Getting Better with Age: Single-Nucleotide Polymorphisms in the Relations among
Social Identity, Resilience, and Mental Health among Retirement Community Residents

by

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Abstract

Given the dynamic nature of mental health throughout the lifespan, this study examined associations among several psychosocial factors, single-nucleotide polymorphisms (SNPs) for *brain-derived neurotrophic factor (BDNF)*, *neuropeptide y (NPY)*, and *oxytocin receptor (OXTR)*, and mental health among older ($N=88$) and younger adults ($N=369$). Older age was related to lower stress and depression, greater social identity and resilience, and various coping styles. Moreover, *OXTR* moderated the direct relationship between age and depression, as well as the mediating roles of identity and coping in that relation. *OXTR* also moderated the mediating role of coping in the relation between social identity and depression. However, age also moderated this relation both directly, and indirectly through the mediating role of resilience. These results suggest that identity, resilience, coping and *OXTR* may be protective to mental health, but that these factors may impact the mental health of older and younger adults differently.

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Introduction

Older adults are a highly diverse group of individuals, so it is no surprise that the relationship between aging and mental health is complex. Indeed, mental health is often influenced by a variety of personal (e.g., resilience), social (e.g., support), and biological factors (e.g., genetic mutations), many of which can change as individuals age. In this regard, upwards of 20% of older adults in retirement communities have depression (Stewart et al., 2014), compared to the prevalence of depression in the general population of 16% (Disner, Beevers, Haigh, & Beck, 2011). Symptoms of depression include, but are not limited to, anhedonia, sadness, concentration problems, fatigue, and even suicidal ideation (Disner, et al., 2011). It follows that individuals who are more resilient tend to have better mental health as shown through fewer symptoms of depression and anxiety. Resilience is the ability to adapt to stress, or to create a favourable outcome out of an adverse event, and generally decreases with age (McEwen, 2016). However, older adults who are able to maintain a high degree of social connectedness may benefit from the social support offered therein in the form of greater resilience with life's stressors (McEwen, 2002). Indeed, individuals who are members of meaningful, positive social groups tend to have fewer symptoms of depression or anxiety (Cruwys, Haslam, Dingle, Haslam, & Jetten, 2014; Haslam, Jetten, Postmes, & Haslam, 2009). This may be due, in part, to their sense of social identity. Social identity theory proposes that our sense of self is intertwined with the groups in which we have membership, and that these groups have a strong impact on our psychology—that is, a sense that one is socially connected and supported by other group members (Tajfel & Turner, 1979; Haslam et al., 2009; Haslam, 2014).

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From a biological perspective, single nucleotide polymorphisms (SNPs) have been linked with psychological variables. SNPs are defined as point mutations (mutations resulting in the change of a single nucleotide) that occur with a frequency of greater than 1% of the population (Hine & Martin, 2015). Individuals with genetic risk variants of brain derived neurotrophic factor (*BDNF*), neuropeptide y (*NPY*), and oxytocin receptor (*OXTR*), have been shown to exhibit poorer mental health in terms of depression, anxiety, and stress reactivity. For instance, there is a relationship between the Val(66)Met *BDNF* risk SNP and lower levels of resiliency, as well as higher incidences of depression, anxiety, and negative affect in response to social stress (Colzato et al., 2011). *NPY* may also play a role, as higher levels during stress are negatively related to psychological distress (Morgan et al., 2002). Along these lines, genetic risk variants of *NPY* have been linked to reduced resilience, as well as heightened symptoms of depression and anxiety (Zhou et al., 2008). There is also a relationship between *OXTR* risk polymorphisms and elevated stress reactivity, as well as social support seeking and empathy (Kim et al., 2010; McQuaid et al., 2013). In light of these complex relationships, it is likely that genetic differences may confer vulnerability factors that influence resiliency, identification, and depression. Much current research linking polymorphisms and psychosocial factors (such as social identity, coping, depression, and resilience) has been conducted with younger adults; however, such relations among older individuals have been largely ignored (Ebner et al., 2013; Chagnon et al., 2015). In this way, it is possible that biological predisposition acts as a first risk factor and age as a second factor, making older adults more vulnerable to symptoms of poor mental health compared to younger individuals.

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In the present study, these relationships will primarily be examined in an older population, with a younger population for comparison. Specifically, older and younger adults will be assessed for depressive symptoms, resilience, social identity, and coping styles used to deal with stressors. These psychosocial variables will be analyzed along with the aforementioned genetic variants (*BDNF*, *NPY*, *OXTR*), in order to determine the potential relationships between these biological and psychosocial components in an older group of individuals.

Social Groups and Identification

Social involvement is positively associated with stronger mental health, and this is particularly important when considering older cohorts, since loneliness is reported in as many as 40% of seniors and is related to higher incidences of mortality and functional decline (Perissinotto, Stijacic, & Covinsky, 2012). Moreover, older adults who exhibit depressive or lonely symptoms also self-report low levels of social interaction and feelings of togetherness (Tiikkainen & Heikkinen, 2005). Along these lines, having less social support has been linked with higher incidences of depressive symptoms in older adults, suggesting a vital role for social interaction in promoting better mental health (Vanderhorst & McLaren, 2005).

Tajfel (1974) originally defined social identity as having a portion of the sense of self derived from the social groups with which people belong. Here, it follows that those who derive a sense of meaning, belonging, and purpose from their groups will have more positive social identities and better mental health (Haslam et al., 2009). There are many aspects of social groups that can be beneficial to a person as they age, including the number of social groups or contacts, their quality or feelings of connectedness, and the

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group type (Tiikkainen & Heikkinen, 2005). For instance, membership in a religious group was associated with fewer depressive symptoms in older adults, even more so than other types of social groups (Ysseldyk, Haslam, & Haslam, 2013). Moreover, those who are satisfied with their amount of social participation and who are involved in volunteer and/or exercise groups are less likely to have or to develop depression (Hong, Hasche, & Bowland, 2009). Of course, these associations may be bidirectional, where those who have better mental health may be more likely to have larger social networks as well as more social interaction (Voils et al., 2007). Conversely, *lack* of social involvement, including low network size and quality, is also a risk factor for the development of anxiety disorders in older adults, suggesting a possible role for social networks in mitigating anxiety (Lindesay, Stewart, & Bisla, 2012). Thus, having more social groups—and especially identifying with those groups—is consistently related to more positive mental health outcomes (Haslam et al., 2009).

However, social groups often diminish in number and change in character as individuals age (Charles & Carstensen, 2010). This is especially true during major times of transition such as illness or retirement (Steffens et al., 2016). Thus, social participation is highly important for older cohorts, since identifying with multiple social groups is thought to act as a buffer for aging, stress, life transitions, identity loss, and change (Haslam et al., 2008). Individuals (and particularly retirees) who become less socially active are at a heightened risk for poor health outcomes such as increased risk of depression, cognitive impairment, and mortality (Steffens et al., 2016). In contrast, retirees who continue to belong to social groups have lower incidences of mortality and higher quality of life. For example, in a sample of stroke victims, belonging to more

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social groups was related to better well-being, also indicating that social groups can protect mental health during transitory times (Haslam et al., 2008). Along these lines, the activity theory of aging proposes that those who are socially active as they age are more likely to have better mental health (Hasworth & Cannon, 2015). Indeed, maintaining participation in social groups and activities throughout the lifespan can act as a buffer against adverse events, especially during times of transition, and potentially result in better mental health outcomes (Haslam et al., 2008; Ysseldyk, Haslam, & Haslam, 2013).

From a therapeutic standpoint, social programs can have a positive impact on mental health (Cruwys et al., 2014). For instance, in an intervention where retirement home residents were placed into groups to plan the remodeling of their lounge, those who were empowered with group-based decision-making for those design changes demonstrated greater improvements in social identification and cognitive function than non-intervention control groups (Haslam et al., 2014). Similarly, male seniors who participated in “gentlemen clubs,” i.e. groups for men specifically, showed increases in social identification as well as decreases in anxiety and depression (Gleibs et al., 2011). Taken together, these results provide further support for the importance of social groups and feelings of social identity in aging, and show the potential for social group interventions in improving mental health, particularly when those groups empower individuals with the support and coping strategies they need to be resilient during times of stress.

Resilience and Coping

One of the functions that social groups may play in promoting healthy aging is to support individuals' sense of resilience in response to stressors associated with aging

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(Moore et al., 2015). Resilience is broadly defined as the ability to successfully cope with stress and adversity, denoted by the ability to maintain or regain biopsychosocial homeostasis in the presence of stress (McEwen, 2016). In another sense, it can be conceptualized as the ability to preserve allostasis (the maintenance of homeostasis) during stress, and the minimization of allostatic overload—the biological damage resulting from the mismanagement of stress (McEwen, 2000). In the event that actions to deal with, or prevent, a particular stressor are no longer effective, an individual will either respond to this disruption in a positive way by finding a better way to cope (thereby minimizing allostatic overload) or will respond in a dysfunctional way by using maladaptive coping strategies (such as rumination or other emotion-focused strategies; Connor & Davidson, 2003; Matheson & Anisman, 2003). Here, it follows that those who are more likely to use such maladaptive coping strategies are also more likely to suffer from depression or anxiety disorders.

In addition to specific coping strategies, social groups and support are protective against allostatic overload, suggesting that social identities themselves may also play an important role in resilience (McEwen, 2016). For example, social support was associated with lower levels of perceived stress and greater self-reported successful aging, suggesting a role for social support in successful coping (Moore et al., 2015). Similarly, maintaining identities and social resources was related to greater resilience in older adults (Hildon, Smith, Netuveli & Blane, 2008). Moreover, older adults who self-reported greater resilience also tended to have lower perceived stress, less depression, and better self-reported successful aging (Jeste et al., 2013; Moore et al., 2015). Thus, both resilience and social support likely play prominent roles in promoting positive mental

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health among seniors, potentially through lowering perceived stress. Taken together, these studies suggest that older adults who are more resilient (including those who exhibit better coping mechanisms) are less likely to suffer from symptoms of depression and anxiety, and more likely to exhibit better overall mental health outcomes (Lavretsky, 2010).

Age is also commonly associated with specific stressor appraisals and coping strategies (Aldwin, Sutton, Chiara, & Spiro, 1996; Folkman, Lazarus, Pimley, & Novacek, 1987). In this way, increasing age has been linked with appraising stressors more positively, although these effects may be due in part to the changing nature of stressors with age (Aldwin, Sutton, Chiara, & Spiro, 1996; Diehl, Coyle, & Labouvie-Vief, 1996). More specifically, it has also been demonstrated that older adults tend use more problem-focused coping (Richaud de Minzi & Sacchi, 2005), where the use of problem-focused coping has been related to lower stress (Trouillet, Doan-Van-Hay, Launay, & Martin, 2011). Moreover, in older individuals, participation in certain types of social groups (including volunteer, religious, and physically active groups) was related to differential coping strategies (depending on group type), such as using less rumination, emotional expression, active distraction, and cognitive restructuring (Pochopsky, Ysseldyk, Matheson & Anisman, 2017). Here, adaptive coping strategies were related to better mental health outcomes including lower self-reported depression and anxiety (Pochopsky et al., 2017). This suggests that although age may be related to vulnerabilities in mental health, specific types of group participation and identities may influence coping strategies, which, in turn, may be protective of mental health as people age.

Biological Factors Implicated in Mental Health

Along with the importance of social factors in successful aging, it is also important to consider the potential impact of biological components in the mental health of older adults. Brain derived neurotrophic factor is highly implicated in neuronal survival and plasticity; deficits are linked with poor mental health (Budni et al., 2015; Sen, Duman, & Sanacora, 2008). Another biological component, neuropeptide Y, is related to aging and mental health as reductions to its levels are linked with aging and worsening psychological outcomes (Botelho & Cavadas, 2015). Differences in the levels of oxytocin are also related to age as well as different measures of social behaviour and mental health (Heinrichs, Baumgartner, Kirschbaum, & Ehlert, 2003). Given these relationships, it would be useful to understand how specific genetic variants of these factors are related to mental health (specifically depression and stress) and how these outcomes are different for older versus younger adults.

Brain derived neurotrophic factor. Brain derived neurotrophic factor (BDNF) is another biological component implicated in mental health (Sen, Duman & Sanacora, 2008). Specifically, BDNF is a neurotrophin that aids in neuronal survival, dendritic branching, synaptic plasticity and differentiation (Budni et al., 2015). It is expressed in different levels in a number of regions in the nervous system, and is also involved in the regulation of long-term potentiation and depression (Leal, Afonso, Salazar & Duarte, 2015). It acts through interactions with tropomyosin- related kinase (Trk) receptors, in particular through binding TrkB (Lu, Christian, & Lu, 2008). Changes in BDNF levels are associated with differences in affective states as well as diseases related to cognitive

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decline, such as mild cognitive impairment, Alzheimer's and other forms of dementia (Budni et al., 2015).

The hippocampus, which is involved in learning and memory, has strong connections with the prefrontal cortex and amygdala, and aids in the regulation of the stress response via down regulation of hypothalamic pituitary adrenal (HPA) axis functioning (Duman & Monteggia, 2006). Thus, the hippocampus is important in emotional regulation and control as well as cognition. Since both acute and chronic stress have been associated with decreases in levels of neurotrophins (and particularly BDNF) in the hippocampus, it has been suggested that BDNF may play a role in depression or anxiety symptomatology (Duman & Monteggia, 2006). In particular, BDNF levels are significantly lower in individuals with depression, and these levels can be increased with efficacious antidepressant treatment (Sen, Duman, & Sanacora, 2008). The relation between reduced levels of BDNF and greater symptoms of depression is also evident in older adults, as lower levels have been linked with bipolar disorder (Soares et al., 2016). There is also evidence from animal models that social isolation is related to reductions in hippocampal levels of BDNF, although it is unclear whether this is the case in humans (Scaccianoce et al., 2006). In these ways, it is likely that BDNF plays a role in mental health, and that reduced levels of BDNF are associated with poorer mental health outcomes and possibly lack of social support (Duman & Monteggia, 2006).

Importantly, there are also relationships between different genetic variants of *BDNF*, in particular the Val(66)Met polymorphism, and cognition as well as depression (Kambeitz et al., 2012). Specifically, those carrying the A allele (coding for Met) in the rs6265 variant, tend to have reduced extracellular BDNF levels and activity-dependent

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secretion in comparison to G carriers (coding for Val), due to detriments to the trafficking of BDNF precursors in dendrites. In addition, those carrying the A allele (as opposed to the G allele), had lower hippocampal volume as well as activation during memory and decision-making tasks, and worse performance on tasks using declarative memory. A carriers also tend to produce stronger anticipatory responses to stressful events, as measured by cortisol levels in combination with anxiety measures, and are more likely to have higher social anxiety (Colzato et al., 2011). Similarly, these individuals experienced higher levels of negative affect in response to social stress in particular (Van Winkel et al., 2014). Met carriers also tended to use more emotion-focused coping, which can, itself be related to higher depression scores (Caldwell et al., 2013). Taken together, these results indicate that A carriers may be more likely to experience greater overall negative affect, may not be as resilient to stress, and may use differential coping compared to G carriers (Colzato et al., 2011).

Neuropeptide Y. Another biological factor, neuropeptide Y (NPY), consists of a linear arrangement of 36 amino acids, and is typically found throughout the central and peripheral nervous systems (Botelho & Cavadas, 2015). NPY binds to class A NPY receptors (G-protein coupled receptors/GPCRs), and deficiencies in NPY have been related to circadian rhythm functioning as well as learning and memory (Gøtzsche & Woldbye, 2016). In addition, increased NPY activity in the hypothalamus has been associated with lower blood pressure and sugar, better responses to stress, and longer lifespan (Minor, Chang, de Cabo, 2009). Neuropeptide Y is also involved in a number of molecular aspects of aging including dysfunction of mitochondria, reduction of stem cell activity, changes in intercellular communication, protein modifications and nutrient

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sensing, as well as cellular aging (Botelho & Cavadas, 2015). There is also evidence that NPY is protective against stress and anxiety, as elevated levels of NPY in veterans under stress were related to lower levels of psychological distress (Morgan et al., 2002). For example, soldiers without PTSD who have undergone trauma in the field have higher levels of NPY, in comparison to those with PTSD (Yehuda, Brand, & Yang, 2006). NPY has also been positively correlated with adaptive coping, indicating a potential role for NPY as a biological marker for resiliency.

Changes in NPY are also related to differential mood states, as lower levels of NPY have been associated with major depression (Mickey et al., 2011). For instance, those with major depression are more likely to have a variant of the *NPY* gene resulting in lower *NPY* expression (Mickey et al., 2011). This makes sense in light of the role that BDNF plays in depression, as BDNF is known to upregulate NPY (Reibel et al., 2000). NPY is also thought to be released in response to stress and arousal, as it is highly expressed in areas of the limbic system known to be related to these processes, and its levels are inversely proportional to levels of anxiety (Zhou et al., 2008). Specifically, a variant of *NPY*—the C allele of the rs16147 SNP—is linked with resistance to antidepressant treatment in individuals with depression (Domschke et al., 2010). This risk allele is associated with reduced NPY expression, and individuals with this variant are more susceptible to anxiety as well as depression (Sommer et al., 2010). The rs16147 variant of *NPY* is also related to increased susceptibility to anxiety and HPA axis dysregulation after stressful life events such as natural disasters or childhood adversity (Reichmann & Holzer, 2016). Thus, along with NPY's possible role in longevity and other functions (Botelho & Cavadas, 2015), it is also likely to play a role in stress

(including social stress), anxiety, resilience (Zhou et al., 2008), and depressive symptoms (Mickey et al., 2011).

