the self-esteem literature has received, including that global self-esteem may be too broad to effectively predict specific outcomes (Baumeister et al., 2003; Crocker & Wolfe, 2001). While our research cannot provide a firm answer as to whether or not levels or changes in self-esteem are more important, especially since experimental changes in self-esteem were not documented in our results, we can still point to the conclusion that there is variability in young and older adults' self-esteem over time. Consistent with the conclusions from other self-esteem researchers, investigating both levels and changes in self-esteem would provide a more comprehensive picture regarding the nature of self-esteem (Crocker et al., 2006; Brown & Marshall, 2006; Robins et al., 2002). As such, our results demonstrate that such changes in self-esteem can represent meaningful changes in personality associated with both psychological and physical health.

Clinical Implications

While the present research highlights the importance of investigating personality change, and more specifically changes in self-esteem in a lifespan developmental context, there are also clinical implications to be considered. First, our findings contribute to the debated topic of whether self-esteem matters, and whether it is actually predictive of positive life outcomes. The overall pattern of results from the three studies in this dissertation suggests that self-esteem can be an adaptive personality process and is consistent with extant literature demonstrating that high self-esteem and increases in self-esteem are generally associated with positive outcomes (for a review, Orth et al., 2018). In addition, it suggests that self-esteem could be an area worth intervening in, particularly since self-esteem has been shown to mitigate the consequences of stressful experiences (Greenberg et al., 1992) and could have lasting impact on individuals' physical health.

Second, the results from this dissertation point to the importance of developing age-appropriate interventions. One of the strengths in examining personality changes within a lifespan developmental context is the ability to identify age periods where intervention could be most effective. While our attempts to improve self-esteem with a writing intervention were not effective in changing self-esteem levels for young or older adults, these results provide important clinical implications when targeting an individual's self-esteem. It may be the case that older adults have shifted into a stage where acceptance and compassion is more important, and as such, increasing older adults' self-esteem could exercise appreciation for what they have accomplished and what they have in the present. For young adults, asking them to write about themselves at this stage in life may be more stressful than adaptive – as there is research to suggest that individuals repeating positive affirmations about themselves can only work for certain people, such as individuals with already high levels of self-esteem, and that repeating positive affirmations can sometimes backfire for those individuals reporting low self-esteem (Wood et al., 2009).

Third, since the particular writing intervention was not successful, there are some further clinical implications to consider. Based on the format of existing writing intervention protcols in our laboatory (implemented in the management of older adults' regrets, Wrosch et al., 2007), the duration for the writing intervention focused on positive aspects of the self was 20 minutes over three consecutive days. This may not have been enough time to elicit any notable change, or

change that could be captured within the timing of self-esteem measurements. There is research to suggest that changing beliefs about the self can range from intense one-day, in-person workshops to 12 sessions of individual psychotherapy (Kolubinski et al., 2018). As such, the length of time and engagement of intervention would be important to consider. For example, there exists work on "self-improvement" through therapist assisted writing interventions (Rigby & Waite, 2006) and other writing programs with longer time intervals (Chandler, 1999; Lepore et al., 2002), which show promise in improving individuals' self-esteem. These considerations, however, do not guarantee improvements in individuals' self-esteem, and more research is required on the efficacy of such programs. Nonetheless, our clinical implications provide strong factors to consider when investigating experimental changes in self-esteem.

Limitations and Future Directions

There were several limitations to the present research that could be addressed in future studies. First, while it is a strength of our research program to examine longitudinal associations between changes in self-esteem and indices of well-being and health across the lifespan, two of our studies (Studies 1 and 3) used data from relatively small projects on community-dwelling young and older adults in Montreal, Canada, which may limit the generalizability of the study's conclusions. In addition, as these two studies suggested different patterns of results from Study 2 (using a 16-year national longitudinal dataset), which highlighted the differences in using distinct ways of conceptualizing personality change, replicating all the analyses in large representative studies could clarify and strengthen our findings. Second, the analyses used in the three studies prevent us from drawing causal inferences, as the data were correlational in nature. Further, while Study 3 used a quasi-experimental approach to examine changes in self-esteem, it did not work. As such, additional experimental studies are needed to further examine, in a developmental context, whether self-esteem could be improved.

Third, our data assessed changes in self-esteem and other factors of well-being over a span of two days to six years (across the three studies). While this methodology provided a broad array of information about how self-esteem changes, and allowed us to conceptualize changes in personality using intraindividual, normative and experimental methods, a more consistent and perhaps a closer range of assessments (to examine other processes such as self-esteem variability), could provide us with a clearer picture of how self-esteem changes.

Fourth, the studies in this dissertation mainly used subjective measures of well-being and physical health. While we had hypotheses about older adults' subjective perceptions of stress (in Study 1), subjective measures can be prone to self-report biases. Future research should include additional objective measures of stress and physical health, and measures that could examine situational factors as individuals progress through adult development.

Fifth, we examined age effects across all three studies. However, using age as a moderator could involve a potential confound between age and birth cohort. While we controlled for SES variables that could have an impact on self-esteem and well-being, future research should use sequential designs (Baltes, 1968) or examine associations with other sociodemographic variables (e.g., Jones et al., 2019; Orth et al., 2012; Ross & Wu, 1996). Additionally, the present research did not include culturally diverse samples. Future research should examine the development of self-esteem and associations with well-being in other countries with other kinds of cultural contexts (Heine, Lehman, Markus, & Kitayama, 1999), which may provide additional information on how self-esteem develops in different contexts or how it can be improved.

Finally, our study did not consider other psychological factors, from an acceptance-based framework, that could be associated with self-esteem and that may also protect both young and older adults from the adverse consequences of stress and contribute to their overall well-being (e.g., self-compassion; Herriot, Wrosch, & Gouin, 2018). These kinds of psychological factors could be important and closely associated with self-esteem as adults confront age-related challenges throughout their development. The addition of other factors such as these to an analysis could further illuminate ways of developing effective interventions to improve self-esteem and contribute to successful aging across the lifespan.