Oxytocin and oxytocin receptor. Oxytocin and the oxytocin receptor (OXTR) have also been shown to play a pertinent role in many processes in aging, mental health, and social interaction (Ebner et al., 2013). Specifically, oxytocin is a hormone made in the supraoptic nuclei (SON) and paraventricular nuclei (PVN) of the hypothalamus and released into the bloodstream; it is implicated in a variety of social behaviours including social recognition, aggression, bonding and attachment. It is thought that oxytocin reduces responses to social stress, both from a behavioural and a neuroendocrine perspective (Heinrichs & Domes, 2008). Oxytocin acts in regions of the limbic system, including the striatum, amygdala, and hippocampus, and acts centrally as well as peripherally, by its binding of the oxytocin receptor, OXTR (Ebner et al., 2013).

One of the functions of oxytocin is to reduce amygdalar as well as HPA axis activity (Heinrichs & Domes, 2008). In animal studies for instance, *OXTR* knockout mice tended to display heightened aggression, reductions in cognitive flexibility, and detriments to social functioning (Sala et al., 2013). Moreover, oxytocin is associated with reductions in avoidant and increases in approach behaviours in animals, thereby facilitating social interaction and bonding (Heinrichs & Domes, 2008). Similarly, administered oxytocin in humans has been associated with reduced anxiety and lower cortisol levels upon exposure to stress (Heinrichs et al., 2003), perhaps indicating that increased oxytocin levels (often naturally brought about through positive social interactions) may have a role in reducing stress, anxiety, and potentially depression and in this way improve mental health. Evidence also suggests a role for oxytocin and coping,

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since plasma oxytocin levels have been linked with forms of coping including problem-focused strategies (McInnis, McQuaid, Matheson & Anisma, 2017). Although older adults often display comparable emotional control when compared with younger adults, they differ in a few main ways (Ebner, et al., 2013). They tend to have less of an ability to recognize emotional social cues (possibly due to impaired visual systems), and are generally more trusting (Isaacowitz et al., 2007; Ruffman, Henry, Livingstone, & Philips, 2008; Castle et al., 2012; Ruffman, Murray, Halberstadt & Vater, 2012). In light of the research on oxytocin on sociality and anxiety, the age-related differences in social functioning suggest a possible role for oxytocin age-related changes, although these differences have not been widely explored in humans.

In general, mutations in oxytocin receptor genes have been associated with detriments to a number of prosocial behaviours and outcomes, including impairments in pair bonding, reduced empathy, increased sensitivity to stress, and less positive affect (Ebner et al., 2013). For instance, those homozygous for the T allele in the rs1042778 SNP, a variant known to be linked with low levels of circulating oxytocin, are more likely to display unemotional or anti-social behaviours (Dadds et al., 2014). Moreover, individuals with this risk allele tend to have less of a propensity for prosocial or altruistic behaviour (Israel et al., 2009). In contrast, the G allele of the *OXTR* SNP, rs53576, is related to more prosocial behaviours including higher levels of optimism, empathy, and trust (McQuaid et al., 2013). Nevertheless, those with the G allele could also be susceptible heightened social sensitivity, making individuals more sensitive to adverse events (McQuaid et al., 2013). Supporting these results, individuals classified as psychologically distressed who had the G allele (i.e., GG or AG, rather than AA

genotypes) tended to report more frequently seeking social support (Kim et al., 2010).

Others have found that G carriers, in addition to being more empathetic, were less reactive to stress (Rodrigues et al., 2009). Thus, it is unclear whether the G allele is related to increased or decreased reactivity to stress, yet results appear to converge on this allele's relationship with heightened empathy, and the seeking of social support (McQuaid et al., 2013).

The Present Study

Given the growing population of older adults, research relating genetic variants with social identification, resilience and mental health is of growing salience. Since BDNF and oxytocin are highly associated with various social behaviours and affective states, and NPY is linked with stronger mental health and resilience, it is relevant to understand the roles of these factors in healthy aging. It was hypothesized that 1) increasing age would be related to higher depression and greater stress. However, it was also hypothesized that 2) higher levels of social identity would be related to less depression and stress, and that 3) resilience and adaptive coping would mediate these relationships. Moreover, it was also proposed that 4) these relationships may differ based on the presence of particular SNPs.

In particular, those who had stronger social identities, better mental health, and used more effective coping styles were expected to be less likely to exhibit the *BDNF* rs6265 A allele, and the *NPY* rs16147 C allele. Although it was unclear whether individuals with the *OXTR* risk alleles would score differently on measures of mental health and resilience, it was hypothesized that those who had stronger social identities may be less likely to carry the *OXTR* rs1042778 T allele, but more likely to carry the

OXTR rs53576 G allele. Finally, it was hypothesized that older adults with these alleles may, in addition, display more pronounced psychosocial differences than younger adults due to the cumulative effects of age. Given the paucity of research relating these factors together, specifically among older adults, this study purported to add significantly to the literature in this domain.

Methods

Participants

Participants for this study consisted of 88 older adults living at four Riverstone Retirement Communities in Ottawa, specifically the Carlingwood, Maplewood, Oakpark, and Bridlewood Trails residences. Posters were positioned throughout high-traffic areas of these residences, such as common areas, elevators and at the reception desk. Researchers introduced the study to participants at monthly resident council meetings at these locations. A recruitment table was also set up two days per week at each residence during the course of the study in order to convey information about the study, and allow the participants to complete consent forms. Most participants were female ($n = 65$), and most were Caucasian ($n = 85$), with a mean age of 86.7 years ($SD = 7.58$). Those who participated were provided the option of entering a draw for one of eight gift cards valued at \$25 each for Tim Hortons. A younger group of individuals (Carleton University students, $n = 369$), with a mean age of 20 years ($SD = 4.39$) was also assessed in order to establish a comparison population and to collect data from a larger sample size in order to facilitate biological analyses. Most of the students assessed were female ($n = 245$), and Caucasian ($n = 205$), and only Caucasian participants were included in SNP analysis. Students were compensated with course credit for their participation.

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Since a high proportion of older adults take medications or have physical ailments, all individuals living at the retirement residences were invited to participate in the study to ensure maximal inclusivity. Information pertaining to medication use and disability were self-reported. Only those with dementia or those who could not communicate in English were excluded from participation in the study. Recruitment of student participants occurred at Carleton University through the SONA online recruitment system for participating in psychological research. Inclusion criteria for younger participants was similar, in that individuals who were able to communicate in English were allowed to participate.

Procedure

This study was approved by Carleton University's Research Ethics Board. Following recruitment and obtaining written informed consent, older adult participants were brought to more private rooms (often a dining room or library) in which to complete surveys as well as provide saliva samples. Survey completion took approximately 45 min for older adults, and 30 min for the younger adults, during which time participants were asked to abstain from eating or drinking. A single saliva sample was requested from each participant upon completion of these questionnaires. During this process, help was provided by the researchers if requested. Participants were asked for additional verbal consent prior to giving the saliva sample to ensure that they understood their choice to provide, or not provide, a saliva sample. Participants were then debriefed following their participation. They were also provided with contacts and helplines should they experience distress, as well as information about healthy aging.

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Questionnaires, consent forms, and saliva kits were given numbers pertaining to specific participants, serving as participant codes, before the commencement of the study. Only the master code list contained participants' names associated with codes. In all other places personal information regarding participants was not affiliated with their responses; thus all responses remained confidential. These components were stored securely and separately at Carleton University. Moreover, all data generated from this study was stored on password-protected computers and made available only to the researchers during the course of the study.

DNA was collected, preserved, and isolated using Norgen's Saliva DNA Collection, Preservation, and Isolation Kit and protocol. Following DNA isolation, purified DNA was sent to Genome Quebec for SNP sequencing.

Measures

Social identification. The Identification with Retirement Community scale, adapted from Doosje, Ellemers, and Spears (1995), was used to measure social identification. The scale consists of five items (e.g. 'I see myself as part of the retirement/university community'; I am pleased to be part of the retirement/university community'), and requires participants to rate the degree to which they agree with each statement on a scale from 1 (strongly disagree) to 5 (strongly agree). Overall scores range from 5 to 25, with higher scores indicating a higher degree of identification with one's retirement community. In order to account for missing data, however, mean scores were used rather than summed scores. In this study, this scale was also used in a subset of individuals attending Carleton University. In this case, the scale was adapted to this group by replacing "retirement community" with "university community" for each of the

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statements. In the current data, this scale demonstrated a strong internal consistency ($M = 3.60$; $SD = .81$; $\alpha = .84$; see Appendix G for complete measures).

Resilience. The Connor Davidson Resilience Scale-Revised (CDRS-R) was used to measure resilience (Campbell-Sills & Stein, 2007). This scale can be used for a wide variety of participants from differing ages and backgrounds and consists of ten items (e.g. ‘I was able to adapt to change’; ‘I could deal with whatever came my way’; ‘I tried to see the humorous side of problems’), and requires participants to rate the degree to which they agree with each statement on a scale from 1 (not true at all) to 4 (true nearly all the time). Overall scores range from 0 to 40, with higher scores indicating higher resilience. In order to account for missing data, however, mean scores were used rather than summed scores. In the current data, this scale demonstrated a strong internal consistency ($M = 2.73$; $SD = .65$; $\alpha = .87$; see Appendix G for complete measures).

Coping. The Survey of Coping Profiles Endorsement- Short Form (SCOPE-SF) was used to assess coping styles (Matheson & Anisman, 2003). The scale consists of 30 items describing methods of responding to stressful situations (e.g. ‘I blamed myself for my problems’; ‘I asked others for help or advice’; ‘I told others I was really upset’). It requires participants to rate the degree to which they used each of these methods in the recent past, using a scale from 0 (not at all) to 4 (totally). Scores are averaged for the following coping domains: other-blame ($\alpha = .83$), self-blame ($\alpha = .73$), rumination ($\alpha = .79$), emotional containment ($\alpha = .59$), social support ($\alpha = .72$), activity ($\alpha = .64$), denial ($\alpha = .54$), cognitive structuring ($\alpha = .57$), problem solving ($\alpha = .70$), passivity ($\alpha = .34$), religious coping (single item), humour ($\alpha = .92$), wishful thinking ($\alpha = .41$), and using food/alcohol/drugs to cope ($\alpha = .46$).

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In order to facilitate interpretation of subsequent analyses, a factor analysis was conducted, resulting in four main coping categories: emotion-focused (comprising other-blame, self-blame, rumination, emotional containment, and wishful thinking; $M = 2.22$; $SD = .78$; $\alpha = .76$), problem-focused (comprising activity, cognitive restructuring, problem solving, and humour; $M = 2.47$; $SD = .73$; $\alpha = .62$), social-emotional (comprising emotional expression and social support coping; $M = 1.80$; $SD = 1.03$; $\alpha = .66$), and avoidant coping (comprising religious coping, denial, and passivity; $M = 1.92$; $SD = .80$; $\alpha = .38$; see Appendix G for complete measures). Although the reliability of the avoidant coping style was low, α did not change when removing different coping styles from this factor. These four factors were used in all further analyses, where higher scores in each of these domains indicated a greater use of that particular coping style.

Depression. The Center for Epidemiologic Studies Short Depression Scale (CES-D 10), derived from Radloff's CES-D 20 question scale (1977), was used to measure depressive symptoms. The scale consists of 10 items (e.g., 'I was bothered by things that usually don't bother me'; 'I felt depressed'; 'My sleep was restless'). It requires participants to respond, reflecting on how they have felt in the past week, on a scale from 1 (rarely or none of the time/ less than one day in the past week) to 4 (all of the time/ 5-7 days in the past week). Scores range from 0 to 30, with higher scores indicating more depressive symptoms (Dozeman et al., 2011). Scores surpassing 18-22 are predictive of depression in older adults, with a high specificity (80%) and predictive power (.87) (Dozeman et al., 2011). In order to account for missing data mean, rather than summed scores were used. In the current data, this scale demonstrated a strong internal consistency ($M = 1.92$; $SD = .53$; $\alpha = .81$; see Appendix G for complete measures).

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Stress. A single item stress measure was used to assess self-reported stress (Littman et al., 2006). The question asks participants to rate the amount of stress in their lives on a scale from 1 (no stress) to 6 (extreme stress; Littman et al., 2006).

Medical history and demographic information. Finally, participants were also asked to provide information related to self-reported medication use, the presence or absence of medical conditions, alcohol consumption, and smoking status, in addition to standard demographics such as sex, age, relationship status, ethnicity, religious affiliation, living situation, and education.

Saliva Collection, Preservation, and DNA Isolation

As mentioned, DNA was collected, preserved, and isolated using Norgen's Saliva DNA Collection, Preservation, and Isolation Kit and protocol for product RU45400. Subsequent procedures are those following Norgen's protocol (2014).

Saliva collection and preservation. Participants were asked to not consume food, drink, nor smoke for 30 minutes prior to the collection of saliva. During saliva collection, each participant was asked to spit into a collection funnel until they provided 2 mL of saliva into the collection tube. Preservative was added to the collection tube, the top of which was then closed and the contents shaken for 10 seconds to ensure mixing. These collected saliva samples were stored in a secure location (a locked room at Carleton University) at room temperature until DNA isolation.

DNA isolation. Preserved saliva samples were retrieved and mixed by gentle shaking and inversion; 0.5 mL portions of these were then transferred to 1.5 mL microcentrifuge tubes. Proteinase K, as provided in the DNA isolation kits, was vortexed. To each 1.5 mL microcentrifuge tube, 20 μ L of Proteinase K was added. Next, tubes were

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vortexed for 10 seconds and incubated for 15 minutes at 55°C. To each tube, 200 µL of Binding Buffer B was added. Samples were then vortexed for 10 seconds, and subsequently incubated for 10-15 minutes at 55°C. A volume of isopropanol equating that of the sample (720 µL) was added to each tube, and tubes were vortexed for 10 seconds to ensure mixing. In the next step, columns and collection tubes corresponding to each sample were assembled, and 760 µL of saliva lysate transferred to these columns. These collection tubes/columns were centrifuged at 6,000rpm for 1 minute, and the flow-through discarded. The remaining saliva lysate was transferred to the corresponding columns, which were, again, centrifuged at 6,000rpm for 1 minute and the flow-through discarded.

Wash Solution A (500 µL) was added to each column. Columns were subsequently spun for 1 minute at 8,000rpm, and the flow-through discarded. Wash Solution A (500 µL) was again added, and the samples spun for 1 minute at 13,200rpm. This flow-through was discarded, and the columns spun again for 2 minutes at 13,200rpm. Collection tubes were discarded, and columns placed in new 1.5 mL microcentrifuge tubes. Elution Buffer B (100 µL) was next added to the tubes, which were then incubated for 10 minutes at 55°C. These tubes were spun at 2,000rpm for 2 minutes, and again at 13,200rpm for 1 minute, with the purified DNA being collected in the tube at this step. These purified DNA samples were securely stored at -80°C until samples are ready to be sent to Genome Quebec for genotyping.

Before sending the DNA samples for genotyping, purity (as shown by the 260/280 absorbance ratios), and concentration (ng/uL) were assessed through the use of

nanodrop. All aliquots sent for genotyping were diluted to 22ng/uL with pure untreated water, and loaded into 96 well plates as requested by Genome Quebec.

Data Analyses

Initial analyses. In the first instance, bivariate correlations assessed the relations between age, social identity, resilience, coping, depression, and stress. Hierarchical regression analyses were then used to assess interactions between age and social identity, resilience, and coping in predicting depression and stress. Significant interactions were followed up with simple effects analyses to determine whether differences emerged as a function of age group (older or younger).

Moderation and mediation analyses. Moderated mediation analyses were conducted to assess the potential mediating role of psychosocial factors, and moderating role of biological factors, in the relations between 1) age and depression, and 2) social identity and depression.¹ In the relation between age and depression, resilience, social identity, and the four coping factors were assessed as potential mediators, while the SNPs analyzed for *OXTR*, *NPY*, and *BDNF* were tested as moderators. For the relationships between age and depression, along with identity and depression, the SNPs were tested, again as moderators. These analyses were conducted using Hayes' PROCESS Model 1, for simple moderations; along with 7 and 14 for moderated mediations.

Covariates. Variables which could influence the results, including the presence of past and present medical conditions, medication use, alcohol consumption, past and present smoking status, gender, ethnicity, and education were assessed for relationships

¹Moderation and moderated mediation analyses for the relations between age and stress, as well as social identity and stress, were included in supplemental analyses in Appendix F.

with all potential mediating and outcome variables in a series of preliminary analyses. If there were significant relationships (either interactions or main effects; see Appendix B & C), those factors were controlled for as covariates in the moderated mediation analyses. Specific variables controlled for are indicated in the table notes.

Results

Correlations among Age and Psychosocial Variables

Initial analyses assessed bivariate correlations between age and the other psychosocial variables of interest. As seen in Table 1, contrary to the hypothesis that aging would be associated with poorer mental health, older age was negatively related to depression and stress. Similarly, age and resilience were positively related, as were age and social identity. Finally, when the relations between age and coping styles were assessed, older age was associated with less use of emotion-focused coping, but more avoidant coping. Age was unrelated to either social-emotional or problem-focused coping.

Table 1

The relations among age and psychosocial variables.

	1	2	3	4	5	6	7	8
1. Age	-	-	-	-	-	-	-	-
2. Identity	.32**	-	-	-	-	-	-	-
3. Resilience	.34**	.38**	-	-	-	-	-	-
4. EF Coping	-.38**	-.32**	-.43**	-	-	-	-	-
5. PF Coping	.05	.13**	.40**	.04	-	-	-	-
6. SE Coping	-.07	.03	-.06	.23**	.23**	-	-	-
7. AV Coping	.27**	.11*	.10*	.06	.19**	.09	-	-
8. Depression	-.26**	-.41**	-.61**	.54**	-.25**	.06	-.05	-
9. Stress	-.26**	-.29**	-.29**	.39**	-.04	.19**	-.02	.40**

EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

** $p = .05$; ** $p = .01$*

Interactions between Age and Resilience, Coping, and Social Identity in Predicting Mental Health

When the moderating role of age was assessed in the relations between resilience and poorer mental health outcomes (i.e. depression and stress), several significant interactions emerged.² Specifically, resilience and age interacted to predict stress in the past year, $F(20, 397) = 2.00, p = .007$. Here, there was a stronger negative relationship between resilience and stress in older ($r = -.31, p = .004$), compared with younger adults ($r = -.18, p < .001$; Table 2). Resilience and age did not significantly interact, however, to predict depression, $F(20, 397) = 1.47, p = .089$; suggesting that the negative relationship between resilience and depression was consistent between the two age groups (Table 2).

Similarly, the moderating role of age was assessed in the relations between coping styles and poorer mental health outcomes. Although there was a significant interaction between age and problem-focused coping in predicting stress in the past year, $F(23, 403) = 1.40, p = .043$, when the simple effects were assessed, problem-focused coping and stress were not significantly related among older ($r = .10, p = .359$) or younger adults ($r = .07, p = .184$; Table 2). The potential moderating role of age was also assessed in the relations between the remaining coping styles (i.e., emotion-focused, social-emotional, and avoidant) and mental health (i.e., stress and depression); however, none were significant.

Although there was a positive relationship between age and social identity, there were no significant interactions between age and social identity in predicting either

² Refer to Appendix D for non-significant interaction analyses along with main effects in older and younger individuals.

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depression, $F(12, 423) = 1.33, p = .200$, or stress in the past year, $F(12, 422) = 1.10, p = .357$.

Table 2

The relations among psychosocial variables in older (above the diagonal) compared with younger adults (below the diagonal).

	1	2	3	4	5	6	7	8
1. Identity	-	.03	-.18	-.02	-.02	.05	-.14	-.06
2. Resilience	.34**	-	-.22*	.29**	-.16	-.10	-.48**	-.31**
3. EF Coping	-.22**	-.37**	-	.31**	.49**	.43**	.31**	.29**
4. PF Coping	.15**	.44**	-.01	-	.35**	.38**	-.17	.10
5. SE Coping	.08	-.00	.16**	.21**	-	.29**	.17	.12
6. AV Coping	.02	.04	.10	.13*	.07	-	.23*	.32**
7. Depression	-.39**	-.59**	.53**	-.27**	.02	-.02	-	.36**
8. Stress	-.24**	-.18**	.33**	-.07	.19**	-.02	.35**	-

EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

** $p = .05$; ** $p = .01$*

In sum, contrary to what was expected, age appeared to be related to better mental health (i.e., less depression and stress) and more effective coping (i.e., greater resilience, less emotion-focused coping; with the exception of a greater reliance on avoidant coping). Moreover, the negative relation between resilience and stress appeared to be augmented by age, perhaps suggesting that resilience in older age was especially effective in buffering stress.

Moderation and Moderated Mediations in the relation between Age and Depression

The moderating role of SNPs. Given the negative relationship between age and depression, it was also of interest to assess whether certain single nucleotide polymorphisms might moderate that relation. Indeed, the SNP for *OXTR* (rs53576) moderated the direct relationship between age and depression (Table 3; Figure 1), where

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only in G carriers of rs53576 was there a significant negative relationship between age and depression (Table 3; Figure 1).

Table 3

The moderating role of SNPs for OXTR, NPY, & BDNF (Hayes' PROCESS Model 1), in the relationship between age and depression.

Moderator	Moderator Level	<i>B</i>	<i>SE</i>	<i>p</i>	Lower-bound 95% CI	Upper-bound 95% CI
<i>OXTR</i> rs1042778	GG	-.0074	.0022	.0010	-.0118	-.0031
	GT, TT	-.0092	.0020	.0000	-.0131	-.0053
<i>OXTR</i> rs53576	AA	-.0099	.0053	.0647	-.0204	.0006
	AG, GG	-.0083	.0017	.0000	-.0116	-.0050
<i>NPY</i> rs16147	TT	-.0114	.0027	.0000	-.0167	-.0060
	TC, CC	-.0074	.0018	.0000	-.0109	-.0039
<i>BDNF</i> rs6265	GG	-.0088	.0019	.0000	-.0124	-.0051
	GA, AA	-.0068	.0024	.0057	-.0116	-.0020

Note: Significant confidence intervals are bolded; past and present medical conditions, medication use, education, gender, and consumption of alcohol are included as covariates.

The moderating role of SNPs in mediations through psychosocial factors.

When SNPs were assessed in moderated mediation analyses, only the two SNPs for *OXTR* partially moderated the mediating role of psychosocial factors in the relationship between age and depression (Table 4; Figure 1).³ Here, in individuals homozygous for the G allele of the rs1042778 oxytocin receptor variant ($B = 4.2740$, $SE = 8.8318$, $LLCI = 1.3363$, $ULCI = 8.7076$), there was a positive relationship between age and avoidant coping, where avoidant coping was positively related to depression in older adults, and this aspect of the relationship did not significantly differ depending on genetic factors (Table 4; Figure 1). Moreover, in individuals not carrying the G allele of the rs53576

³Hayes' PROCESS models 7 and 14 were assessed for all SNPs (rs1042778, rs53576, rs3796863, rs16147, and rs6265), and non-significant moderated mediations in the relation between age and depression are presented in Appendix E.

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SNP (i.e. those with the AA genotype), there was a stronger negative relationship between identity and depression ($B = .0030$, $SE = .0020$, $LLCI = .0001$, $ULCI = .0083$), where the positive relationship between age and identity did not significantly differ based on this SNP (Table 4; Figure 1). Although the potential mediating role of resilience (moderated by SNPs) was also assessed, no relations were significant. Nonetheless, these results suggest that genetic factors may play a role in differential coping as well as feeling a sense of identity with age (Table 3; Table 4; Figure 1).

Table 4

The mediating roles of social identity and coping, and the moderating role of SNPs for OXTR (Hayes' PROCESS Model 7 & 13) in the relationship between age and depression.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
7	EF Coping	<i>OXTR</i> rs1042778 ¹	GG	-4.2221	1.7094	-8.4405	-1.4531
			GT, TT	-5.2831	1.9273	-9.3364	-1.6921
	PF Coping		GG	.1799	.9028	-1.5726	2.2367
			GT, TT	.1355	.6576	-1.1032	1.5863
	SE Coping		GG	.1542	.5953	-.7870	1.7721
			GT, TT	-.6688	.6062	-2.4421	.0934
	AV Coping		GG*	-3.4971	1.6683	-7.6383	-.7807
			GT, TT	.7769	.8737	-.8252	2.7006
14	Identity	<i>OXTR</i> rs53576	AA*	-.0053	.0023	-.0110	-.0020
			AG, GG*	-.0023	.0007	-.0039	-.0011

*Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping. Index of moderated mediation for model 7 & 14 reported in-text. Significant mediations are bolded. *Indicates significant moderated mediation. Past and present medical conditions, medication use, education, gender, past and present smoking status, and consumption of alcohol are included as covariates.*

Figure 1

A conceptual summary of Tables 3 and 4, including all mediators and moderators in the relationship between age and depression.

**Indicates positive significant relationship only in older adults.*

Taken together, these results suggest that the negative relationship between age and depression can be partially explained through higher levels of social identity and avoidant coping. Moreover, it is possible that the AG/GG variant of rs53576 (*OXTR*) may be protective against depression with age. Along these lines, it is also possible that the GG variant of the rs1042778 SNP for *OXTR* acts as a vulnerability factor with age, since carriers tend to use coping that is typically considered to be more maladaptive (i.e. avoidant) with age. Finally, these results suggest that the AA variant of the rs53576 SNP for *OXTR* allows for a stronger (negative) relationship between social identity and depression (where in all carriers there was a positive relation between age and identity) suggesting that social identity itself may be more important for stronger mental health in carriers of this SNP. Taken together, these findings suggest that the relation between age

and depression may, in fact, be partially explained by coping styles and social identity, and that these relationships may differ depending on certain SNP variants (Figure 1).

Moderation and Moderated Mediations in the relation between Social Identity and Depression

Analogous to the analyses conducted to assess the potential moderating roles of SNPs and mediating psychosocial factors in the relation between age and depression, similar analyses were conducted for social identity and depression.

The moderating roles of Age and SNPs. Interestingly, the strength and presence of a negative relationship between social identity and depression depended on age. In this way, the direct relationship between identity and depression was moderated by age, where this effect was only significant in younger adults (Table 5; Figure 2). This is contrary to the findings earlier that there were no interactions between age and identity in relation to depression; however, this could be due to slightly different sample sizes (i.e., thirteen fewer cases) in the moderation analyses.

Table 5

The moderating role (Hayes' PROCESS Model 1) of age and SNPs for OXTR, NPY, & BDNF, in the relationship between identity and depression.

Moderator	Moderator Level	<i>B</i>	<i>SE</i>	<i>p</i>	Lower-bound 95% CI	Upper-bound 95% CI
Age	Older	-.0881	.0789	.2651	-.2431	.0670
	Younger	-.2452	.0306	.0000	-.3054	-.1850
<i>OXTR</i> rs1042778	GG	-.2281	.0669	.0008	-.3600	-.0962
	GT, TT	-.3543	.0502	.0000	-.4533	-.2553
<i>OXTR</i> rs53576	AA	-.5725	.1487	.0002	-.8655	-.2795
	AG, GG	-.2865	.0417	.0000	-.3687	-.2042
<i>NPY</i> rs16147	TT	-.4131	.0758	.0000	-.5625	-.2638
	TC, CC	-.2743	.0470	.0000	-.3669	-.1817
<i>BDNF</i> rs6265	GG	-.3552	.0485	.0000	-.4507	-.2597
	GA, AA	-.2186	.0703	.0021	-.3572	-.0799

Note: Significant confidence intervals are bolded; past and present medical conditions, medication use, alcohol consumption, gender and education are included as covariates.

The moderating roles of Age and SNPs in mediations through psychosocial factors. When assessing the moderating roles of age, along with SNPs for *OXTR*, *NPY*, and *BDNF*, only age and *OXTR* significantly moderated the mediating role of resilience and emotion-focused coping respectively, in the relation between identity and depression.⁴ Firstly, resilience mediated the relationship between social identity and depression, where this effect was partially moderated by age, in that only younger adults displayed a positive relationship between identity and resilience ($B = -.1217$, $SE = .0427$, $LLCI = -.2093$, $ULCI = -.0408$; Table 6; Figure 2). However, in both younger and older adults, there was a negative relationship between resilience and depression (Table 2).

⁴ Hayes' PROCESS models 7 and 14 were assessed for all SNPs (rs1042778, rs53576, rs3796863, rs16147, and rs6265), and non-significant moderated mediations in the relation between identity and depression are presented in Appendix E.

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This suggests that having a stronger social identity may confer higher resilience, which may benefit mental health in younger, but not older, adults.

Emotion-focused coping was also found to mediate the relationship between identity and depression, but only in those carrying the T allele (heterozygous or homozygous) for the rs1042778 *OXTR* SNP (Table 8; Figure 3). Specifically, those with higher social identities who had this particular variant tended to use less emotion-focused coping, where the use of less emotion-focused coping was related to lower depression scores ($B = -.0937$, $SE = .0443$, $LLCI = -.1814$, $ULCI = -.0064$; Table 6; Figure 2).

Table 6

The mediating roles of resilience and coping, and the moderating roles of age and OXTR (Hayes' PROCESS Model 7) in the relationship between social identity and depression.

Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
Resilience	Age	Older	.0081	.0372	-.0648	.0820
		Younger*	-.1136	.0189	-.1515	-.0781
EF Coping	<i>OXTR</i> rs1042778 ¹	GG	-.0376	.0354	-.1112	.0280
		GT, TT*	-.1313	.0283	-.1922	-.0799
PF Coping		GG	-.0065	.0194	-.0456	.0303
		GT, TT	-.0175	.0132	-.0499	.0036
SE Coping		GG	.0009	.0060	-.0073	.0195
		GT, TT	.0003	.0035	-.0046	.0108
AV Coping		GG	.0066	.0096	-.0078	.0337
		GT, TT	.0021	.0045	-.0025	.0187

*Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping. Index of moderated mediation for model 7 & 14 reported in-text. Significant mediations are bolded. *Indicates significant moderated mediation. Past and present medical conditions, medication use, education, gender, and consumption of alcohol are included as covariates.*

¹*Indicates model also contains past and present smoking status as covariates.*

Figure 2

A conceptual summary of Tables 7 and 8, of the mediators and moderators in the relationship between social identity and depression.

In summary, the relationship between identity and depression appeared to be dependent on younger age, but not seemingly dependent on SNPs. The negative relation between identity and depression was also partially explained by higher resilience, and less emotion-focused coping. Moreover, a relationship between identity and resilience appeared to be dependent on being younger, suggesting that social identity may be more important for the mental health of younger, compared to older, individuals. Finally, the negative relation between identity and emotion-focused coping was dependent on the T allele of the rs1042778 *OXTR* SNP, suggesting its role as a protective factor for mental health. Taken together, these analyses suggest that the relationship between social identity and mental health may impacted by resilience and coping (Figure 2).

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Additionally, these results suggest that these direct and indirect relationships may be partially contingent upon both genetic factors and age.

Moderation and Moderated Mediations in the relations between Age and Stress, as well as Social Identity and Stress

In order to facilitate more parsimonious presentation of analyses, details of moderation and moderated mediation analyses with stress as an outcome variable are presented in Appendix F. Although several of the relations were similar to those with depression as an outcome, there were several differences worth noting here. First, in the relation between age and stress, although avoidant coping also acted as a mediator, so too did resilience, and social-emotional coping; however, social identity only significantly mediated the relation between age and depression (but not stress). As with depression, several SNPs also moderated the mediated associations between age and stress, but these relations were slightly different. In particular, the rs16147 *NPY* SNP moderated the direct relation between age and stress, where this relation was only significant in those with the C allele. In addition, the *OXTR* rs53576 SNP moderated the mediating role of social-emotional coping, where the relation between age and social emotional coping was stronger in G carriers. Moreover, the *NPY* rs16147 SNP, along with age, moderated the mediating role of avoidant coping, where there was only a positive relationship between avoidant coping and stress in those with the TT genotype, and older adults. Finally, the *OXTR* rs1042778 SNP moderated the mediating role of resilience, where resilience and stress were only negatively related in T carriers.

Likewise, in the relation between social identity and stress, similar to the moderating roles of age and SNPs found between identity and depression, the rs53576

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SNP for *OXTR* moderated the relationship between identity and stress, where this relation was only significant in G carriers. Similarly, age also moderated the relation between identity and stress, where this relation was only significant in younger adults.

Interestingly, age differentially moderated the mediating roles of resilience and avoidant coping in this relationship. Here, age moderated the mediating role of resilience, where only in younger adults was social identity positively related to resilience, but only in older adults was the negative relation between resilience and stress significant. The *OXTR* rs1042778 SNP also moderated the mediating role of emotion-focused coping, in the relation between identity and stress, where the negative relation between identity and emotion-focused coping was only significant in T carriers. Similarly, this SNP also moderated the direct relation between identity and depression, where this link was only significant in T carriers. Moreover, both the *NPY* rs16147 SNP and age moderated the mediating role of avoidant coping, where the relation between avoidant coping and stress was only significant in those with the TT genotype, along with older adults (see Appendix F for more details).

Discussion

Overall, and contrary to hypotheses, age was related to better mental health (i.e., less stress and depression), some coping styles that are typically considered to be more effective (e.g., less emotion-focused), and stronger social identities (i.e., with one's retirement community). Moreover, the relations between age and mental health, as well as those between identity and mental health, were mediated by resilience and coping; additionally, some aspects of these relationships were moderated by single nucleotide polymorphisms (SNPs) for *oxytocin receptor* (*OXTR*) and *neuropeptide y* (*NPY*).

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Specifically, both social identity and avoidant coping mediated the direct relation between age and depression, while the rs53576 and rs1042778 SNPs for *OXTR*, respectively, moderated these mediations, and the rs53576 *OXTR* SNP moderated the direct relation. Moreover, resilience and emotion-focused coping mediated the relation between identity and depression, where age moderated the former, and the rs1042778 *OXTR* SNP moderated the latter. Additionally, age also moderated the relation between identity and depression. Taken together these results suggest that age is related to better mental health, and that social identity, resilience, coping, and genetic factors may contribute as protective factors toward mental health with increasing age.

Getting Better with Age? The Role of Psychosocial Factors

Relations among age and mental health. Contrary to some previous research suggesting that age may be related to a deterioration of mental health (Stewart et al., 2014; Disner et al., 2011), this was not the case in the present study. Instead, greater age was associated with fewer self-reported depressive symptoms and less stress (reported retrospectively over the past year). However, in line with previous research was the finding that age is generally associated with differential coping in older compared with younger adults (Folkman et al., 1987), and that certain coping styles associated with age can be protective against stress (Trouillet et al., 2011). In this regard, age was related to a lower reliance on emotion-focused coping (i.e., other and self-blame, rumination, emotional containment and wishful thinking); however, somewhat unexpectedly, greater age was also associated with more use of avoidant coping (i.e., denial, passivity, and turning to God or faith) perhaps due to the higher religiosity generally reported among older, compared with younger, individuals (Statistics Canada, 2010). In this way, the

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inclusion of God/faith in the avoidant coping factor (which arguably might have been labeled as religious coping rather than avoidant) could partially explain why older adults tended to use more of this form of coping, and could help explain how “avoidant coping” may not always be maladaptive (Holahan et al., 2005), since religious coping is frequently related to better mental health outcomes (Pargament, 2001; Ysseldyk, Haslam, & Haslam, 2013). However, age was also associated with higher levels of resilience and a greater sense of social identity with one’s retirement (or university) community members. Thus, stronger identity, higher resilience, more adaptive coping, and fewer mental health symptoms were all associated with increasing age. This makes sense in light of past research indicating that stronger feelings of social identity (Tiikkainen & Heikkinen, 2005; Haslam et al., 2009), higher resilience (Jeste et al., 2013; Moore et al., 2015), and less use of emotion-focused coping (Connor & Davidson, 2003; Matheson & Anisman, 2003), are all related to better mental health. Moreover, age also moderated the relation between resilience and stress, such that resilience was only associated with lower self-reported stress among older (but not younger) adults. This matches other findings in the present study indicating that there was a significant resilience by age interaction in relation to stress. Although age did not moderate the relations between mental health and the remaining psychosocial variables, both social identity and avoidant coping accounted for the relation between age and depression, and each of resilience, avoidant coping, and social-emotional coping all accounted for the relation between age and stress (see Appendix F). Thus, in addition to corroborating earlier research linking adaptive coping, resilience, and social identity to better mental health, the present study also links these

findings with age, challenging the notion that age is always associated with detriments to mental health (Stewart et al., 2014; Disner et al., 2011).