Conclusions

This dissertation investigated self-esteem changes across the lifespan and across situational contexts, and whether self-esteem changes were associated with different aspects of young and older adults' well-being. Overall, the pattern of findings across the three studies suggest that changes in self-esteem can be protective and exert age-related effects on young and older adults' psychological and physical well-being. These findings highlight that personality changes, such as self-esteem, can provide important information about how individuals adapt to and navigate life events and challenges throughout the adult lifespan.

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APPENDIX A: Consent forms

Concordia University consent form (Montreal, Aging and Health Study)

Concordia University consent form, Intervention Group (Writing, Aging and Health Study)

Concordia University consent form, Control Group (Writing, Aging and Health Study)

Concordia University consent form, Deception Debrief (Writing, Aging and Health Study)

CONSENT FORM TO PARTICIPATE IN RESEARCH

This is to state that I agree to participate in a program of research being conducted by Dr. Carsten Wrosch of the Psychology Department of Concordia University.

A. PURPOSE

I have been informed that the purpose of the research is to study older adults' goal management, well- being, and health.

B. PROCEDURES

This research will involve a questionnaire and 15 salivary cortisol samples collected over the course of three typical days. It also involves collecting some blood drops. A research assistant will go to the participant's home to administer part of a questionnaire on goal management, well-being and health, explain the saliva collection procedure, and collect the blood drops. The rest of the questionnaire will be filled in by the participant while alone and should take approximately one hour to complete. The saliva collection will involve chewing a provided cotton swab for one minute before placing it in its salivette. The saliva collection will be performed five times a day at specific times. The participant will receive phone calls from the research assistant to remind him/her to take a salivary cortisol sample. The blood drops will be collected by the trained research assistant using a finger-prick with a small lancet. The participant will receive $70 for participating in the study.

There should be no risks or discomfort involved in answering the questions or collecting the salivary cortisol samples. Collection of the blood drops should also involve no risk and should not be painful. The participant's name will not be attached to the questionnaire, although the signatures and names on the consent forms will be collected and stored separately by the supervising professor. The participant is free to refuse to participate in any portion of the study or to answer any question that makes him or her uncomfortable.

C. CONDITIONS OF PARTICIPATION

• I understand that I am free to withdraw my consent and discontinue my participation at anytime without negative consequences. Even if I discontinue my participation, I will receive $70.

• I understand that my participation in this study is CONFIDENTIAL (i.e., the researcher will know, but will not disclose my identity)

• I understand that the data from this study might be published.

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT.
I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY.

NAME (please print) _____

SIGNATURE _____

WITNESS SIGNATURE _____ DATE _____

INFORMATION AND CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Study Title: Writing, Aging and Health Study
Researcher: Sarah Liu, PhD student in Clinical Psychology
Researcher's Contact Information: SP 315- 7141 Sherbrooke St W., Montreal, H4B 1R6; Wahs.Study@gmail.com; (514) 848 -2424 ext. 2236
Faculty Supervisor: Dr. Carsten Wrosch, Professor Department of Psychology
Faculty Supervisor's Contact Information: PY170-11 – 7141 Sherbrooke St. W., Montreal, H4B 1R6; Carsten.Wrosch@concordia.ca; (514) 848 – 2424 ext. 2231
Source of funding for the study: CURC – Concordia University

You are being invited to participate in the research study mentioned above. This form provides information about what participating would mean. Please read it carefully before deciding if you want to participate or not. If there is anything you do not understand, or if you want more information, please contact Sarah Liu the study researcher.

A. PURPOSE

The purpose of the research is to investigate the association between expressive writing and physical health in adulthood. Specifically, we are interested in determining if expressive writing would affect an individuals' biological response to stressful situations.

B. PROCEDURES

If you participate, you will be asked to attend two scheduled laboratory sessions (one day apart) at the Personality, Aging and Health laboratory on the Loyola campus at Concordia University, and complete 20-minute writing exercises over three consecutive days.

At the first laboratory visit, you will be asked to complete questionnaires, where you will be asked about demographic information, what you think about yourself, emotions and attitudes. This questionnaire will take approximately 30 minutes to complete. Subsequently, you will be asked to complete your first 20-minute writing exercise that involves writing about yourself. Following the lab visit, you will be asked to complete your second and third 20-minute writing exercises at home prior to your second laboratory visit.
The second laboratory visit will be scheduled one day after the first visit. At the second visit, you will be asked to complete questionnaires (approximately 30 minutes) similar to ones completed at the first visit. Following the questionnaires, you will be asked to complete a stress task that is meant to elicit a biological response to stressful circumstances. As such, you will also be asked to complete saliva samples throughout and after completing the stress task. Saliva samples involve chewing a provided cotton swab for one minute before placing it in its plastic container. The stress task will take approximately 1 hour to complete.

In total, participating in this study will take approximately 3 hours.

C. RISKS AND BENEFITS

You might face certain risks by participating in this research. Since you will be asked to provide information regarding your emotions and attitudes, there is a possibility these questions may cause slight discomfort. There is also the possibility of experiencing negative emotions resulting from the stress task. However, the stress task administered in the study is not meant to elicit stress greater than what you would be exposed to in your daily life. If these tasks have caused sufficient distress that you wish to speak to a mental health professional, the researcher will provide a list of mental health professional resources for you to contact.

You might or might not personally benefit from participating in this research. Potential benefits include: insight into how you think about yourself or your daily life.

D. CONFIDENTIALITY

We will gather the following information as part of this research: demographic information, contact information, and your responses to questionnaires, on the writing exercises and on the stress task.

We will not allow anyone to access the information, except people directly involved in conducting the research, and except as described in this form. We will only use the information for the purposes of the research described in this form.

The information gathered will be coded. That means that the information will be identified by a code. Your name will not be connected to the study information that you provide to us and only the researcher will have a list that links the code to your name.

We will protect the information by keeping all study materials in a locked filing cabinet in the researcher's office and electronic information will be protected in a password-protected file on the researcher's hard drive.

We intend to publish the results of the research. However, it will not be possible to identify you in the published results. We will destroy the information five years after the end of the study and when all the results have been published.