Relations among identity and mental health. Not surprisingly, social identity—that is, feelings of connectedness and belonging with one’s retirement community (for older adults) or university community (for younger adults) was related to better mental health. Indeed, this was demonstrated through negative relationships between identity and both stress and depression, and a positive relationship between identity and resilience. Moreover, feelings of identity were positively related to problem-focused as well as avoidant coping, and negatively related to emotion-focused coping. This is, for the most part, consistent with previous research that has demonstrated the now well-established finding that having a more positive social identity is related to better mental health (e.g., Haslam et al., 2009). Additionally, the positive relation between adaptive problem-focused and avoidant coping suggests that avoidant coping, in this study, may not be entirely mal-adaptive. Moreover, the negative relation between identity and depression was mediated by less use of emotion-focused coping and greater resilience, suggesting that identity may confer better mental health through less use of maladaptive coping, along with higher resilience, both of which are commonly associated with better mental health (Connor & Davidson, 2003; Matheson & Anisman, 2003; Jeste et al., 2013; Moore et al., 2015).

Importantly, however, both the direct (negative) relation between social identity and depression, as well as the mediating role of resilience in the relation between identity and depression was also moderated by age, such that this was only the case for younger adults. This suggests that social identity with the Carleton University community may

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confer protective factors (i.e. higher resilience) against depression in younger adults. In this way, the mental health of younger individuals may be more contingent upon the resiliency possibly gained from feeling connected and supported by the university community. Conversely, in older adults, although resiliency remains important for mental health, identity did not appear to confer protection against depression through resilience. This was also true for the relationship between identity and stress, where age moderated both the direct relationship and the mediating role of resilience. In this regard, only among younger adults were there significant relationships between identity and depression, identity and stress, and between identity and resilience. This supports the notion that identity with the university community may be especially important for the mental health of younger individuals (Iyer et al., 2009) but contradicts past research indicating that strong feelings of social identity are important as a buffer for mental health with increasing age (Haslam et al., 2009).

Moreover, age also moderated the positive relation between avoidant coping and stress, where the use of avoidant coping (as discussed earlier) increased with age (Appendix F). This might suggest that this form of coping may be more detrimental to mental health in older individuals. However, avoidant coping was not consistently related to poor mental health, since in the whole sample of older and younger adults combined, there was no significant relation between either stress or depression and avoidant coping; nor did age significantly moderate the relation between avoidant coping and depression. Additionally, since this form of coping was fairly heterogeneous and included both adaptive and maladaptive forms of coping in the present study (i.e. religious coping along with denial and passivity), it is possible that the negative effects of denial and passivity

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overcame the benefits of religious coping in this regard, making older adults more vulnerable to stress (Pargament, 2001; Holahan et al., 2005; Matheson & Anisman, 2003). This supports the notion that although avoidant coping was not entirely maladaptive in the present study (Holahan et al., 2005; Folkman et al., 1987), it may be beneficial or detrimental to mental health with age depending upon the context.

Finally, the relative importance of social identity in the mental health of older versus younger adults can be considered through another perspective. Since increasing age was related to lower stress and fewer symptoms of depression, it is possible that younger adults' social identity acted as a buffer for the higher levels of stress that they experienced, perhaps due in part to the transition of beginning university (since many of these participants were in first-year university; Iyer et al., 2009). Alternatively, in older adults who may not have been in a state of transition (i.e. living in the same care home for many years), identity did not appear to act as a buffer against stress or depression. Here, had the older sample reported poorer mental health, identity may have played a similar buffering role to that apparent in younger adults (Iyer et al., 2009). In this way, younger individuals may have had more stress, perhaps due to the life-transition of beginning university, and hence more of a need for identity to buffer against that stress.

The Role of Single Nucleotide Polymorphisms

Relations among age and mental health. In the initial hypotheses of the present study, it was relatively unclear whether those carrying the G allele of the *OXTR* rs53576 SNP would be more or less reactive to stress (McQuaid et al., 2013; Rodrigues et al., 2009). In the current data, the relationship between age and depression was dependent upon possessing this allele, suggesting that this allele was related to less depression with

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age. Similarly, this SNP also appeared to moderate the mediating role of social-emotional coping in the relationship between age and stress (Appendix F). Here, in G carriers there was a stronger negative relation between age and social-emotional coping (where lower social-emotional coping was also related to lower stress). This suggests G carriers (i.e. those without the homozygous variant of the SNP) may be more inclined to use coping strategies that are typically considered to be effective (e.g., social support; Rodrigues et al., 2009), supporting the notion that this allele may be related better, rather than worsening, mental health (Rodrigues et al., 2009).

Moreover, in the current data, the rs53576 SNP for *OXTR* moderated the mediating role of social identity in the link between age and depression, where there was a stronger negative relation between identity and depression in those with the AA genotype in comparison to those carrying the G allele. Since those with the AA variant (i.e. those homozygous for this SNP) are generally considered to less frequently seek social support when stressed (Kim et al., 2010), and also less likely to display prosocial behaviours (McQuaid et al., 2013), it may be that feelings of identity are more important for the mental health of individuals who are less social (i.e. individuals who are less prosocial and less frequently seek social supports). In this way, although those with this AA genotype may be less social (Rodrigues et al., 2009; Kim et al., 2010), stronger feelings of identity may, nevertheless, be protective to mental health in these individuals.

Considering the mediating role of avoidant coping in the relationship between age and depression, the moderating role of the *OXTR* rs1042778 SNP on the positive relationship between age and avoidant coping was somewhat in line with the hypotheses. Those with the GG genotype are generally thought to have higher circulating oxytocin

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levels and to be more social (Dadds et al., 2014). Higher circulating oxytocin levels have, in the past, been related to reduced amygdalar (a region of the brain commonly associated with negative emotions) activity, and generally better mental health (Heinrichs & Domes, 2008). Moreover, higher levels of oxytocin have been related to more adaptive coping (McInnis, McQuaid, Matheson & Anisman, 2017). Since avoidant coping arguably contained both adaptive (i.e., religious) and maladaptive (i.e., denial) strategies in the present study (as previously discussed), it is possible that this increase in avoidant coping with age in those with the GG variant (i.e. those without this risk SNP) was due to the religious component of this coping style. In this way, although this form of coping was related to poorer mental health, these results suggest that those with higher oxytocin levels may be more likely to use avoidant coping (including religious coping, denial, and passivity), where some aspects of this form of coping may be vulnerability factors for mental health, whereas others may not be (Matheson & Anisman, 2003; Pargament, 2001).

Conversely, this SNP moderated the mediating role of resilience in the relationship between age and stress (Appendix F). Here, only in individuals with this SNP (i.e. those with the T allele), commonly associated with low circulating oxytocin levels (Dadds et al., 2014), was there a negative relationship between resilience and stress. This suggests that only in T carriers, with lower oxytocin levels (Dadds et al., 2014), was there a positive impact of resilience on mental health; thus, resilience may be more important to the mental health of those with low oxytocin levels. In summary, the current findings indicate that those with the GG genotype of the rs1042778 *OXTR* variant (i.e. those without the risk SNP), with higher oxytocin levels (Dadds et al., 2014), may be

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more likely to use avoidant coping, where some forms of this coping may be detrimental to mental health (i.e. related to higher depression), but only in older adults. They also suggest that the increased resilience associated with age may be more beneficial to mental health in T carriers of this variant, who tend to have lower levels of oxytocin (Dadds et al., 2014).

Finally, the rs16147 SNP for *NPY* only appeared to play moderating roles in relation to stress (Appendix F). Specifically, a negative relationship between age and stress was only evident among those with the C variant. This is contrary to the literature in this domain which suggests that this SNP (i.e. the C allele) is related to reduced *NPY* expression, along with higher susceptibility to anxiety and depression (Sommer et al., 2010; Reichmann & Holzer, 2016). Conversely, only in individuals with the TT genotype (associated with higher *NPY* levels and better mental health; Sommer et al., 2010; Reichmann & Holzer, 2016), was the mediating role of avoidant coping significant in this relation and the link between identity and stress. Once again, however, since avoidant coping contained religious coping, denial and passivity, it is possible that those with higher *NPY* levels use more of an aspect of this coping (such as religious coping), and that the negative aspects of this coping (i.e. passivity and denial) were related to the poorer mental health outcomes in older adults (Holahan et al., 2005). Taken together, these results are somewhat contrary to previous research suggesting that the C allele of this variant is the risk variant of this SNP, linked to lower *NPY* expression and poorer mental health (Sommer et al., 2010; Reichmann & Holzer, 2016).

Relations among identity and mental health. In the negative relationship between social identity and depression, as well as with the relationship between identity

and stress, only the rs1042778 SNP for *OXTR* partially moderated the mediating role of emotion-focused coping. Here, only in those with the SNP (i.e. T carriers), those typically with lower levels of oxytocin, and anti-social behaviour (Dadds et al., 2014), was there a negative relationship between social identity and emotion-focused coping. Similarly, in the relationship between identity and stress, this SNP moderated the direct (negative) relation between identity and stress, where only in those with the T allele was social identity beneficial to mental health. These findings suggest that in individuals with this variant, stronger feelings of identity may be both directly (i.e. through the negative relation between identity and stress) and indirectly protective to mental health through the use of less maladaptive coping strategies (i.e. emotion-focused coping). Since these individuals tend to have lower oxytocin levels (Dadds et al., 2014), it is possible that having stronger feelings of social identity and connectedness are protective to mental health in these individuals though naturally raising oxytocin levels (Heinrichs et al., 2003).

There was also a negative relationship between identity and stress, but only in G carriers of the *OXTR* rs53576 SNP. As mentioned, the G allele of this SNP is commonly related to prosocial behaviours (McQuaid et al., 2013) along with using social supports to cope (Kim et al., 2010). In the context of past findings, this result indicates that in carriers of the G allele of this SNP, that is, those who are more prosocial and inclined to use social supports to cope (McQuaid et al., 2013; Kim et al., 2010), identity is protective against stress. This is contrary to the earlier finding that it was the AA variant (associated with less prosocial behaviour; McQuaid et al., 2013) related to a stronger negative relation between identity and depression. Here, it is possible that stress and depression

operate differently in this respect, where the G allele is protective against stress through identity, and the AA variant is protective against depression through identity.

Limitations

Despite several strengths of the present study, including the large sample size (especially of older individuals, in the context of other older samples), and the wide array of variables—both biological and psychosocial—analyzed, there are a number of limitations to consider. Firstly, given this was a correlational study assessing participants at a single point in time, causal assumptions should be made cautiously, and thus conclusions drawn may be subject to cohort effects. Nonetheless, the sample included participants ranging in age from 17 to 102, which partially mitigated this limitation. Moreover, many older participants needed help in answering questions; thus, some answers may have been subject to biases of the researchers themselves. Selection bias may also have been a risk, where older adults who participated may have had different characteristics than those who did not (e.g., more willing to participate in a socially-engaging study), and where students who participated were part of a certain discipline at Carleton University (e.g., psychology). These biases may make the samples non-representative of the population as a whole. Moreover, although this study included many co-variables in the moderation and moderated mediation analyses, there are many more variables that might have influenced the current results, including environmental, or other psychological and biological factors.

This study expected to see SNPs for *BDNF* also play moderating roles in the relations between age and mental health, where better mental health and coping was expected in individuals not carrying the risk alleles. It was expected that having the risk

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variants of these SNPs would change the nature of the relations between age and mental health, along with social identity and mental health. In these instances, although there were some trends for moderation and/or moderated mediations with these SNPs, it is possible that the sample size for this study limited the extent to which such trends could be significantly distinguished. Although the sample size was sufficient for a psychosocial study, another obvious limitation is the small sample size for a study examining genetic polymorphisms, given that sample sizes of greater than 250 are typically required in order to achieve enough statistical power for these types of analyses (Hong & Park, 2012). This can be partially due to low frequencies of certain genetic variants found in the population. Thus, since most studies of this nature require many more participants, the current SNP-related findings might instead be viewed as exploratory, where further research could determine if these genetic trends hold true for a larger sample.

Finally, a number of the coping factors analyzed, including avoidant coping, had fairly low internal reliability scores, and these reliabilities were not improved when removing any one item or subscale from the analyses. Here, low inter-item correlations could indicate the items do not consistently measure the same construct. This could, in part, be due to the type of coping scale used. Due to the length of the questionnaire, the SCOPE short form was used—the use of the full version of this coping scale may have provided a more comprehensive and reliable analysis of coping. Moreover, religious coping was one of the coping styles included within the avoidant coping factor, and more insight might have been gained by analyzing this form of coping separately. Finally, no measures used in this study were statistically normal, and yet appropriate transformations did not help the data to achieve normality. Although this is not uncommon in

psychosocial data (Merz et al., 2013), non-normality may render certain statistical analyses less robust. Nonetheless, genetic data was in Hardy-Weinberg equilibrium, as assessed by Chi-Square Tests on the allelic frequencies for each SNP assessed for *BDNF*, *OXTR*, and *NPY* (Appendix H), suggesting that the allele frequencies found in this sample do not significantly deviate from those predicted by the Hardy-Weinberg principle.

Conclusions

Overall, age was associated with better mental health, more adaptive coping styles, stronger social identity, and higher resilience (Stewart et al., 2014; Disner et al., 2011). The findings discussed here help in explaining these relationships. Identity, along with a variety of coping styles (e.g., avoidant, emotion-focused), may account for the relationship between age and depression, where SNPs for *OXTR* moderated the direct relation and also moderated these mediation effects. That said, the relationship between identity and depression, along with the mediating role of resilience, appeared to be dependent on younger age, suggesting that identity may have been more important to the mental health (depression) of younger, rather than older individuals. Conversely, resilience appeared to be more important to the mental health (stress) of older, rather than younger, individuals. And finally, *OXTR* moderated the indirect effect of emotion-focused coping on the relation between identity and depression, perhaps suggesting that identity is most protective to mental health through less use of emotion-focused coping styles in carriers of this SNP. Taken together, these findings highlight the importance of genetic factors (and particularly *OXTR*), social identity, resilience, and adaptive coping

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strategies in healthy aging, and challenge the assumption that mental health symptoms will inevitably increase with age.

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Appendix

Appendix A: Questionnaires

CES-D

	Rarely/ none of the time (less than 1 day)	Some/ little of the time (1-2 days)	Occasionally/ moderate amount of time (3-4 days)	All of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	☐	☐	☐	☐
2. I had trouble keeping my mind on what I was doing.	☐	☐	☐	☐
3. I felt depressed.	☐	☐	☐	☐
4. I felt that everything I did was an effort.	☐	☐	☐	☐
5. I felt hopeful about the future.	☐	☐	☐	☐
6. I felt fearful.	☐	☐	☐	☐
7. My sleep was restless.	☐	☐	☐	☐
8. I was happy.	☐	☐	☐	☐
9. I felt lonely.	☐	☐	☐	☐
10. I could not "get going".	☐	☐	☐	☐

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GAI-SF (not included in final analyses)

Please answer the items according to how you've felt in the last week.

Check the column under **Agree** if you mostly agree that the item describes you;

Check the column under **Disagree** if you mostly disagree that the item describes you.

	Agree	Disagree
1. I worry a lot of the time.	☐	☐
2. I often feel nervous.	☐	☐
3. Little things bother me a lot.	☐	☐
4. I think of myself as a worrier.	☐	☐
5. My own thoughts often make me anxious.	☐	☐

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Beck Anxiety Inventory (not included in final analyses)

Please rate how much you have been bothered by each of the following symptoms over the past week.

0

1

2

3

Not at all

Severely (I could barely stand it)

- _____ 1. Numbness or tingling
- _____ 2. Feeling hot
- _____ 3. Wobbliness in legs
- _____ 4. Unable to relax
- _____ 5. Fear of the worse happening
- _____ 6. Dizzy or lightheaded
- _____ 7. Heart pounding or racing
- _____ 8. Unsteady
- _____ 9. Terrified
- _____ 10. Nervous
- _____ 11. Feelings of choking
- _____ 12. Hands trembling
- _____ 13. Shaky
- _____ 14. Fear of losing control
- _____ 15. Difficulty breathing
- _____ 16. Fear of dying
- _____ 17. Scared
- _____ 18. Indigestion or discomfort in abdomen
- _____ 19. Faint
- _____ 20. Face flushed
- _____ 21. Sweating (not due to heat)

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Social Connectedness Scale (not included in final analyses)

1. I feel disconnected from the world around me.

1	2	3	4	5	6
Agree					Disagree

2. Even around people I know, I don't feel that I really belong.

1	2	3	4	5	6
Agree					Disagree

3. I feel so distant from people.

1	2	3	4	5	6
Agree					Disagree

4. I have no sense of togetherness with my peers.

1	2	3	4	5	6
Agree					Disagree

5. I don't feel related to anyone.

1	2	3	4	5	6
Agree					Disagree

6. I catch myself losing all sense of connectedness with society.

1	2	3	4	5	6
Agree					Disagree

7. Even among my friends, there is no sense of brother/sisterhood.

1	2	3	4	5	6
Agree					Disagree

8. I don't feel I participate with anyone or any group.

1	2	3	4	5	6
Agree					Disagree

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Identification with Retirement⁵ Community

Using a scale from 1 to 5, with 1 being “strongly disagree” and 5 being “strongly agree”, please state how you feel about the following statements:

1. I see myself as being part of the _____.

1	2	3	4	5
Strongly Disagree				Strongly Agree

2. I am pleased to be part of the _____.

1	2	3	4	5
Strongly Disagree				Strongly Agree

3. I feel strong ties with people in the _____.

1	2	3	4	5
Strongly Disagree				Strongly Agree

4. I can identify with people in the _____.

1	2	3	4	5
Strongly Disagree				Strongly Agree

5. I feel that I am very different from other people in the _____.

1	2	3	4	5
Strongly Disagree				Strongly Agree

⁵ This scale was modified and used for university students as well. For younger participants, this scale was entitled “Identification with University Community Scale,” and individuals were asked the degree to which they agreed with each of the above 5 questions in relation to the university, rather than retirement community.

CDRS-R

Considering your experiences over the last month, please rate how true the following statements are on a scale of 0 (rarely true) to 4 (true nearly all of the time). *Over the past month . . .*

1. I was able to adapt to change				
0	1	2	3	4
Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
2. I could deal with whatever came my way				
0	1	2	3	4
Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
3. I tried to see the humorous side of problems				
0	1	2	3	4
Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
4. I thought that coping with stress could strengthen me				
0	1	2	3	4
Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
5. I tended to bounce back after illness or hardship				
0	1	2	3	4
Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
6. I could achieve goals despite obstacles being in my way				
0	1	2	3	4
Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
7. I could stay focused under pressure				
0	1	2	3	4
Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
8. I was not easily discouraged by failure				
0	1	2	3	4
Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
9. I thought of myself as a strong person				
0	1	2	3	4
Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
10. I could handle unpleasant feelings				
0	1	2	3	4
Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time

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SCOPE – Short Form

The purpose of this questionnaire is to find out how people deal with their problems or the stresses in their lives. The following are activities that you may have done. After each activity, please indicate the extent to which you would use this as a way of dealing with problems or stresses in recent months.

In that Situation I...	Not at all		Somewhat		Totally
1. accepted that there was nothing I could do to change my situation.	0	1	2	3	4
2. blamed myself for my problems.	0	1	2	3	4
3. told others that I was really upset.	0	1	2	3	4
4. asked others for help or advice.	0	1	2	3	4
5. spent a lot of time thinking about my problems.	0	1	2	3	4
6. took time for recreation or pleasure activities.	0	1	2	3	4
7. made plans to overcome my concerns or problems.	0	1	2	3	4
8. avoided thinking about my problems.	0	1	2	3	4
9. told jokes about my situation.	0	1	2	3	4
10. thought a lot about who was responsible for my problems (besides me).	0	1	2	3	4
11. worried about my problems a lot.	0	1	2	3	4
12. made humorous comments or stories about my situation.	0	1	2	3	4
13. wished the situation would just go away or be over with.	0	1	2	3	4
14. thought a lot about how I brought my problems on myself.	0	1	2	3	4
15. decided to wait and see how things turned out.	0	1	2	3	4
16. tried to keep my mind off things that were upsetting me.	0	1	2	3	4
17. sought reassurance and emotional support from others.	0	1	2	3	4
18. thought about how my problems were caused by other people.	0	1	2	3	4

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19. cried, even if someone else was around.	0	1	2	3	4
20. looked for how I could grow and learn through my situation.	0	1	2	3	4
21. told myself that other people have problems like mine	0	1	2	3	4
22. did things to keep busy or active (e.g. exercised/ went out).	0	1	2	3	4
23. held in my feelings.	0	1	2	3	4
24. daydreamed about how things may turn out.	0	1	2	3	4
25. tried to act as if I wasn't feeling bad.	0	1	2	3	4
26. took steps to overcome the problem.	0	1	2	3	4
27. turned to God or my faith.	0	1	2	3	4
28. used prescription drugs to try to make me feel better.	0	1	2	3	4
29. used alcohol to try to make me feel better.	0	1	2	3	4
30. used food to try to make me feel better.	0	1	2	3	4

Single Item Stress Measures

1. On a scale of 1 to 6, how would you rate your ability to handle stress?⁶

1	2	3	4	5	6
I can shake off stress					Stress eats away at me

2. In the past year, how would you rate the amount of stress in your life?

1	2	3	4	5	6
No stress					Extreme stress

⁶ Question not included in analyses.

Medical History

1. When was the last time you ate today? _____ minutes/hours ago

2. When was the last time you drank something today? _____

minutes/hours ago

3. Are you currently being treated for any condition(s) (e.g. disease, allergy, depression)?

- ☐ No
☐ Yes *please specify:*

4. Are you taking medication for any of the following conditions? Please check all that apply.

- ☐ High Blood Pressure
☐ Diabetes
☐ Cardiovascular Disease
☐ Hypothyroidism
☐ Gastrointestinal Disorders
☐ Dementia
☐ Depression
☐ Anxiety
☐ Other:

5. Do you smoke?

- ☐ No
☐ Yes → How often? ____ very often ____ somewhat often ____ once in a while
____ rarely ____ socially

6. Did you smoke in the past?

- ☐ No, I have never smoked.
☐ Yes → For how long? ____ years
How often? ____ very often ____ somewhat often ____ once in a while ____ rarely
Did you smoke socially? Yes / No

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7. Do you consume alcohol? If so, how often?

- ☐ No
- ☐ Yes → How often? ____ very often ____ somewhat often ____ once in a while
____ rarely ____ socially

8. Have you had any of the following conditions in the recent past?

Please check all that apply.

- ☐ Pneumonia
- ☐ Influenza (the flu)
- ☐ Shingles
- ☐ Cancer
- ☐ Depression
- ☐ Anxiety
- ☐ Other:
-

Demographic Information

1. What is your current age? _____

2. What is your gender?

- ☐ Male
- ☐ Female
- ☐ Other: _____

3. What is your ethnic/racial identity?

- ☐ Asian (i.e. Chinese, Japanese, Korean)
- ☐ South Asian (i.e. East Indian, Pakistani, Punjabi, Sri Lankan)
- ☐ South East Asian (i.e. Cambodian, Indonesian, Laotian)
- ☐ Arabic
- ☐ Black
- ☐ South/Latin American
- ☐ Mexican
- ☐ Aboriginal
- ☐ Euro-Caucasian
- ☐ Other *please specify*: _____

4. What is your religious affiliation?

- ☐ Protestant
- ☐ Catholic
- ☐ Jewish
- ☐ Muslim
- ☐ Buddhist
- ☐ Hindu
- ☐ Sikh
- ☐ Baha'i
- ☐ Atheist
- ☐ Agnostic
- ☐ Other *please specify*: _____

5. What is your current relationship status? *Please check the one that best applies to you.*

- ☐ Single
- ☐ In a serious dating relationship
- ☐ Co-Habiting
- ☐ Engaged
- ☐ Married
- ☐ Separated/Divorced
- ☐ Widowed

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6. What is your current living arrangement? *Please check the one that best applies to you.*

- ☐ Living alone
- ☐ Living with spouse/significant other
- ☐ Other *please specify* _____

7. When did you move into _____?

Date: _____

8. What is the highest level of education that you have completed?

- ☐ Grade school
- ☐ Some high school
- ☐ High school diploma
- ☐ Trade certificate/diploma
- ☐ Some college
- ☐ College diploma/degree
- ☐ Some university
- ☐ University degree

Appendix B: Supplemental Interaction Effects as a Function of Covariates

Past and present medical conditions along with medications. There were no statistically significant interactions between age and the presence of past medical conditions in relation to depression, $F(1, 447) = 1.46, p = .227$, resilience, $F(1, 447) = .89, p = .244$, stress in the past year, $F(1, 447) = .16, p = .688$, social identity, $F(1, 447) = .50, p = .481$, emotion-focused coping, $F(1, 447) = .70, p = .404$, problem-focused coping, $F(1, 447) = .59, p = .443$, social-emotional coping, $F(1, 447) = .79, p = .375$, or avoidant coping, $F(1, 447) = .00, p = .952$.

Similarly, there were no interactions between age and current medical conditions with regard to depression, $F(1, 446) = 1.00, p = .317$, resilience, $F(1, 446) = .01, p = .911$, $F(1, 446) = .51, p = .478$, social identity, $F(1, 446) = .45, p = .501$, emotion-focused coping, $F(1, 446) = .29, p = .593$, problem-focused coping, $F(1, 446) = 1.88, p = .171$, social-emotional coping, $F(1, 446) = 3.01, p = .083$, or avoidant coping, $F(1, 446) = 3.51, p = .062$. There was, however, a significant interaction between age and current medical conditions in predicting stress in the past year, $F(1, 446) = 3.86, p = .050$. Specifically, both older and younger individuals being treated for a current medical condition tended to have more stress in the past year ($M = 3.79, SD = 1.39$ for older adults; and $M = 4.74, SD = 1.03$ for younger adults) than those without a condition ($M = 2.71, SD = 1.06$; $t(50.72) = 3.65, p = .001$ for older adults; and $M = 4.29, SD = 1.17$; $t(119.39) = 3.22, p = .002$ for younger adults; Table C2A & Table C2B), but younger adults in both conditions tended to have more stress in the past year.

Similarly, no significant interactions were found between age and medication use for depression, $F(1, 448) = .13, p = .718$, resilience, $F(1, 448) = .18, p = .672$, stress in

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the past year, $F(1, 448) = 1.37, p = .242$, social identity, $F(1, 448) = .57, p = .449$, emotion-focused coping, $F(1, 448) = .00, p = .991$, problem-focused coping, $F(1, 448) = 1.22, p = .269$, or social-emotional coping, $F(1, 448) = .00, p = .982$. There were, however, significant interactions between age and medication use in predicting avoidant coping, $F(1, 448) = 15.49, p < .001$. In this way, the relation between avoidant coping and medication use was different for older and younger adults. Here, older adults using medications tended to use more avoidant coping ($M = 2.42, SD = .76$) than those not requiring medications ($M = 1.58, SD = .78; t(82) = 3.10, p = .003$); Table C3A). On the other hand, younger adults using medications tended to use less avoidant coping ($M = 1.55, SD = .61$) than those not using medications ($M = 1.87, SD = .79; t(84.17) = -3.35, p = .001$; Table C3B).

Past smoking status. There were no statistically significant interactions between age and past smoking status for depression, $F(1, 443) = 1.19, p = .275$, resilience, $F(1, 443) = .01, p = .925$, stress, $F(1, 443) = .34, p = .563$, identity, $F(1, 443) = 2.32, p = .128$, emotion-focused coping, $F(1, 443) = .73, p = .394$, problem-focused coping, $F(1, 443) = .08, p = .775$, social-emotional coping, $F(1, 443) = .78, p = .378$, and avoidant coping, $F(1, 443) = .04, p = .839$.

Alcohol consumption. There were no statistically significant interactions between age and alcohol consumption for resilience, $F(1, 447) = 1.09, p = .296$, stress in the past year, $F(1, 447) = 1.43, p = .233$, emotion-focused coping, $F(1, 447) = 3.59, p = .059$, problem-focused coping, $F(1, 447) = .00, p = .956$, social-emotional coping, $F(1, 447) = 3.19, p = .075$, and avoidant coping, $F(1, 447) = .02, p = .88$. There were, however, significant interactions between age and alcohol consumption in predicting

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depression, $F(1, 447) = 4.01, p = .046$, and social identity, $F(1, 447) = 4.83, p = .028$).

Specifically, alcohol consumption was related to depression differentially in older and younger individuals. In older adults, those who consumed alcohol tended to self-report lower depression scores ($M = 1.56, SD = .37$) than those who did not consume alcohol ($M = 1.80, SD = .51; t(82) = -2.47, p = .016$); this effect was non-significant for younger adults (Table C6A & B). Alternatively, alcohol use was not significantly related to alcohol use in older or younger adults, although the trends differed for older versus younger individuals. In this way, older adults who consumed alcohol tended to have non-significantly lower social identification ($M = 4.09, SD = .66$) than non-drinkers ($M = 4.35, SD = .60; t(82) = -1.82, p = .073$; Table C6A). On the other hand, younger adults who consumed alcohol tended to have non-significantly higher social identification ($M = 3.51, SD = .79$) than non-drinkers ($M = 3.35, SD = .79; t(365) = 1.81, p = .071$; Table C6B).

Gender differences. There were no statistically significant interactions between age and gender for depression, $F(1, 449) = 1.12, p = .291$, resilience, $F(1, 449) = .28, p = .600$, stress in the past year, $F(1, 449) = .40, p = .526$, social identity, $F(1, 449) = .06, p = .806$, emotion-focused coping, $F(1, 449) = .14, p = .707$, problem-focused coping, $F(1, 449) = 2.37, p = .124$, social-emotional coping, $F(1, 449) = .89, p = .345$, or avoidant coping, $F(1, 449) = 2.52, p = .113$.

Appendix C: Supplemental Simple Effects as a Function of Age**Past and present medical conditions along with medications.**

Older adults. Importantly, for the most part, the use of medications as well as the presence of past and current medical conditions were not related to depression, resilience, stress in the past year, social identity, or coping in older individuals (Table C1A; Table C2A, & B3A). The only exception to this was that older adults with current medical conditions tended to use more social-emotional coping ($M = 1.75$, $SD = .93$) than those without conditions ($M = 1.22$, $SD = .87$; $t(81) = 2.43$, $p = .017$; Table C2A).

Table C1A

Psychosocial variables as a function of the presence or absence of recent past medical conditions in older adults.

Outcome	Group						95% CI for Mean Difference	t	df	p
	Presence of Recent Past Medical Conditions			Absence of Recent Past Medical Conditions						
	M	SD	n	M	SD	n				
Depression	1.7	.47	56	1.54	.33	27	-.36, .04	-1.58	81	.119
Resilience	3.19	.56	56	3.17	.48	27	-.27, .23	-.14	81	.890
Stress	3.63	1.40	56	3.19	1.42	27	-.21, 1.09	1.34	81	.184
Identity	4.18	.65	56	4.2	.64	27	-.28, .33	.15	81	.879
EF Coping	1.64	.76	56	1.55	.79	27	-.27, .45	.47	81	.637
PF Coping	2.54	.88	56	2.48	.72	27	-.33, .45	.31	81	.756
SE Coping	1.62	.90	56	1.55	1.03	27	-.37, .51	.32	81	.753
AV Coping	2.34	.81	56	2.30	.81	27	-.34, .42	.22	81	.828

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

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Table C2A

Psychosocial variables as a function of the presence or absence of current medical conditions being treated in older adults.

Outcome	Group						95% CI for Mean Difference	t	df	p
	Presence of Current Medical Conditions			Absence of Current Medical Conditions						
	M	SD	n	M	SD	n				
Depression	1.68	.47	59	1.53	.31	24	-.33, .03	-1.67	63.29	.100
Resilience	3.15	.52	59	3.36	.52	24	-.04, .46	1.68	81	.097
Stress	3.80	1.39	59	2.71	1.16	24	.49, 1.69	3.65	50.72	.001
Identity	4.21	.67	59	4.14	.59	24	-.38, .25	-.4	81	.687
EF Coping	1.64	.77	59	1.51	.77	24	-.23, .51	.73	81	.465
PF Coping	2.58	.8	59	2.35	.91	24	-.18, .62	1.10	81	.275
SE Coping	1.75	.93	59	1.22	.87	24	.10, .97	2.43	81	.017
AV Coping	2.33	.75	59	2.29	.94	24	-.34, .43	.23	81	.818

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Table C3A

Psychosocial variables as a function of the use and disuse of medications to treat medical conditions in older adults.

Outcome	Group						95% CI for Mean Difference	t	df	p
	Using Medications to Treat Conditions			Not Using Medications to Treat Conditions						
	M	SD	n	M	SD	n				
Depression	1.66	.45	75	1.48	.28	9	-.49, .12	-1.22	82	.225
Resilience	3.19	.55	75	3.26	.36	9	-.23, .36	.49	12.93	.633
Stress	3.56	1.41	75	2.78	1.20	9	-.19, 1.76	1.60	82	.114
Identity	4.19	.66	75	4.09	.53	9	-.56, .36	-.43	82	.667
EF Coping	1.61	.78	75	1.66	.67	9	-.58, .50	-.16	82	.873
PF Coping	2.53	.83	75	2.32	.85	9	-.37, .80	.73	82	.469
SE Coping	1.60	.93	75	1.58	1.05	9	-.65, .67	.04	82	.968
AV Coping	2.42	.76	75	1.58	.78	9	.30, 1.37	3.10	82	.003

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Younger adults. Younger adults reporting medical conditions in the recent past tended to self-report higher depression on average ($M = 2.17$, $SD = .57$) than those without past conditions ($M = 1.85$, $SD = .46$; $t(293.58) = -5.69$, $p < .001$; Table C1B).

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Along these lines, those with medical conditions in the past also self-reported lower resilience ($M = 2.53$, $SD = .63$) and more stress in the past year ($M = 4.70$, $SD = 1.03$), than individuals without ($M = 2.69$, $SD = .61$; $t(366) = 2.51$, $p = .013$; and $M = 4.14$, $SD = 1.19$; $t(357.41) = 4.83$, $p < .001$; Table C1B). These individuals also reported lower social identity ($M = 3.37$, $SD = .83$) than participants without a condition ($M = 3.54$, $SD = .75$; $t(366) = 1.95$, $p = .052$; Table C1B); where the results were meaningful but not significant. Young individuals with a past condition also tended to use differential coping. In this way, they tended to use more emotion-focused coping ($M = 2.50$, $SD = .66$) and less social-emotional coping ($M = 2.02$, $SD = 1.05$) than those without medical conditions in the recent past (; $M = 2.26$, $SD = .74$; $t(354.25) = 4.83$, $p = .001$; and $M = 1.71$, $SD = 1.04$; $t(366) = -1.10$, $p = .006$ respectively; Table C1B). Alternatively, there were no significant differences in other forms of coping between those with and without medical conditions in the recent past (Table C1B).