E. BIOLOGICAL SAMPLES

You will be asked to provide saliva samples as part of the research. Tasking these saliva samples involves chewing a provided cotton swab for one minute before placing it in its plastic container. We will use the saliva samples to analyze cortisol, which is a way to assess your biological response to stress. We will keep the saliva samples in our laboratory until the end of the study, when we will send the saliva samples to be analyzed and disposed of at the University of Trier.

F. CONDITIONS OF PARTICIPATION

You do not have to participate in this research. It is purely your decision. If you do participate, you can stop at any time. You can also ask that the information you provided not be used, and

your choice will be respected. If you decide that you don't want us to use your information, you may inform the researcher at anytime.

You will receive $50 for participating in the study. Even if you discontinue your participation, you will receive $50. To make sure that research money is being spent properly, auditors from Concordia or outside will have access to a coded list of participants. It will not be possible to identify you from this list.

We will tell you if we learn of anything that could affect your decision to stay in the research.

There are no negative consequences for not participating, stopping in the middle, or asking us not to use your information.

We will not be able to offer you compensation if you are injured in this research. However, you are not waiving any legal right to compensation by signing this form.

G. PARTICIPANT'S DECLARATION

I have read and understood this form. I have had the chance to ask questions and any questions have been answered. I agree to participate in this research under the conditions described.

NAME (please print) _____

SIGNATURE _____

DATE _____

If you have questions about the scientific or scholarly aspects of this research, please contact the researcher. Their contact information is on page 1. You may also contact their faculty supervisor. If you have concerns about ethical issues in this research, please contact the Manager, Research Ethics, Concordia University, 514.848.2424 ex. 7481 or oor.ethics@concordia.ca.

INFORMATION AND CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Study Title: Writing, Aging and Health Study
Researcher: Sarah Liu, PhD student in Clinical Psychology
Researcher's Contact Information: SP 315- 7141 Sherbrooke St W., Montreal, H4B 1R6; Wahs.Study@gmail.com; (514) 848 -2424 ext. 2236
Faculty Supervisor: Dr. Carsten Wrosch, Professor Department of Psychology
Faculty Supervisor's Contact Information: PY170-11 – 7141 Sherbrooke St. W., Montreal, H4B 1R6; Carsten.Wrosch@concordia.ca; (514) 848 – 2424 ext. 2231
Source of funding for the study: CURC – Concordia University

You are being invited to participate in the research study mentioned above. This form provides information about what participating would mean. Please read it carefully before deciding if you want to participate or not. If there is anything you do not understand, or if you want more information, please contact Sarah Liu the study researcher.

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The purpose of the research is to investigate the association between expressive writing and physical health in adulthood. Specifically, we are interested in determining if expressive writing would affect an individuals' biological response to stressful situations.

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If you participate, you will be asked to attend two scheduled laboratory sessions (one day apart) at the Personality, Aging and Health laboratory on the Loyola campus at Concordia University, and complete 20-minute writing exercises over three consecutive days.

At the first laboratory visit, you will be asked to complete questionnaires, where you will be asked about demographic information, what you think about yourself, emotions and attitudes. This questionnaire will take approximately 30 minutes to complete. Subsequently, you will be asked to complete your first 20-minute writing exercise that involves writing about your daily life. Following the lab visit, you will be asked to complete your second and third 20-minute writing exercises at home prior to your second laboratory visit.
The second laboratory visit will be scheduled one day after the first visit. At the second visit, you will be asked to complete questionnaires (approximately 30 minutes) similar to ones completed at the first visit. Following the questionnaires, you will be asked to complete a stress task that is meant to elicit a biological response to stressful circumstances. As such, you will also be asked to complete saliva samples throughout and after completing the stress task. Saliva samples involve chewing a provided cotton swab for one minute before placing it in its plastic container. The stress task will take approximately 1 hour to complete.

In total, participating in this study will take approximately 3 hours.

C. RISKS AND BENEFITS

You might face certain risks by participating in this research. Since you will be asked to provide information regarding your emotions and attitudes, there is a possibility these questions may cause slight discomfort. There is also the possibility of experiencing negative emotions resulting from the stress task. However, the stress task administered in the study is not meant to elicit stress greater than what you would be exposed to in your daily life. If these tasks have caused sufficient distress that you wish to speak to a mental health professional, the researcher will provide a list of mental health professional resources for you to contact.

You might or might not personally benefit from participating in this research. Potential benefits include: insight into how you think about yourself or your daily life.

D. CONFIDENTIALITY

We will gather the following information as part of this research: demographic information, contact information, and your responses to questionnaires, on the writing exercises and on the stress task.

We will not allow anyone to access the information, except people directly involved in conducting the research, and except as described in this form. We will only use the information for the purposes of the research described in this form.

The information gathered will be coded. That means that the information will be identified by a code. Your name will not be connected to the study information that you provide to us and only the researcher will have a list that links the code to your name.

We will protect the information by keeping all study materials in a locked filing cabinet in the researcher's office and electronic information will be protected in a password-protected file on the researcher's hard drive.

We intend to publish the results of the research. However, it will not be possible to identify you in the published results. We will destroy the information five years after the end of the study and when all the results have been published.

E. BIOLOGICAL SAMPLES

You will be asked to provide saliva samples as part of the research. Tasking these saliva samples involves chewing a provided cotton swab for one minute before placing it in its plastic container. We will use the saliva samples to analyze cortisol, which is a way to assess your biological response to stress. We will keep the saliva samples in our laboratory until the end of the study, when we will send the saliva samples to be analyzed and disposed of at the University of Trier.

F. CONDITIONS OF PARTICIPATION

You do not have to participate in this research. It is purely your decision. If you do participate, you can stop at any time. You can also ask that the information you provided not be used, and

your choice will be respected. If you decide that you don't want us to use your information, you may inform the researcher at anytime.

You will receive $50 for participating in the study. Even if you discontinue your participation, you will receive $50. To make sure that research money is being spent properly, auditors from Concordia or outside will have access to a coded list of participants. It will not be possible to identify you from this list.

We will tell you if we learn of anything that could affect your decision to stay in the research.

There are no negative consequences for not participating, stopping in the middle, or asking us not to use your information.

We will not be able to offer you compensation if you are injured in this research. However, you are not waiving any legal right to compensation by signing this form.