Table C1B

Psychosocial variables as a function of the presence or absence of recent past medical conditions in younger adults.

Conditions in younger adults.										
Outcome	Group						95% CI for Mean Difference	t	df	p
	Presence of Recent Past Medical Conditions			Absence of Recent Past Medical Conditions						
	M	SD	n	M	SD	n				
Depression	2.17	.57	157	1.85	.46	211	-.42, -.21	-5.69	293.58	.000
Resilience	2.53	.63	157	2.69	.61	211	.04, .29	2.51	366	.013
Stress	4.70	1.03	157	4.14	1.19	211	.33,.79	4.83	357.41	.000
Identity	3.37	.83	157	3.54	.75	211	-.001, .32	1.95	366	.052
EF Coping	2.50	.66	157	2.26	.74	211	.10, .38	4.83	354.25	.001
PF Coping	2.41	.74	157	2.49	.67	211	-.23, .06	3.28	316.96	.271
SE Coping	2.02	1.05	157	1.71	1.04	211	.09,.52	-1.10	366	.006
AV Coping	1.84	.78	157	1.81	.77	211	-.13, .19	2.76	366	.719

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

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Similarly, younger individuals being treated for a current medical condition reported lower resilience ($M = 2.47$, $SD = .64$), and a worse ability to handle stress ($M = 3.78$, $SD = 1.29$) than participants without a condition ($M = 2.66$, $SD = .61$; $t(365) = 2.38$, $p = .018$; and $M = 3.25$, $SD = 1.40$; $t(365) = -2.93$, $p = 0.004$ respectively; Table C2B). On the other hand, those with a condition tended to use less avoidant coping ($M = 1.54$, $SD = .54$) than those without conditions ($M = 1.89$, $SD = .80$; $t(157.43) = -4.45$, $p < .001$; Table C2B). Alternatively, those with a current medical condition did not have significantly different social identity, or other differences in coping, than those not being treated for a condition (Table C2B).

Table C2B

Psychosocial variables as a function of the presence or absence of current medical conditions being treated in younger adults.

Outcome	Group						95% CI for Mean Difference	t	df	p
	Presence of Current Medical Conditions			Absence of Current Medical Conditions						
	M	SD	n	M	SD	n				
Depression	2.21	.57	72	1.93	.5	295	-.43, -.14	-3.94	100.07	.000
Resilience	2.47	.64	72	2.66	.61	295	.034, .35	2.38	365	.018
Stress	4.74	1.03	72	4.29	1.17	295	.17, .73	3.22	119.39	.002
Identity	3.4	.81	72	3.48	.78	295	-.13, .28	.76	365	.449
EF Coping	2.38	.67	72	2.35	.72	295	-.15, .21	.32	365	.749
PF Coping	2.41	.64	72	2.47	.72	295	-.23, .13	-.57	365	.567
SE Coping	1.88	1.06	72	1.84	1.06	295	-.23, .31	.30	365	.768
AV Coping	1.54	.54	72	1.89	.80	295	-.51, -.19	-4.45	157.43	.000

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Along these lines, younger adults taking medications for a medical condition tended to self-report higher depression ($M = 2.21$, $SD = .55$) than those not taking medications ($M = 1.95$, $SD = .52$; $t(366) = -3.32$, $p = .001$; Table C3B). There were,

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however, no significant differences in those taking medications for a condition compared to those not on medications, in resilience, coping, or social identity (Table C3B).

Table C3B

Psychosocial variables as a function of the use and disuse of medications to treat medical conditions in younger adults.

Outcome	Group						95% CI for Mean Difference	t	df	p
	Using Medications to Treat Conditions			Not Using Medications to Treat Conditions						
	M	SD	n	M	SD	n				
Depression	2.21	.55	53	1.95	.52	315	-.41, -.10	-3.32	366	.001
Resilience	2.48	.61	53	2.65	.62	315	-.02, .35	1.80	366	.074
Stress	4.58	1.23	53	4.34	1.14	315	-.09, .58	1.42	366	.156
Identity	3.36	.85	53	3.48	.78	315	-.11, .35	1.05	366	.295
EF Coping	2.32	0.62	53	2.36	0.73	315	-.25, .16	-.44	366	.658
PF Coping	2.38	.68	53	2.47	.71	315	-.30, .11	-.90	366	.367
SE Coping	1.85	1.02	53	1.84	1.06	315	-.30, .31	.03	366	.977
AV Coping	1.55	.61	53	1.87	.79	315	-.50, -.13	-3.35	84.17	.001

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Past and present smoking status.

Older adults. In older adults, having smoked in the past was not significantly related to mental health, coping, or social identity (Table C4A). Alternatively, only one older adult participant smoked at the time of the study, rendering further analyses on current smoking status invalid for the older group.

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Table C4A

Psychosocial variables as a function of the past smoking and non-smoking status of older adults.

Outcome	Group						95% CI for Mean Difference	t	df	p
	Non-Smoker			Smoker						
	M	SD	n	M	SD	n				
Depression	1.71	.44	41	1.58	.43	43	-.06, .32	1.40	82	.166
Resilience	3.21	.51	41	3.19	.57	43	-.21, .25	.17	82	.868
Stress	3.59	1.47	41	3.37	1.35	43	-.40, .82	.70	82	.489
Identity	4.29	.55	41	4.07	.72	43	-.07, .49	1.52	78.410	.134
EF Coping	1.54	.75	41	1.69	.79	43	-.49, .18	-.94	82	.352
PF Coping	2.54	.74	41	2.48	.91	43	-.30, .42	.32	79.99	.754
SE Coping	1.54	.94	41	1.65	.94	43	-.51, .30	-.50	82	.617
AV Coping	2.35	.81	41	2.31	.80	43	-.31, .39	.24	82	.814

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Younger adults. In younger adults, having smoked in the past was related to a few psychosocial and coping variables. Here, past smokers used more social-emotional coping ($M = 2.09$, $SD = 1.06$) than those who did not smoke in the past ($M = 1.76$, $SD = 1.04$; $t(361) = -2.54$, $p = .012$ respectively; Table C4B).

Table C4B

Psychosocial variables as a function of the past smoking and non-smoking status of younger adults.

Outcome	Group						95% CI for Mean Difference	t	df	p
	Non-Smoker			Smoker						
	M	SD	n	M	SD	n				
Depression	1.98	.54	279	1.98	.48	84	-.14, .12	-.12	361	.906
Resilience	2.64	.64	279	2.60	.57	84	-.12, .19	.44	361	.662
Stress	4.37	1.14	279	4.33	1.22	84	-.25, .32	.26	361	.794
Identity	3.45	.80	279	3.53	.75	84	-.27, .11	-.83	361	.409
EF Coping	2.35	.72	279	2.35	.69	84	-.18, .17	-.02	361	.987
PF Coping	2.46	.67	279	2.45	.81	84	-.19, .20	.05	118.68	.964
SE Coping	1.76	1.04	279	2.09	1.06	84	-.59, -.07	-2.54	361	.012
AV Coping	1.85	.79	279	1.77	.70	84	-.11, .27	.85	361	.397

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

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Alternatively, younger adults who smoked at the time of the study tended to be more likely to use problem-focused coping ($M = 2.65$, $SD = .74$), than non-smokers ($M = 2.42$, $SD = .69$; $t(365) = -2.13$, $p = .034$; Table C5). In younger individuals, past and current smoking status was not significantly related to other mental health variables, including forms of coping, or social identity (Table C5).

Table C5

Psychosocial variables as a function of the current smoking and non-smoking status of younger adults.

Outcome	Group						95% CI for Mean Difference	t	df	p
	Non-Smoker			Smoker						
	M	SD	n	M	SD	n				
Depression	1.99	.54	316	1.97	.50	51	-.14, .18	.28	365	.782
Resilience	2.62	.63	316	2.66	.56	51	-.23, .14	-.44	365	.658
Stress	4.35	1.15	316	4.51	1.16	51	-.50, .18	-.92	365	.359
Identity	3.44	.79	316	3.60	.77	51	-.39, .07	-1.35	365	.178
EF Coping	2.36	.71	316	2.35	.76	51	-.20, .23	.16	365	.875
PF Coping	2.42	.69	316	2.65	.74	51	-.43, -.02	-2.13	365	.034
SE Coping	1.82	1.06	316	1.94	.99	51	-.43, .19	-.76	365	.451
AV Coping	1.85	.78	316	1.64	.68	51	-.02, .44	1.79	365	.074

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Alcohol consumption.

Older adults. Interestingly, older individuals who consumed alcohol tended to have lower self-reported depression ($M = 1.56$, $SD = .37$), and higher resilience scores ($M = 3.28$, $SD = .51$) than those who did not ($M = 1.80$, $SD = .51$; $t(82) = 2.47$, $p = .016$; and $M = 3.04$, $SD = .55$; $t(82) = -2.01$, $p = .048$ respectively; Table C6A). Alternatively, in older adults, drinking status was not significantly related to stress in the past year, coping, or social identity (Table C6A).

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Table C6A

Psychosocial variables as a function of the current drinking and non-drinking status of older adults.

Outcome	Group						95% CI for Mean Difference	t	df	p
	Drinks Alcohol			Does not Drink Alcohol						
	M	SD	n	M	SD	n				
Depression	1.56	.37	55	1.80	.51	29	-.43, -.05	-2.47	82	.016
Resilience	3.28	.51	55	3.04	.55	29	-.48, -.00	-2.01	82	.048
Stress	3.38	1.46	55	3.66	1.29	29	-.91, .37	-.85	82	.399
Identity	4.09	.66	55	4.35	.60	29	-.56, .03	-1.82	82	.073
EF Coping	1.52	.77	55	1.80	.73	29	-.62, .07	-1.58	82	.118
PF Coping	2.54	.81	55	2.46	.89	29	-.31, .46	.39	82	.696
SE Coping	1.53	.95	55	1.72	.90	29	-.62, .23	-.92	82	.361
AV Coping	2.24	.85	55	2.49	.69	29	-.59, .09	-1.45	68.00	.153

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Younger adults. On the other hand, younger individuals who consumed alcohol tended to more frequently use more social-emotional coping ($M = 1.92$, $SD = 1.08$) and less avoidant coping ($M = 1.74$, $SD = .74$) than non-drinkers ($M = 1.65$, $SD = .96$; $t(225.29) = 2.40$, $p = .017$; and $M = 2.02$, $SD = .82$; $t(183.27) = -3.06$, $p = .003$ respectively; Table C6B). In this group, however, alcohol consumption was not related to other forms of coping, mental health, or social identity (Table C6B).

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Table C6B

Psychosocial variables as a function of the current drinking and non-drinking status of younger adults.

Outcome	Group						95% CI for Mean Difference	t	df	p
	Drinks Alcohol			Does not Drink Alcohol						
	M	SD	n	M	SD	n				
Depression	2.00	.53	259	1.98	.52	108	-.10, .14	.38	365	.708
Resilience	2.64	.62	259	2.56	.61	108	-.22, .06	-1.13	365	.260
Stress	4.41	1.15	259	4.31	1.19	108	-.16, .36	.73	365	.468
Identity	3.51	.79	259	3.35	.79	108	-.01, .34	1.81	365	.071
EF Coping	2.38	.69	259	2.31	.77	108	-.08, .24	.93	365	.351
PF Coping	2.48	.69	259	2.39	.72	108	-.07, .24	1.06	365	.289
SE Coping	1.92	1.08	259	1.65	.96	108	.05, .50	2.40	225.29	.017
AV Coping	1.74	.74	259	2.02	.82	108	-.46, -.10	-3.06	183.27	.003

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Gender differences.

Older adults. In older adults, gender was related to mental health and coping.

Firstly, there was a significant relationship between gender and self-reported depression in older adults ($t(85) = -1.99, p = .050$; Table C7A). In this way, older females tended to have higher self-reported depression on average ($M = 1.68, SD = .46$), than older men ($M = 1.47, SD = .33$; Table C7A). Older men tended to use less social-emotional coping ($M = 1.27, SD = .67$) and avoidant coping ($M = 1.96, SD = .81$) than women ($M = 1.73, SD = .97; t(52.72) = -2.42, p = .019$; and $M = 2.44, SD = .75; t(85) = -2.54, p = .013$ respectively; Table C7A). Gender was not significantly related to other measures of mental health, coping, or social identity in older individuals (Table C7A).

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Table C7A

Psychosocial variables as a function of gender of older adults.

Outcome	Group						95% CI for Mean Difference	t	df	p
	Male			Female						
	M	SD	n	M	SD	n				
Depression	1.48	.33	22	1.68	.46	65	-.42, .00	-1.99	85	.050
Resilience	3.38	.56	22	3.14	.54	65	-.02, .51	1.81	85	.074
Stress	3.14	1.32	22	3.54	1.42	65	-1.08, .28	-1.17	85	.245
Identity	4.15	.70	22	4.19	.64	65	-.36, .29	-.22	85	.831
EF Coping	1.49	.63	22	1.66	.80	65	-.51, .17	-1.01	45.47	.317
PF Coping	2.37	.89	22	2.60	.82	65	-.64, .18	-1.10	85	.276
SE Coping	1.27	.67	22	1.73	.97	65	-.83, -.08	-2.42	52.72	.019
AV Coping	1.96	.81	22	2.44	.75	65	-.88, -.08	-2.54	85	.013

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Younger adults. Along these lines, in younger individuals, gender was differentially related to mental health and coping. In this way, females tended to be less resilient ($M = 2.57$, $SD = .63$) than males ($M = 2.73$, $SD = .59$; $t(364) = 2.30$, $p = .022$; Table C7B). Younger men also tended to use less social-emotional coping ($M = 1.38$, $SD = .91$) than women ($M = 2.08$, $SD = 1.05$; $t(364) = -6.33$, $p < .001$; Table C7B). Alternatively, there were no significant gender differences in depression, social identity or coping in this group (Table C7B).

Table C7B

Psychosocial variables as a function of the gender of younger adults.

Outcome	Group						95% CI for Mean Difference	t	df	p
	Male			Female						
	M	SD	n	M	SD	n				
Depression	1.95	.52	121	2.01	.53	245	-.18, .05	-1.08	364	.281
Resilience	2.73	.59	121	2.57	.63	245	.02, .29	2.30	364	.022
Stress	4.25	1.23	121	4.44	1.12	245	-.45, .06	-1.51	364	.131
Identity	3.41	.76	121	3.49	.81	245	-.26, .09	-.98	364	.330
EF Coping	2.30	.73	121	2.39	.70	245	-.25, .06	-1.21	364	.228
PF Coping	2.51	.73	121	2.44	.68	245	-.08, .23	.98	364	.329
SE Coping	1.38	.91	121	2.08	1.05	245	-.93, -.49	-6.33	364	.000
AV Coping	1.71	.70	121	1.87	.80	245	-.31, .01	-1.76	268.20	.067

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Ethnicity.

Older adults. All but one participant in the older group were of

European/Caucasian descent, rendering statistical analyses in this regard invalid.

Younger adults. To match the older sample demographic, statistical analyses in younger adults consider ethnicity in terms of two categories- Caucasian and Non-Caucasian. In younger adults, Caucasians tended to have more stress in the past year ($M = 4.51$, $SD = 1.12$), use more social-emotional coping ($M = 1.98$, $SD = 1.07$), and use less avoidant coping ($M = 1.61$, $SD = .66$) than Non-Caucasian individuals ($M = 4.22$, $SD = 1.19$; $t(365) = 2.38$, $p = .018$; $M = 1.68$, $SD = 1.02$; $t(365) = 2.74$; and $M = 2.07$, $SD = .83$; $t(302.08) = -5.77$, $p < .001$ respectively; Table C8). On the other hand, in this group ethnicity was not significantly related to depression, other forms of coping, or social identity (Table C8).

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Table C8

Psychosocial variables as a function of ethnicity, measured as Caucasian and Non-Caucasian status, in younger adults.

Outcome	Group						95% CI for Mean Difference	t	df	p
	Caucasian			Non-Caucasian						
	M	SD	n	M	SD	n				
Depression	1.99	.58	205	1.99	.45	162	-.10, .11	.10	364.93	.920
Resilience	2.63	.64	205	2.61	.60	162	-.11, .15	.31	365	.756
Stress	4.51	1.12	205	4.22	1.19	162	.05, .53	2.38	365	.018
Identity	3.47	.81	205	3.45	.77	162	-.14, .19	.29	365	.775
EF Coping	2.33	.69	205	2.40	.74	162	-.22, .07	-.98	365	.326
PF Coping	2.49	.69	205	2.42	.71	162	-.08, .21	.93	365	.355
SE Coping	1.98	1.07	205	1.68	1.02	162	.08, .52	2.74	365	.007
AV Coping	1.61	.66	205	2.07	.83	162	-.61, -.30	-5.77	302.08	.000

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Education.

Older adults. In older adults, increasing education was not significantly correlated with resilience, self-reported ability to handle stress, coping, or social identity (Table C9). It was, however, negatively related to depression ($r = -.23$, $p = .029$; Table C9).

Table C9

Psychosocial and coping variables as a function of increasing education status in older adults.

Outcome	<i>r</i>	<i>n</i>	<i>p</i>
Depression	-.23	87	.029
Resilience	.20	87	.066
Stress	-.08	87	.474
Identity	-.11	87	.331
EF Coping	.16	87	.147
PF Coping	.11	87	.327
SE Coping	.09	87	.414
AV Coping	-.14	87	.213

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Younger adults. Since all younger individuals were moderately educated (i.e. they were students), with a minimal number having degrees ($n < 10$), no education analyses were performed in this sample.

Appendix D: Supplemental Relations among Age and Mental Health

Non-significant age-interaction analyses. In relation to depression, there were no age-related interactions with resilience, $F(20, 397) = 1.47, p = .089$, social identity, $F(12, 423) = 1.33, p = .200$, number of groups, $F(4, 439) = .59, p = .671$, emotion-focused coping, $F(26, 391) = .90, p = .606$, problem-focused coping, $F(23, 403) = 1.35, p = .130$, social-emotional coping, $F(14, 423) = .60, p = .863$, or avoidant coping $F(19, 410) = .92, p = .564$.

In relation to stress, there were also no significant age related interactions with identity, $F(12, 422) = 1.10, p = .357$, number of groups, $F(4, 438) = .68, p = .608$, emotion-focused coping, $F(26, 391) = 1.07, p = .372$, social-emotional coping, $F(14, 423) = .99, p = .461$, or avoidant coping, $F(19, 410) = 1.40, p = .151$.

Relations among mental health and coping in older and younger adults.

Although there were few interactions between the variables of interest and age, resilience, feelings of social connectedness, and coping played direct roles in the mental health of both older and younger individuals. This was demonstrated by a negative correlation between depression and resilience ($r = -.48, p < .001$) in older adults. Additionally, depression was positively related to emotion focused ($r = .31, p = .003$) and avoidant coping ($r = .23, p = .033$; Table 2) in older adults. Many of these variables were, similarly, related to perceived stress in the past year. In this way, resilience ($r = -.31, p = .004$) was negatively related to stress in the past year; whereas emotion focused ($r = .29,$

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$p = .007$), and avoidant coping ($r = .32, p = .003$) were positively related to stress in the past year in older adults.

Similarly, in younger individuals, resilience ($r = -.59, p < .001$) and problem focused coping ($r = -.27, p < .001$) were negatively related with depression. On the other hand, the use of emotion focused coping was positively linked with depression in younger individuals ($r = .53, p < .001$). Alternatively, resilience ($r = -.18, p < .001$) and social identity ($r = -.24, p < .001$) were negatively related to stress experienced in the past year in younger adults; whereas emotion focused ($r = .33, p < .001$) and social emotional coping ($r = .19, p < .001$) were positively related to stress in the past year in younger adults.

Appendix E: Supplemental Non-Significant Moderated Mediation Analyses**The relationship between age and depression.**

Table E1

Non-significant moderated mediations for the relationship between age and depression, examining resilience and stress as mediators and SNPs for OXTR, NPY and BDNF as moderators.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
7	Resilience	<i>OXTR</i> rs1042778	GG	-.0060	.0012	-.0087	-.0038
			GT, TT	-.0058	.0013	-.0087	-.0034
14	Resilience	<i>OXTR</i> rs1042778	GG	-.0054	.0011	-.0078	-.0034
			GT, TT	-.0062	.0012	-.0089	-.0040
7	Resilience	<i>OXTR</i> rs53576	AA	-.0071	.0096	-.0131	-.0014
			AG, GG	-.0058	.0011	-.0082	-.0039
14	Resilience	<i>OXTR</i> rs53576	AA	-.0068	.0027	-.0135	-.0029
			AG, GG	-.0058	.0011	-.0081	-.0038
7	Resilience	<i>NPY</i> rs16147	TT	-.0063	.0020	-.0105	-.0024
			TC, CC	-.0058	.0010	-.0080	-.0040
14	Resilience	<i>NPY</i> rs16147	TT	-.0056	.0013	-.0085	-.0032
			TC, CC	-.0061	.0011	-.0085	-.0040
7	Resilience	<i>BDNF</i> rs6265	GG	-.0063	.0012	-.0089	-.0041
			GA, AA	-.0053	.0013	-.0082	-.0029
14	Resilience	<i>BDNF</i> rs6265	GG	-.0058	.0011	-.0081	-.0039
			GA, AA	-.0064	.0015	-.0096	-.0038

Significant mediations are bolded. Past and present medical conditions, medication use, education, gender, and consumption of alcohol are included as covariates.

Table E2

Non-significant moderated mediations for the relationship between age and depression, examining identity as a mediator and SNPs for OXTR, NPY, and BDNF as moderators.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
7	Identity	<i>OXTR</i> rs1042778	GG	-2.0087	1.2881	-5.2579	.0184
			GT, TT	-2.4932	1.4360	-5.6013	.2123
14	Identity	<i>OXTR</i> rs1042778	GG	-3.3565	2.2257	-8.1030	.6296
			GT, TT	-1.8049	1.4594	-4.9036	.8496
7	Identity	<i>OXTR</i> rs53576	AA	.0011	.0064	-.0027	.0064
			AG, GG	-.0027	.0008	-.0044	-.0013
7	Identity	<i>NPY</i> rs16147	TT	-2.2940	1.3920	-5.6114	-.0579
			TC, CC	-2.3861	1.3398	-5.3717	.0768
14	Identity	<i>NPY</i> rs16147	TT	-.6555	2.1291	-5.2090	3.1690
			TC, CC	-2.9334	1.5079	-6.2033	-.2373
7	Identity	<i>BDNF</i> rs6265	GG	-2.8405	1.5006	-6.1089	-.0826
			GA, AA	-2.1987	1.2854	-5.5482	-.2601
14	Identity	<i>BDNF</i> rs6265	GG	-2.0271	1.6240	-5.5733	.9364
			GA, AA	-3.9029	2.2782	-8.9136	.0877

Significant mediations are bolded. Past and present medical conditions, medication use, education, gender, consumption of alcohol, and past smoking status are included as covariates.

Table E3

Non-significant moderated mediations for the relationship between age and depression, examining coping style as a mediator and SNPs for OXTR as moderators.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
14	EF Coping	<i>OXTR</i> rs1042778	GG	-6.2139	3.2296	-13.0190	-.1641
			GT, TT	-4.2604	1.8337	-8.1836	-.9600
	PF Coping		GG	.7055	1.2158	-1.5118	3.3974
			GT, TT	-.0918	.8654	-1.9316	1.5665
	SE Coping		GG	-.3810	.5308	-2.3120	.1807
			GT, TT	-.4451	.4707	-1.8383	.1454
	AV Coping		GG	-.8462	1.1813	-3.5179	1.2274
			GT, TT	-.4498	.6660	-2.1981	.5712
7	EF Coping	<i>OXTR</i> rs53576	AA	.0001	.0064	-.0123	.0052
			AG, GG	-.0052	.0010	-.0074	-.0034
	PF Coping		AA	-.0012	.0039	-.0045	.0019
			AG, GG	-.0004	.0006	-.0016	.0007
	SE Coping		AA	-.0001	.0009	-.0015	.0006
			AG, GG	.0001	.0003	-.0005	.0007
	AV Coping		AA	.0005	.0011	-.0008	.0028
			AG, GG	.0003	.0004	-.0005	.0013
14	EF Coping	<i>OXTR</i> rs53576	AA	-.0067	.0031	-.0131	-.0012
			AG, GG	-.0048	.0010	-.0068	-.0030
	PF Coping		AA	-.0003	.0008	-.0035	.0005
			AG, GG	-.0004	.0005	-.0016	.0005
	SE Coping		AA	-.0010	.0016	-.0046	.0015
			AG, GG	.0001	.0003	-.0003	.0007
	AV Coping		AA	-.0013	.0034	-.0100	.0032
			AG, GG	.0005	.0005	-.0004	.0015

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Significant mediations are bolded. Past and present medical conditions, medication use, education, gender, consumption of alcohol, and past and present smoking status are included as covariates.

Table E4

Non-significant moderated mediations for the relationship between age and depression, examining coping style as a mediator and SNPs for NPY and BDNF as moderators.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
7	EF Coping	<i>NPY</i> rs16147	TT	-5.6793	2.2026	-10.7992	-2.0186
			TC, CC	-4.6038	1.6882	-8.3308	-1.6720
	PF Coping		TT	.1260	.6853	-1.0748	1.8994
			TC, CC	.1615	.7677	-1.3151	1.7934
	SE Coping		TT	-1.2940	.9204	-3.8136	-.0031
			TC, CC	.0090	.4441	-.8801	.9918
	AV Coping		TT	-1.2776	1.6841	-5.2124	1.5016
			TC, CC	-.2837	.9237	-2.1312	1.5461
14	EF Coping	<i>NPY</i> rs16147	TT	-5.9429	2.7964	-11.6828	-.6550
			TC, CC	-4.5625	2.0691	-9.0099	-.8625
	PF Coping		TT	.1466	1.3221	-2.6492	2.6546
			TC, CC	.1780	.8526	-1.3951	2.0377
	SE Coping		TT	-.1087	.4382	-1.4983	.4713
			TC, CC	-.5180	.5341	-2.1026	.1654
	AV Coping		TT	-.6663	.9671	-3.0785	.8914
			TC, CC	-.6014	.8242	-2.5408	.8117
7	EF Coping	<i>BDNF</i> rs6265	GG	-4.7922	1.7402	-8.7152	-1.7461
			GA, AA	-5.6071	2.1100	-10.6080	-2.1326
	PF Coping		GG	.1336	.7479	-1.2871	1.7629
			GA, AA	.1526	.8429	-1.4830	1.9598
	SE Coping		GG	-.3083	.4725	-1.6295	.3843
			GA, AA	-.2962	.7928	-2.2345	1.0192
	AV Coping		GG	-.9862	1.0735	-3.5320	.7431
			GA, AA	.5495	1.5133	-2.1139	3.9113
14	EF Coping	<i>BDNF</i> rs6265	GG	-6.0916	2.0896	-10.6530	-2.4289
			GA, AA	-3.9195	2.9212	-10.0919	1.3872
	PF Coping		GG	-.6067	.8514	-2.4677	.9561
			GA, AA	2.2545	1.7959	-.6405	6.4916
	SE Coping		GG	-.3095	.4393	-1.6888	.2567
			GA, AA	-.1065	.4476	-1.6490	.4290
	AV Coping		GG	-.5357	.8523	-2.5731	.8643
			GA, AA	-.5809	.9607	-3.0907	.9395

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Significant mediations are bolded. Past and present medical conditions, medication use, education, gender, consumption of alcohol, and past and present smoking status are included as covariates.

The relationship between age and stress.

Table E5

Non-significant moderated mediations for the relationship between age and stress, examining resilience as a mediator and SNPs for OXTR, NPY, and BDNF as moderators.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
7	Resilience	<i>OXTR</i> rs1042778	GG GT, TT	-.0070 -.0069	.0018 .0018	-.0110 -.0111	-.0040 -.0039
7	Resilience	<i>OXTR</i> rs53576	AA AG, GG	-.0080 -.0069	.0104 .0016	-.0177 -.0104	-.0025 -.0040
14	Resilience	<i>OXTR</i> rs53576	AA AG, GG	-.0083 -.0068	.0031 .0017	-.0150 -.0106	-.0026 -.0037
7	Resilience	<i>NPY</i> rs16147	TT TC, CC	-.0075 -.0068	.0023 .0017	-.0129 -.0106	-.0037 -.0038
14	Resilience	<i>NPY</i> rs16147	TT TC, CC	-.0066 -.0071	.0025 .0019	-.0113 -.0111	-.0015 -.0037
7	Resilience	<i>BDNF</i> rs6265	GG GA, AA	-.0076 -.0063	.0018 .0019	-.0116 -.0109	-.0045 -.0032
14	Resilience	<i>BDNF</i> rs6265	GG GA, AA	-.0071 -.0072	.0017 .0033	-.0108 -.0140	-.0039 -.0010

Significant mediations are bolded. Past and present medical conditions, gender, and consumption of alcohol are included as covariates.

Table E6

Non-significant moderated mediations for the relationship between age and stress, examining identity as a mediator and SNPs for OXTR, NPY and BDNF as moderators.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
7	Identity	<i>OXTR</i> rs1042778	GG	-.0020	.0011	-.0048	-.0002
			GT, TT	-.0037	.0014	-.0069	-.0013
14	Identity	<i>OXTR</i> rs1042778	GG	-.0014	.0014	-.0044	.0010
			GT, TT	-.0038	.0014	-.0070	-.0015
7	Identity	<i>OXTR</i> rs53576	AA	.0004	.0084	-.0047	.0064
			AG, GG	-.0032	.0012	-.0059	-.0013
14	Identity	<i>OXTR</i> rs53576	AA	-.0009	.0032	-.0083	.0044
			AG, GG	-.0031	.0011	-.0057	-.0013
7	Identity	<i>NPY</i> rs16147	TT	-.0031	.0014	-.0065	-.0007
			TC, CC	-.0029	.0011	-.0057	-.0011
14	Identity	<i>NPY</i> rs16147	TT	-.0039	.0018	-.0079	-.0007
			TC, CC	-.0025	.0012	-.0054	-.0007
7	Identity	<i>BDNF</i> rs6265	GG	-.0031	.0012	-.0060	-.0012
			GA, AA	-.0023	.0014	-.0074	-.0003
14	Identity	<i>BDNF</i> rs6265	GG	-.0027	.0013	-.0056	-.0005
			GA, AA	-.0033	.0016	-.0074	-.0007

Significant mediations are bolded. Past and present medical conditions, and alcohol consumption are included as covariates.

Table E7

Non-significant moderated mediations for the relationship between age and stress in the past year, examining coping style as a mediator and SNPs for OXTR as moderators.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
7	EF Coping	<i>OXTR</i> rs1042778	GG	-.0044	.0015	-.0079	-.0018
			GT, TT	-.0059	.0019	-.0103	-.0027
	PF Coping		GG	-.0008	.0016	-.0043	.0017
			GT, TT	-.0008	.0013	-.0036	.0007
	SE Coping		GG	-.0007	.0009	-.0033	.0007
			GT, TT	-.0020	.0010	-.0048	-.0004
	AV Coping		GG	.0010	.0019	-.0025	.0052
			GT, TT	.0004	.0009	-.0009	.0028
14	EF Coping	<i>OXTR</i> rs1042778	GG	-.0050	.0028	-.0112	-.0003
			GT, TT	-.0054	.0017	-.0092	-.0026
	PF Coping		GG	-.0009	.0015	-.0052	.0011
			GT, TT	-.0008	.0011	-.0037	.0010
	SE Coping		GG	-.0015	.0012	-.0048	.0002
			GT, TT	-.0014	.0009	-.0040	-.0001
	AV Coping		GG	.0018	.0024	-.0023	.0073
			GT, TT	.0001	.0014	-.0027	.0028
14	EF Coping	<i>OXTR</i> rs53576	AA	.0000	.0050	-.0085	.0087
			AG, GG	-.0054	.0016	-.0089	-.0026
	PF Coping		AA	-.0011	.0017	-.0062	.0012
			AG, GG	-.0008	.0011	-.0035	.0011
	SE Coping		AA	-.0021	.0022	-.0081	.0008
			AG, GG	-.0015	.0009	-.0039	-.0002
	AV Coping		AA	-.0044	.0048	-.0140	.0015
			AG, GG	.0010	.0013	-.0012	.0043

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Significant mediations are bolded. Past and present medical conditions, medication use, gender, consumption of alcohol, and past and present smoking status are included as covariates.

Table E8

Non-significant moderated mediations for the relationship between age and stress, examining coping style as a mediator and SNPs for NPY and BDNF as moderators.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
7	EF Coping	<i>NPY</i> rs16147	TT	-.0059	.0021	-.0111	-.0025
			TC, CC	-.0049	.0017	-.0087	-.0022
	PF Coping		TT	-.0001	.0020	-.0038	.0042
			TC, CC	-.0011	.0013	-.0042	.0011
	SE Coping		TT	-.0013	.0012	-.0046	.0003
			TC, CC	-.0014	.0009	-.0039	-.0002
	AV Coping		TT	.0007	.0014	-.0014	.0047
			TC, CC	.0007	.0012	-.0016	.0034
7	EF Coping	<i>BDNF</i> rs6265	GG	-.0052	.0015	-.0087	-.0026
			GA, AA	-.0053	.0021	-.0105	-.0019
	PF Coping		GG	-.0011	.0013	-.0038	.0014
			GA, AA	-.0004	.0019	-.0047	.0029
	SE Coping		GG	-.0013	.0008	-.0039	-.0002
			GA, AA	-.0013	.0013	-.0050	.0003
	AV Coping		GG	.0008	.0013	-.0014	.0038
			GA, AA	.0009	.0014	-.0017	.0041
14	EF Coping	<i>BDNF</i> rs6265	GG	-.0043	.0018	-.0082	-.0011
			GA, AA	-.0084	.0029	-.0148	-.0035
	PF Coping		GG	-.0012	.0015	-.0045	.0015
			GA, AA	-.0001	.0007	-.0023	.0010
	SE Coping		GG	-.0016	.0010	-.0042	-.0002
			GA, AA	.0001	.0011	-.0020	.0026
	AV Coping		GG	.0008	.0017	-.0023	.0045
			GA, AA	.0012	.0018	-.0019	.0051

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Significant mediations are bolded. Past and present medical conditions, medication use, gender, consumption of alcohol, and past and present smoking status are included as covariates.

The relationship between identity and depression.

Table E9

Non-significant moderated mediations for the relationship between identity and depression, examining resilience as well as coping style as mediators and age as a moderator.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
14	Resilience	Age	Older	-.1092	.0287	-.1766	-.0596
			Younger	-.1201	.0183	-.1574	-.0868
7	EF Coping	Age ¹	Older	-.0571	.0479	-.1522	.0349
			Younger	-.0601	.0169	-.0937	-.0279
	PF Coping		Older	.0224	.0275	-.0316	.0771
			Younger	-.0242	.0095	-.0455	-.0079
	SE Coping		Older	.0000	.0038	-.0082	.0079
			Younger	-.0002	.0023	-.0065	.0036
	AV Coping		Older	.0001	.0044	-.0086	.0108
			Younger	.0001	.0017	-.0027	.0047
14	EF Coping	Age ¹	Older	-.0439	.0199	-.0904	-.0013
			Younger	-.0801	.0167	-.1144	-.0495
	PF Coping		Older	-.0214	.0114	-.0502	-.0047
			Younger	-.0190	.0084	-.0380	-.0049
	SE Coping		Older	.0008	.0046	-.0046	.0162
			Younger	-.0002	.0017	-.0056	.0020
	AV Coping		Older	.0080	.0075	-.0019	.0290
			Younger	.0006	.0037	-.0056	.0098

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Significant mediations are bolded. Past and present medical conditions, medication use, education, gender, and consumption of alcohol are included as covariates. ¹Indicates model also includes ethnicity along with past and present smoking status as covariates.