G. PARTICIPANT'S DECLARATION

I have read and understood this form. I have had the chance to ask questions and any questions have been answered. I agree to participate in this research under the conditions described.

NAME (please print) _____

SIGNATURE _____

DATE _____

If you have questions about the scientific or scholarly aspects of this research, please contact the researcher. Their contact information is on page 1. You may also contact their faculty supervisor. If you have concerns about ethical issues in this research, please contact the Manager, Research Ethics, Concordia University, 514.848.2424 ex. 7481 or oor.ethics@concordia.ca.

CONSENT FORM TO PARTICIPATE IN *WRITING, AGING AND HEALTH STUDY*

I have been informed that deceptive information was necessarily provided to me in this study in order to elicit a biological response to a stressful situation. I have been informed of the study's true purpose, and have also been informed that half of participants were asked to write about themselves and the other half were asked to write about their daily lives.

By signing below I am hereby indicating that I have been informed of this minor deception and am allowing my results to be included in the analyses for this study. Given the nature of the deception, I acknowledge that I have been asked to refrain from talking about specific details of this study with my friends or potential study participants.

I acknowledge that I have been given the opportunity to ask the experimenter any questions I have about the study, and/or to voice any concerns I have stemming from my participation in this study. I understand that if I have any questions or concerns following the study, I may contact Sarah Liu, Department of Psychology, (514-848-2424 ext. 2236, Sarah.liu06@gmail.com); or Dr. Carsten Wrosch, Department of Psychology, (514-848-2424 ext. 2231, Carsten.wrosch@concordia.ca)

Name (print): _____

Signature _____

Date _____

Witness _____

If at any time you have questions about your rights as a research participant, please contact the Manager, Research Ethics, Concordia University, (514 – 848 – 2424 ext. 7481, oor.ethics@concordia.ca).

APPENDIX B: Recruitment Materials

Recruitment Materials (Writing, Aging and Health Study)

WRITING, AGING AND HEALTH STUDY

Dr. Wrosch of the Psychology Department at Concordia University is conducting research with older adults (60+). Participants must complete a questionnaire, writing exercise, and have saliva samples collected. Participants must be fluent in written and spoken English. Men encouraged to apply. Compensation $50. Interested?

Email: WAHS.study@gmail.com or call 514 – 848 – 2424 ext. 2236

WRITING, AGING AND HEALTH STUDY

If you are **over the age of 60** and are fluent in spoken and written English, you may be eligible to participate in a Concordia University study looking at how expressive writing may play a role in aging and healthy living.

The study involves:

- Two lab sessions scheduled one day apart (1-1.5 hrs each time), at Concordia's Loyola Campus (7141 Sherbrooke St. West)
- In-lab sessions include questionnaires and saliva samples
- Two take-home writing tasks (20 minutes each)
- You will also be contacted again in 3 months to complete mail-in questionnaires

Participants will be **compensated $50** for their time.

If interested, please contact Sarah at WAHS.study@gmail.com

Or call 514-848-2424 ext. 2236

Men encouraged to apply.

***To take part in the study, you must meet the following inclusion criteria:**

- **Aged 60+**
- Fluent in written and spoken English

APPENDIX C: Questionnaires to Assess Main Study Variables

Questionnaires – Montreal, Aging and Health Study (MAHS)

Questionnaires – Writing, Aging and Health Study (WAHS)

Personal information (MAHS Study)

1. **Sex :** □ Female □ Male

2. **Age** _____ yrs.

3. **Family Status?**
   - □ married
   - □ live with partner but not married
   - □ single
   - □ divorced; please indicate since when _____
   - □ widowed; please indicate since when _____

4. **Working status:** □ Retired □ Still working□ Never worked outside the house

5. **Profession (before retirement)** _____

6. **Current Family income (per year):**

□ Less than 17 000$	□ 17 001$ - 34 000$	□ 34 001$ - 51 000$
□51 001$ - 68 000$	□68 001$ - 85 000$	□more than 85 000$

7. **Height:** _____

8. **Body weight:** _____

9. **What language do you consider your dominant language?** □ English □ French □ Other

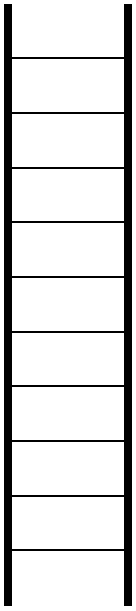
10. **Please rate your level of ability for each of the four skills listed below by using the following rating scheme and circling the appropriate number in the boxes below:**

1 = no ability at all **2** = very little **3** = moderate **4** = very good **5** = fluent ability

Language	Speaking	Reading	Writing	Listening
English	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
French	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

SES and Finances (MAHS Study)

1. **Think of this ladder as representing where people stand in our society. At the top of the ladder are the people who are the best off, those who have the most money, most education, and best jobs. At the bottom are the people who are the worst off, those who have the least money, least education, and worst jobs or no job. Please, place an X on the rung that best represents where you think you stand on the ladder.**



2. **Using a scale from 0 to 10 where 0 means " the worst possible financial situation" and 10 means " the best possible financial situation," how would you rate your financial situation these days?**

Worst **Best**

□ □ □ □ □ □ □ □ □ □ □

0 1 2 3 4 5 6 7 8 9 10

3. **In general, would you say you (and your family living with you) have <u>more money</u> than you need, <u>just enough</u> for your needs, or <u>not enough</u> to meet your needs?**

□ More money than you need □ Just enough money □ Not enough money

4. **How difficult is it for you (and your family) to pay your monthly bills?**

□ Very difficult □ Somewhat difficult □ Not very difficult □ Not at all difficult

Describe Yourself (MAHS Study)

Please mark the appropriate answer for each of the statements below:

	Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**
1. I feel that I'm a person of worth, at least on an equal plane with others.				
2. I feel that I have a number of good qualities.				
3. All in all, I am inclined to feel that I am a failure.				
4. I am able to do things as well as most other people.				
5. I feel I do not have much to be proud of.				
6. I take a positive attitude toward myself.				
7. On the whole, I am satisfied with myself.				
8. I wish I could have more respect for myself.				
9. I certainly feel useless at times.				
10. At times I think I am no good at all.				

Life Regrets (MAHS Study)

People make a lot of important decisions during their lives and they sometimes think that they should have done something differently than they did. For example, a person may believe that she/he would be better off today if she/he had behaved in a different way in the past. In such situations, people might regret their behaviours. In addition, they often want the negative consequences of their behaviours to be undone.

Life regrets might result from things that people have done (e.g., having pursued a fruitless goal) and from things that people have not done (e.g., not having pursued a certain goal) across a number of different life domains (e.g., work, family, spouse, health). Regrets are related to decisions in people's daily lives (e.g., not having visited a friend) and to people's long-term development (e.g., having pursued inappropriate career goals).

Please think for a moment about your life. Is there anything in your life that you regret having done or not having done? Please think about your regrets and write down your most severe life regret.

_____

_____

1. We would like to ask you some specific questions concerning the regret that you have noted.

1. Does the regret that you have noted relate to a behaviour
   - □ that you have done
   - □ that you have *not* done

2. When did the behaviour occur that has lead to the regret? (please try to indicate the exact number of months and years ago that the event occurred)

   _____ months ago _____ years ago

3. How likely is it that the negative consequences of the event can in fact be undone?

Very Unlikely				**Very Likely**
☐	☐	☐	☐	☐
1	2	3	4	5

4. How likely is it that the negative consequences of the event will in fact be undone?

Very Unlikely				**Very Likely**
☐	☐	☐	☐	☐
1	2	3	4	5

5. How much effort do you invest in undoing the negative consequences of the event?

No Effort at all				**A Lot of Effort**
☐	☐	☐	☐	☐
1	2	3	4	5

6. How strongly are you committed to undoing the negative consequences of the event?

Not at all Committed				**Very Much Committed**
☐	☐	☐	☐	☐
1	2	3	4	5

Life Regrets (cont'd)

2. People usually experience different emotions when they think about their regrets. We would like to ask you to what extent you usually experienced the following emotions **during the past few months** when and if you thought about the regret that you noted.

	Not at all	**A little**	**Somewhat**	**Quite a bit**	**Extremely**
1. Sorrow					
2. Angry					
3. Sentimental					
4. Desperate					
5. Irritated					
6. Nostalgic					
7. Helpless					
8. Embarrassed					
9. Contemplative					

3. Below is a list of comments made by people who experienced life regrets. Please indicate how frequently these comments were true for you **during the past few months** by checking the appropriate box.

	Not at all	**Rarely**	**Sometimes**	**Often**
1. I had trouble falling asleep because I couldn't stop thinking about the regret.				
2. I woke up at night thinking about the regret.				
3. I had difficulty concentrating on my work or daily activities because thoughts about the regret kept entering my mind.				
4. Once I start thinking about the regret I find it hard to think about (focus my attention on) other things.				
5. Thoughts about the regret interfered with my ability to enjoy social or leisure activities.				

Well-Being (MAHS Study)

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you will be asked to indicate how often you have felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the response option that seems like a reasonable estimate.

In the last month, how often have you …	**Never**	**Almost Never**	**Some-times**	**Fairly Often**	**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. …felt confident about your ability to handle your personal problems?					
5. …felt that things were going your way?					
6. …found that you could not cope with all the things that you had to do?					
7. …been able to control irritations in your life?					
8. …felt that you were on top of things?					
9. …been angered because of things that happened that were outside of your control?					
10. …felt difficulties were piling up so high that you could not overcome them?					

Personal information (WAHS Study)

11. Sex : ☐ Female ☐ Male

12. Age _____ yrs.

13. Family Status?

- ☐ married
- ☐ live with partner but not married
- ☐ single
- ☐ divorced; please indicate since when _____
- ☐ widowed; please indicate since when _____

14. Working status: ☐ Retired ☐ Part-time Work ☐ Full-time Work
☐ Never worked outside the house

15. Profession (before retirement) _____

16. Highest Level of Education Completed

- ☐ None
- ☐ High School
- ☐ Collegial or Trade School
- ☐ Bachelor's Degree
- ☐ Masters or Doctorate Degree

17. Current Family income (per year):

☐ Less than 17 000$ ☐ 17 001$ - 34 000$ ☐ 34 001$ - 51 000$
☐ 51 001$ - 68 000$ ☐ 68 001$ - 85 000$ ☐ more than 85 000$

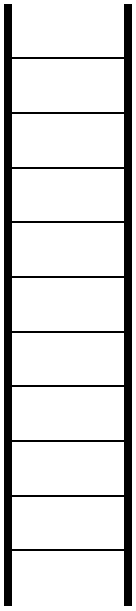
18. Height: _____

19. Body weight: _____

20. What language do you consider your dominant language? ☐ English ☐ French ☐ Other; please specify _____

SES and Finances (WAHS Study)

5. **Think of this ladder as representing where people stand in our society. At the top of the ladder are the people who are the best off, those who have the most money, most education, and best jobs. At the bottom are the people who are the worst off, those who have the least money, least education, and worst jobs or no job. Please, place an X on the rung that best represents where you think you stand on the ladder.**



6. **Using a scale from 0 to 10 where 0 means " the worst possible financial situation" and 10 means " the best possible financial situation," how would you rate your financial situation these days?**

Worst **Best**

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

0 1 2 3 4 5 6 7 8 9 10

7. **In general, would you say you (and your family living with you) have <u>more money</u> than you need, <u>just enough</u> for your needs, or <u>not enough</u> to meet your needs?**

☐ More money than you need ☐ Just enough money ☐ Not enough money

8. **How difficult is it for you (and your family) to pay your monthly bills?**

☐ Very difficult ☐ Somewhat difficult ☐ Not very difficult ☐ Not at all difficult

Describe Yourself: (WAHS Study)

Please mark the appropriate answer for each of the statements below:

	Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**
1. I feel that I'm a person of worth, at least on an equal plane with others.				
2. I feel that I have a number of good qualities.				
3. All in all, I am inclined to feel that I am a failure.				
4. I am able to do things as well as most other people.				
5. I feel I do not have much to be proud of.				
6. I take a positive attitude toward myself.				
7. On the whole, I am satisfied with myself.				
8. I wish I could have more respect for myself.				
9. I certainly feel useless at times.				
10. At times I think I am no good at all.				

Well-Being: (WAHS Study)

This scale consists of a number of words that describe different feelings and emotions. Read each item and indicate to what extent you experienced the following emotions **during the past year**.

	Very slightly or not at all	**A little**	**Moderately**	**Quite a bit**	**Extremely**
1. Interested					
2. Distressed					
3. Excited					
4. Upset					
5. Strong					
6. Guilty					
7. Scared					
8. Hostile					
9. Enthusiastic					
10. Proud					
11. Irritable					
12. Alert					
13. Ashamed					
14. Inspired					
15. Nervous					
16. Determined					
17. Attentive					
18. Jittery					
19. Active					
20. Afraid					

Well-Being: (WAHS Study)

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you will be asked to indicate how often you have felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the response option that seems like a reasonable estimate.

In the last month, how often have you …	**Never**	**Almost Never**	**Some-times**	**Fairly Often**	**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. …felt confident about your ability to handle your personal problems?					
5. …felt that things were going your way?					
6. …found that you could not cope with all the things that you had to do?					
7. …been able to control irritations in your life?					
8. …felt that you were on top of things?					
9. …been angered because of things that happened that were outside of your control?					
10. …felt difficulties were piling up so high that you could not overcome them?					

Well-Being: (WAHS Study)

The questions in this scale ask you about your feelings and thoughts **during the past 20 minutes**. In each case, you will be asked to indicate how often you have felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the response option that seems like a reasonable estimate.

In the past 20 minutes, how often have yo …	**Never**	**Almost Never**	**Sometimes**	**Fairly Often**	**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. …felt confident about your ability to handle your personal problems?					
5. …felt that things were going your way?					
6. …found that you could not cope with all the things that you had to do?					
7. …been able to control irritations in your life?					
8. …felt that you were on top of things?					
9. …been angered because of things that happened that were outside of your control?					
10. …felt difficulties were piling up so high that you could not overcome them?					

APPENDIX D: Writing Intervention Materials

Writing exercise instructions

Intervention Group in-lab writing exercise instructions (oral script)

Intervention Group writing exercise booklet instructions

Control Group in-lab writing exercise instructions (oral script)

Control group writing exercise booklet instructions

Intervention Group in-lab writing exercise instructions (oral script)

For the next three days (including today in our lab), I would like you to spend 20 minutes on this writing exercise. Please set the timer for 20 minutes, record the time you begin the exercise and the time at completion. You can start the timer as soon as you have read the instructions.

I would like for you to write about yourself. Specifically, I would like you to name 3 qualities about yourself and elaborate on those qualities by describing specific examples or situations. These qualities can relate to past experiences and pleasant memories. For example, you could describe a time where you were at your best and how it contributed to a quality that you have. Please include as much detail and descriptions as possible.

All of your writing will be completely confidential. Don't worry about spelling, sentence structure, or grammar. The only rule is that once you begin writing, continue to do so until the 20 minutes is up.

In addition, please take a moment to complete our follow-up question at the end of the allotted space.

You may begin by filling in the date and current time. I will start the timer now ***–Researcher starts timer-***

Encourage participant to continue writing for the full 20 minutes. If the participant is unwilling to continue on this topic, the researcher may show the participant this list of Alternative Topics to choose from to continue the writing assignment until the time is up.

Alternative Topics:

1) Name 3 qualities about yourself
2) Think about a situation where you helped another person
3) Write about 3 good things that happened in your life, because you made them happen
4) Describe a time where you were your best
5) Describe something you do well
6) What is your greatest talent?
7) What is the best compliment you've received?

8) Write down 5 things that define who you are, listing them as "I am ____" statements. Which quality feels best?

Make a note on the instruction sheet (beside the "time ended_____") if participant used the Alternative Topics sheet.

Intervention Group writing exercise booklet instructions

Intervention Group Instruction (printed on booklet) Day 1:

For the next three days (including today in our lab), I would like you to spend 20 minutes on this writing exercise. Please set the timer for 20 minutes, record the time you begin the exercise and record the time at completion. You can start the timer as soon as you have read the instructions.

I would like for you to write about yourself. Specifically, I would like you to name **3 qualities about yourself** and elaborate on those qualities by describing specific examples or situations. These qualities can relate to past experiences and pleasant memories. For example, you could describe a time where you were at your best and how it contributed to a quality that you have. Please include as much detail and descriptions as possible.

All of your writing will be completely confidential. Don't worry about spelling, sentence structure, or grammar. The only rule is that once you begin writing, continue to do so until the 20 minutes is up.

You may begin by filling in the date and current time.

In addition, please take a moment at the end to complete one follow-up question.

Thank you! You have completed the writing exercise for Day 1.

Please take a moment to answer our follow-up question. Please circle the appropriate box.

1. Did you find it challenging to write about yourself?

Not at all	A little	Somewhat	Quite a bit	Extremely

Intervention Group Instruction (printed on booklet) Day 2:

For the next two days, I would like you to spend 20 minutes on this writing exercise. Please set the timer for 20 minutes, record the time you begin the exercise and record the time at completion. You can start the timer as soon as you have read the instructions.

I would like for you to write about yourself. Specifically, I would like you to think about a time where you helped another person, and write down the situation with as much detail as possible. Alternatively, you can also write about 3 good things that happened in your life, because you made them happen. Please include as much detail and descriptions as possible.

All of your writing will be completely confidential. Don't worry about spelling, sentence structure, or grammar. The only rule is that once you begin writing, continue to do so until the 20 minutes is up.

In addition, please take a moment at the end to complete one follow-up question.

Please record the current time, and start the timer now.

Thank you! You have completed the writing exercise for Day 2.

Please take a moment to answer our follow-up question. Please circle the appropriate box.

1. Did you find it challenging to write about yourself?

Not at all	**A little**	**Somewhat**	**Quite a bit**	**Extremely**

Intervention Group Instruction (to be printed on booklet) Day 3:

On this last day, I would like you to spend 20 minutes on this writing exercise *before* your scheduled laboratory session. Please set the timer for 20 minutes, record the time you begin the exercise and record the time at completion. You can start the timer as soon as you have read the instructions.

I would like for you to write about yourself. Specifically, I would like you to describe something you do well. What is your greatest talent? These points can relate to past experiences.

Alternatively, you can also describe and write down the best compliment you've received. Please include as much detail and descriptions as possible.

All of your writing will be completely confidential. Don't worry about spelling, sentence structure, or grammar. The only rule is that once you begin writing, continue to do so until the 20 minutes is up.

In addition, please take a moment at the end to complete one follow-up question.

Please record the current time, and start the timer now.

Thank you! You have completed the writing exercise for Day 3.

Please take a moment to answer our follow-up question. Please circle the appropriate box.

1. Did you find it challenging to write about yourself?

Not at all	A little	Somewhat	Quite a bit	Extremely

Control Group in-lab writing exercise instructions (oral script)

For the next three days (including today in our lab), I would like you to spend 20 minutes on this writing exercise. Please set the timer for 20 minutes, record the time you begin the exercise and record the time at completion. You can start the timer as soon as you have read the instructions.

I would like for you to write about what you have done the previous day. I would like you to describe your day as accurately and as objectively as possible. Please try to leave out emotions, feelings, or opinions. For example, you can begin by listing what time you woke up and what you did after getting out of bed. Remember to include as much detail as possible. Take your time! You have 20 minutes to write.

All of your writing will be completely confidential. Don't worry about spelling, sentence structure, or grammar. The only rule is that once you begin writing, continue to do so until the 20 minutes is up.

You may begin by filling in the date and current time. I will start the timer now ***–Researcher starts timer-***

Control Group writing exercise booklet instructions

Control Group Instruction (to be printed on booklet) Day 1:

For the next three days (including today in our lab), I would like you to spend 20 minutes on this writing exercise. Please set the timer for 20 minutes, record the time you begin the exercise and record the time at completion. You can start the timer as soon as you have read the instructions.

I would like for you to write about what you have done the previous day. I would like you to describe your day as accurately and as objectively as possible. Please refrain from including emotions, feelings, or opinions. For example, you can begin by listing what time you woke up and what you did after getting out of bed. Take your time and remember to include as much detail as possible.

All of your writing will be completely confidential. Don't worry about spelling, sentence structure, or grammar. The only rule is that once you begin writing, continue to do so until the 20 minutes is up.

Please record the current time, and start the timer now.

Thank you! You have completed the writing exercise for Day 1.

Control Group Instruction (to be printed on booklet) Day 2:

For the next two days, I would like you to spend 20 minutes on this writing exercise. Please set the timer for 20 minutes, record the time you begin the exercise and record the time at completion. You can start the timer as soon as you have read the instructions.

I would like for you to write about what you have done today, or what you will be doing today. I would like you to describe your day as accurately and as objectively as possible. Please refrain

from including emotions, feelings, or opinions. For example, you can begin by listing what time you woke up and what you did after getting out of bed. Take your time and remember to include as much detail as possible.

All of your writing will be completely confidential. Don't worry about spelling, sentence structure, or grammar. The only rule is that once you begin writing, continue to do so until the 20 minutes is up.

Please record the current time, and start the timer now.

Thank you! You have completed the writing exercise for Day 2.

Control Group Instruction (to be printed on booklet) Day 3:

On this last day, I would like you to spend 20 minutes on this writing exercise *before* your scheduled laboratory session. Please set the timer for 20 minutes, record the time you begin the exercise and record the time at completion. You can start the timer as soon as you have read the instructions.

I would like for you to write about what you plan to do tomorrow. I would like you to describe your day as accurately and as objectively as possible. Please refrain from including emotions, feelings, or opinions. For example, you can begin by listing what time you plan to wake up and what you will do after you get out of bed. Take your time and remember to include as much detail as possible.

All of your writing will be completely confidential. Don't worry about spelling, sentence structure, or grammar. The only rule is that once you begin writing, continue to do so until the 20 minutes is up. Please record the current time, and start the timer now.

Thank you! You have completed the writing exercise for Day 3.

APPENDIX E: Stress Task Materials

MIST oral script instructions

Saliva sampling schedule

MIST Record Form

Montreal Imaging Stress Task (MIST) oral script

Introduction to the task (DO THIS IN THE TESTING ROOM):

"During the task, I will be interrupting you to take saliva samples. The saliva samples are used to assess hormones that your body excretes throughout the day. The hormone is called, cortisol. We will be taking a total of 5 samples throughout the task today. I will provide you with a tube, called a salivette, and ask you to open the tube in order to take out the cotton swab. We will ask you to insert the swab into your mouth for 1 minute in order to collect your saliva. It helps to think about lemons or something sour so that we may have enough saliva to collect. Please refrain from chewing the swab, and just leave the swab in your mouth. I will then ask you to spit the swab back into the tube and close it."

Take Saliva Sample 1 WRITE DOWN TIME ON LABEL*

"One goal of this study is to investigate mechanisms underlying the effects of stress on cognitive functioning. Here, we define stress as performing a challenging mental arithmetic task. While the task requires you to pay attention and concentrate, it is a task that most people complete with above 85% success rate."

Use example color print-outs of the screen that participants will be seeing

"You will be undergoing two task conditions."

"During a Practice Trial, you will be given a math question, and the outline of the window will be green. *–The participant can be shown a screen-shot of the control condition.*- You are required to solve the question and you will need to submit your response by using the on-screen rotary dial. *– Show participant screen-shot of rotary dial*- To move the dial to the right, you will need to press the 3 key. To move the dial to the left, you will need to press the 1 key. Once you are sure of your response, you will need to confirm it, and you will do this with the 2 key. Once you submit your response, you will see feedback with respect to your performance: correct or incorrect. *–The subject can be shown the image of the control condition feedback screen*. However, because there is a green outline around the window, this means that your performance is not recorded, and it does not count toward your performance score. Your performance starts counting when you are in the Testing Condition, as I will explain to you now"

"After the Practice Trial, you will be given the Testing Condition and it is outlined with red. *– The participant can be shown a screen-shot of the experimental condition.*- This is the condition that is of utmost importance. Here, I would like you to pay attention and concentrate, and do your absolute best to complete the questions that will be given to you. During the testing, you will see the performance colour bar at the top of the screen, indicating red, yellow and green sections, with two arrows on the bar. The top arrow indicates the average performance of someone your age. The bottom arrow indicates your performance, based on each completed question. Therefore, performance during this condition really counts because it is important that you stay within the green zone during the Testing – indicating that you are matching the average performance. *–Show participant performance bar on the screen-shot.*- In addition, you will see a

timer –*show participant progress time bar.*- which indicates how much time you have to answer the question. Finally, once you submit your answer, you will also receive immediate feedback on your performance for that question: correct, incorrect or timeout. –*The participant can be shown the screenshot of the Experimental Condition feedback.*- It is important to note that while you are doing this task, our investigator as well as the research staff will also be evaluating your performance."

"Do you have any questions?"

"We will start the practice trial now"

****Run Practice Trial 1minute [ENTER IN 60 seconds]****

"How did the practice trial go? Do you have any questions before the Testing Condition?"

If yes, answer questions/troubleshoot.
If no, "We will start the Testing Condition now. Please try your best to match the performance of the average user, as our investigator will also be checking in on your performance."

****Run Experimental Trial set for 11 minutes [ENTER IN 660 seconds]**** *[Remember to upload sound file]*
*******RECORD START TIME OF MIST (located on MIST performance sheet)**********
****SET TIMER**** **CALCULATE Saliva Sample 3 (estimated) time *******

Interrupt at 10 minutes. Shut MIST program completely.

"Hi _____. We will do another saliva sample now."

***Take Saliva Sample 2** WRITE DOWN TIME ON LABEL*

While the participant is completing the saliva sample, the Research Assistant provides stern feedback on their performance. The Research Assistant should be very serious, and stern. Try to do this part of the script while they're doing the sample, so it doesn't waste much time.

"We have been following your performance while you were doing the task, and I have to say that you are not doing as well as we were expecting you to. So far, your performance is below that of the average user your age. I have to emphasize that it is really important to do the best that you can do to keep up with the performance of the average user. Otherwise we won't be able to use your data. Ok? I will collect the salivette now."
***Continue to run Experimental Trial** *[Remember to upload sound file]*
SET TIMER for 2 minutes!!*

Interrupt at 2 minutes. Shut MIST program completely.

"Hi again. We just wanted to double check that everything is ok with the keyboard. Are you having any problems with them? It's puzzling that your performance is consistently below

average, and always in the red zone on the performance bar. If you cannot keep up with the average user, or stay within the green zone, we would really like you to at least attempt to pull up your performance and stay within the yellow section. Otherwise, we really cannot use this data."

"Let's try it again"

Continue to run Experimental Trial set for 5 minutes [ENTER IN 300] *[Remember to upload sound file]*
***Set timer for 4.5 minutes!* (to be ready to jump in as soon as task is over)*

Go in when task is over. WITH THE SUPERVISOR

"Hi again. My supervisor has insisted that we look at your performance as you are completing the task. During that session you were asked to solve XX problems, you answered XX correct, XX incorrect, and XX timeout. With that performance you are about 22% lower than the average user. Since we are still detecting those problems, and just want to make sure that you are trying your best.
Before we start again, we would like to gather some information. What amount of mental arithmetic (in hours), on average would you say you do per day? What is your highest level of education? Have you been experiencing any cognitive difficulties, particularly with mental math in the last week (ex., counting change, paying for bills..etc)? Thank you.

We will run the experiment one more time, and again please try your best. My supervisor and I will be monitoring your progress to make sure nothing goes wrong and that you are performing at least in the Yellow sector."

-Research Assistant and "Supervisor" chat behind the participant while participant is completing the task-

Continue to run Experimental Trial set for 3 minutes [ENTER IN 180 secs]* *[Remember to upload sound file]*

"You have completed the task. We will take another saliva sample now."

Take Saliva Sample 3** WRITE DOWN TIME ON LABEL ***SHOULD BE ~25 minutes from start time of experimental trials*

"The final performance wasn't so bad. Thank you for your participation."
"Now we will just ask you to wait here while we take a couple more saliva samples.

While you are waiting, please complete these questionnaires and answer the questions to the best of your ability. I will come back into the room for your next saliva sample."

****Time 20 minutes****

"Thanks for waiting; we will take another saliva sample now."

****Take Saliva Sample 4*** WRITE DOWN TIME ON LABEL*

"We have one more saliva sample to collect. Have you completed the questionnaire?" If yes, direct participant to reading material, "Here are some magazines while we wait to complete the last saliva sample." If no, "Please continue the questionnaire."

****Time 20 minutes***

"Thank you again for waiting; we will take our last saliva sample now."

****Take Saliva Sample 5*** WRITE DOWN TIME ON LABEL*

"This concludes the study, we just have to go over the purposes of the study before you leave. However, just before we do that I would like to ask you a question."

How stressed did you feel at the end of the math task? On a scale of 1 to 5; 1 being not stressed at all to 5, very stressed?" (Record on "MIST Performance Sheet")
Debrief: See Debrief Script.

Saliva sampling schedule; in relation to the onset of the MIST

Saliva sample	Timing
1	Before introduction of task
2	10 minutes into task
3	20 minutes into task (end of task)
4	40 minutes in relation to start of task (20 min post MIST)
5	60 minutes in relation to start of task (40 min post MIST)

MIST Record

START TIME OF EXPERIMENTAL TRIALS: _____PM

ESTIMATED SALIVA SAMPLE 3 TIME (~25 min): _____PM

MIST Performance

_____Number of Tasks _____Correct _____Incorrect

MIST Questions

1. What amount of mental arithmetic (in hours), on average would you say you do per day?

2. What is your highest level of education?
   (If undergrad) What are you studying?

3. Have you been experiencing any cognitive difficulties, particularly with mental math in the last week? For example, you had trouble counting change, paying for bills, that sort of thing?

Saliva Sample Number	Time Taken
1	
2	
3	
4	
5	

"How stressed did you feel at the end of the math task?
On a scale of 1 to 5; 1 being not stressed at all to very stressed?"

_____