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Table E10

Non-significant moderated mediations for the relationship between identity and depression, examining resilience as a mediator and SNPs for OXTR, NPY, and BDNF as moderators.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
7	Resilience	<i>OXTR</i> rs1042778	GG	-.1269	.0455	-.2199	-.0393
			GT, TT	-.1398	.0307	-.2063	-.0850
14	Resilience	<i>OXTR</i> rs1042778	GG	-.1277	.0273	-.1886	-.0799
			GT, TT	-.1389	.0309	-.2068	-.0854
7	Resilience	<i>OXTR</i> rs53576	AA	-.1595	.0913	-.3366	.0257
			AG, GG	-.1321	.0268	-.1892	-.0840
14	Resilience	<i>OXTR</i> rs53576	AA	-.1792	.0650	-.3334	-.0825
			AG, GG	-.1297	.0257	-.1853	-.0825
7	Resilience	<i>NPY</i> rs16147	TT	-.1766	.0530	-.2836	-.0796
			TC, CC	-.1186	.0280	-.1789	-.0695
14	Resilience	<i>NPY</i> rs16147	TT	-.1255	.0317	-.1957	-.0704
			TC, CC	-.1382	.0280	-.1982	-.0884
7	Resilience	<i>BDNF</i> rs6265	GG	-.1618	.0311	-.2265	-.1038
			GA, AA	-.0847	.0425	-.1768	-.0079
14	Resilience	<i>BDNF</i> rs6265	GG	-.1304	.0257	-.1870	-.0845
			GA, AA	-.1514	.0363	-.2314	-.0884

Significant mediations are bolded. Past and present medical conditions, medication use, education, gender, and consumption of alcohol are included as covariates.

Table E11

Non-significant moderated mediations for the relationship between identity and depression, examining coping as a mediator and SNPs for OXTR as moderators.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
14	EF Coping	<i>OXTR</i> rs1042778	GG	-.1036	.0295	-.1733	-.0551
			GT, TT	-.0927	.0233	-.1421	-.0503
	PF Coping		GG	-.0166	.0139	-.0527	.0041
			GT, TT	-.0111	.0097	-.0388	.0022
	SE Coping		GG	.0027	.0060	-.0041	.0236
			GT, TT	-.0011	.0046	-.0172	.0044
	AV Coping		GG	-.0004	.0091	-.0214	.0167
			GT, TT	.0077	.0076	-.0019	.0299
7	EF Coping	<i>OXTR</i> rs53576	AA	-.1813	.0723	-.3184	-.0304
			AG, GG	-.0894	.0236	-.1399	-.0471
	PF Coping		AA	-.0457	.0487	-.1362	.0558
			AG, GG	-.0107	.0109	-.0356	.0079
	SE Coping		AA	-.0001	.0085	-.0182	.0171
			AG, GG	.0006	.0038	-.0047	.0119
	AV Coping		AA	.0083	.0138	-.0090	.0544
			AG, GG	.0033	.0050	-.0029	.0191
14	EF Coping	<i>OXTR</i> rs53576	AA	-.1323	.0572	-.2463	-.0319
			AG, GG	-.0943	.0228	-.1424	-.0531
	PF Coping		AA	-.0090	.0208	-.0839	.0149
			AG, GG	-.0132	.0108	-.0381	.0051
	SE Coping		AA	-.0075	.0226	-.0788	.0208
			AG, GG	.0007	.0035	-.0037	.0131
	AV Coping		AA	-.0174	.0410	-.1366	.0311
			AG, GG	.0054	.0058	-.0022	.0217

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Significant mediations are bolded. Past and present medical conditions, medication use, education, gender, consumption of alcohol, past and present smoking status are included as covariates.

Table E12

Non-significant moderated mediations for the relationship between identity and depression, examining coping as a mediator and SNPs for BDNF and NPY as moderators.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
7	EF Coping	<i>NPY</i> rs16147	TT	-.1415	.0533	-.2541	-.0391
			TC, CC	-.0785	.0240	-.1282	-.0335
	PF Coping		TT	.0091	.0210	-.0302	.0542
			TC, CC	-.0231	.0126	-.0521	-.0019
	SE Coping		TT	.0018	.0094	-.0138	.0255
			TC, CC	.0000	.0027	-.0067	.0053
	AV Coping		TT	.0033	.0076	-.0046	.0314
			TC, CC	.0041	.0059	-.0038	.0228
14	EF Coping	<i>NPY</i> rs16147	TT	-.1044	.0297	-.1738	-.0536
			TC, CC	-.0937	.0233	-.1446	-.0523
	PF Coping		TT	-.0148	.0141	-.0560	.0035
			TC, CC	-.0128	.0103	-.0368	.0045
	SE Coping		TT	.0009	.0064	-.0089	.0166
			TC, CC	.0004	.0041	-.0064	.0117
	AV Coping		TT	.0004	.0099	-.0193	.0225
			TC, CC	.0056	.0063	-.0027	.0249
7	EF Coping	<i>BDNF</i> rs6265	GG	-.0952	.0282	-.1561	-.0452
			GA, AA	-.1051	.0420	-.1876	-.0220
	PF Coping		GG	-.0242	.0145	-.0590	-.0011
			GA, AA	.0003	.0172	-.0331	.0358
	SE Coping		GG	.0003	.0037	-.0054	.0113
			GA, AA	.0036	.0078	-.0061	.0294
	AV Coping		GG	.0038	.0055	-.0024	.0225
			GA, AA	.0044	.0074	-.0036	.0283
14	EF Coping	<i>BDNF</i> rs6265	GG	-.1041	.0259	-.1624	-.0586
			GA, AA	-.0867	.0251	-.1457	-.0457
	PF Coping		GG	-.0149	.0112	-.0431	.0025
			GA, AA	-.0160	.0137	-.0542	.0026
	SE Coping		GG	.0016	.0043	-.0031	.0171
			GA, AA	-.0003	.0065	-.0186	.0101
	AV Coping		GG	.0011	.0057	-.0086	.0156
			GA, AA	.0093	.0097	-.0027	.0369

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Significant mediations are bolded. Past and present medical conditions, medication use, education, gender, consumption of alcohol, past and present smoking status are included as covariates.

The relationship between identity and stress.

Table E13

Non-significant moderated mediations for the relationship between identity and stress, examining coping as a mediator and age as a moderator.

Model	Mediator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
7	EF Coping	Older	-.0796	.0624	-.2104	.0324
		Younger	-.0784	.0274	-.1393	-.0335
	PF Coping	Older	.0152	.0232	-.0132	.0853
		Younger	-.0153	.0121	-.0488	.0017
	SE Coping	Older	-.0043	.0273	-.0688	.0435
		Younger	.0115	.0120	-.0045	.0450
	AV Coping	Older	.0024	.0159	-.0168	.0603
		Younger	.0020	.0055	-.0039	.0218

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Significant mediations are bolded. Past and present medical conditions, medication use, gender, consumption of alcohol, past and present smoking status, and ethnicity are included as covariates.

Table E14

Non-significant moderated mediations for the relationship between identity and stress, examining resilience as a mediator and SNPs for OXTR, NPY, and BDNF as moderators

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
7	Resilience	OXTR rs1042778	GG	-.1769	.0723	-.3470	-.0599
			GT, TT	-.2131	.0555	-.3402	-.1200
14	Resilience	OXTR rs1042778	GG	-.1228	.0614	-.2623	-.0184
			GT, TT	-.2429	.0600	-.3746	-.1410
7	Resilience	OXTR rs53576	AA	-.1720	.1342	-.4442	.0971
			AG, GG	-.2010	.0516	-.3183	-.1120
14	Resilience	OXTR rs53576	AA	-.2312	.0976	-.4434	-.0541
			AG, GG	-.1953	.0523	-.3179	-.1071
7	Resilience	NPY rs16147	TT	-.2482	.0843	-.4447	-.1077
			TC, CC	-.1816	.0526	-.3015	-.0960
14	Resilience	NPY rs16147	TT	-.1835	.0698	-.3362	-.0596
			TC, CC	-.2068	.0563	-.3276	-.1096
7	Resilience	BDNF rs6265	GG	-.2505	.0574	-.3755	-.1508
			GA, AA	-.1243	.0699	-.2902	-.0144
14	Resilience	BDNF rs6265	GG	-.2034	.0515	-.3180	-.1150
			GA, AA	-.2235	.0909	-.4365	-.0731

Significant mediations are bolded. Past and present medical conditions, gender, and consumption of alcohol are included as covariates.

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Table E15

Non-significant moderated mediations for the relationship between identity and stress, examining coping as a mediator and SNPs for OXTR as moderators.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
14	EF Coping	<i>OXTR</i> rs1042778	GG	-.1327	.0652	-.2887	-.0274
			GT, TT	-.1011	.0384	-.1914	-.0375
	PF Coping		GG	-.0336	.0316	-.1313	.0062
			GT, TT	-.0289	.0237	-.0927	.0066
	SE Coping		GG	-.0159	.0221	-.0846	.0099
			GT, TT	-.0182	.0214	-.0809	.0111
	AV Coping		GG	.0137	.0306	-.0345	.0976
			GT, TT	-.0015	.0178	-.0403	.0331
7	EF Coping	<i>OXTR</i> rs53576	AA	-.2027	.0937	-.4313	-.0498
			AG, GG	-.1009	.0364	-.1901	-.0447
	PF Coping		AA	-.1002	.1101	-.3281	.0993
			AG, GG	-.0238	.0243	-.0818	.0166
	SE Coping		AA	.0020	.0612	-.1169	.1394
			AG, GG	-.0192	.0219	-.0806	.0102
	AV Coping		AA	.0045	.0395	-.0585	.1146
			AG, GG	.0019	.0143	-.0243	.0374
14	EF Coping	<i>OXTR</i> rs53576	AA	-.0145	.0947	-.1347	.2591
			AG, GG	-.1141	.0386	-.2060	-.0509
	PF Coping		AA	-.0377	.0417	-.1700	.0159
			AG, GG	-.0277	.0234	-.0899	.0072
	SE Coping		AA	-.0162	.0333	-.1492	.0175
			AG, GG	-.0180	.0212	-.0771	.0014
	AV Coping		AA	-.0614	.0564	-.2246	.0069
			AG, GG	.0077	.0169	-.0162	.0562

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Significant mediations are bolded. Past and present medical conditions, medication use, gender, consumption of alcohol, past and present smoking status are included as covariates.

Table E16

Non-significant moderated mediations for the relationship between identity and stress, examining coping as a mediator and SNPs for NPY and BDNF as moderators.

Model	Mediator	Moderator	Moderator Level	<i>B</i>	<i>SE</i>	Lower-bound 95% CI	Upper-bound 95% CI
7	EF Coping	<i>NPY</i> rs16147	TT	-.1594	.0673	-.3218	-.0493
			TC, CC	-.0884	.0360	-.1759	-.0324
	PF Coping		TT	.0196	.0480	-.0599	.1380
			TC, CC	-.0506	.0290	-.1241	-.0061
	SE Coping		TT	-.0580	.0450	-.1792	.0024
			TC, CC	.0003	.0206	-.0440	.0412
	AV Coping		TT	.0019	.0205	-.0275	.0644
			TC, CC	.0022	.0168	-.0271	.0421
7	EF Coping	<i>BDNF</i> rs6265	GG	-.1106	.0399	-.2128	-.0498
			GA, AA	-.1185	.0586	-.2673	-.0282
	PF Coping		GG	-.0547	.0307	-.1300	-.0056
			GA, AA	.0005	.0387	-.0807	.0756
	SE Coping		GG	-.0038	.0233	-.0600	.0379
			GA, AA	-.0404	.0359	-.1451	.0076
	AV Coping		GG	.0024	.0158	-.0240	.0442
			GA, AA	.0024	.0187	-.0247	.0570
14	EF Coping	<i>BDNF</i> rs6265	GG	-.0921	.0398	-.1839	-.0245
			GA, AA	-.1829	.0686	-.3419	-.0692
	PF Coping		GG	-.0454	.0306	-.1172	.0070
			GA, AA	.0028	.0220	-.0330	.0614
	SE Coping		GG	-.0177	.0233	-.0801	.0166
			GA, AA	.0017	.0163	-.0229	.0492
	AV Coping		GG	.0031	.0209	-.0323	.0567
			GA, AA	.0065	.0208	-.0261	.0624

Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping.

Significant mediations are bolded. Past and present medical conditions, medication use, gender, consumption of alcohol, past and present smoking status are included as covariates.

Appendix F: Supplemental Moderations and Moderated Mediations with Stress as an Outcome

The relationship between age and stress. As with depression as the outcome variable of interest, coping, resilience, and SNPs played roles as mediators and moderators, respectively, in the relationship between age and stress in the past year. Firstly, as seen in Table F1, the rs16147 SNP for *NPY* moderated the relationship between age and stress. Here, there was only a (negative) relationship between age and stress among those with the risk SNP (i.e. the C allele; Table F1; Figure F1).

Table F1

The moderating role of SNPs for OXTR, NPY, & BDNF (Hayes' PROCESS Model 1), in the relationship between age and stress in the past year.

Moderator	Moderator Level	<i>B</i>	<i>SE</i>	<i>p</i>	Lower-bound 95% CI	Upper-bound 95% CI
<i>OXTR</i> rs1042778	GG	-.0172	.0048	.0004	-.0266	-.0078
	GT, TT	-.0185	.0039	.0000	-.0263	-.0107
<i>OXTR</i> rs53576	AA	-.0233	.0115	.0432	-.0459	-.0007
	AG, GG	-.0177	.0032	.0000	-.0240	-.0114
<i>NPY</i> rs16147	TT	-.0112	.0057	.0520	-.0225	.0001
	TC, CC	-.0204	.0035	.0000	-.0274	-.0134
<i>BDNF</i> rs6265	GG	-.0156	.0037	.0000	-.0229	-.0084
	GA, AA	-.0232	.0053	.0000	-.0337	-.0128

Note: Significant confidence intervals are bolded; past and present medical conditions are included as covariates.

Interestingly, when analyzing all measured SNPs (for *OXTR*, *NPY*, and *BDNF*), only those for oxytocin receptor and neuropeptide y displayed significant moderated mediations.⁷ In this way, the rs1042778 variant for oxytocin receptor moderated the

⁷ Hayes' PROCESS models 7 and 14 were assessed for all SNPs (rs1042778, rs53576, rs3796863, rs16147, and rs6265), and non-significant moderated mediations in the relation between age and stress are presented in Appendix E.

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mediation role of resilience in the relationship between age and stress in the past year ($B = -.0057$, $SE = .0027$, $LLCI = -.0113$, $ULCI = -.0006$), where resilience was only significantly negatively related to stress in the past year in individuals carrying the T allele (heterozygous or homozygous; Table F2; Figure F1), and age was positively related to resilience in both variants (Table F2; Table 1). Similarly, the rs535765 variant for *OXTR* moderated the mediation role of social-emotional coping in the relationship between age and stress (Table F2; Figure F1). In this way, only in individuals carrying the G allele was there a negative relationship between age and social-emotional coping ($B = -.0029$, $SE = .0054$, $LLCI = -.0095$, $ULCI = -.0002$); where the positive relationship between social-emotional coping and stress did not differ based on this variant (Table 1; Table 2). Alternatively, the rs16147 *NPY* variant moderated the mediating role of avoidant coping in the relation between age and stress, where although in both variants there was a positive significant relationship between age and avoidant coping (Table 1), only in those homozygous for the T allele was there a positive relationship between avoidant coping and stress ($B = -.0049$, $SE = .0028$, $LLCI = -.0121$, $ULCI = -.0005$; Table F2; Figure F1).

Table F2

The mediating role of resilience and the moderating role of the rs1042778 SNP for OXTR and rs16147 SNP for NPY (Hayes' PROCESS Model 7 & 14) in the relationship between age and stress.

Model	Mediator	Moderator	Moderator Level	B	SE	Lower-bound 95% CI	Upper-bound 95% CI
14	Resilience	OXTR rs1042778	GG	-.0034	.0022	-.0080	.0007
			GT, TT*	-.0091	.0019	-.0133	-.0056
7	EF Coping	OXTR rs53576	AA	-.0009	.0064	-.0188	.0047
			AG, GG	-.0054	.0016	-.0091	-.0029
	PF Coping		AA	-.0027	.0095	-.0114	.0026
			AG, GG	-.0007	.0012	-.0035	.0013
	SE Coping		AA	.0013	.0054	-.0011	.0066
			AG, GG*	-.0015	.0009	-.0040	-.0003
	AV Coping		AA	.0013	.0034	-.0033	.0079
			AG, GG	.0006	.0012	-.0015	.0034
14	EF Coping	NPY rs16147	TT	-.0047	.0024	-.0099	-.0004
			TC, CC	-.0051	.0019	-.0095	-.0020
	PF Coping		TT	-.0014	.0021	-.0065	.0020
			TC, CC	-.0006	.0009	-.0031	.0008
	SE Coping		TT	-.0015	.0012	-.0047	.0001
			TC, CC	-.0014	.0009	-.0041	-.0001
	AV Coping		TT*	.0042	.0025	.0002	.0105
			TC, CC	-.0007	.0014	-.0037	.0017

*Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping. Index of moderated mediation for model 7 & 14 reported in-text. Significant mediations are bolded. *Indicates significant moderated mediation. Past and present medical conditions, gender, and consumption of alcohol are included as covariates.*

[†]*Indicates model also contains medication use, as well as past and present smoking status as covariates.*

Figure F1

A conceptual summary of Tables 5 and 6, including all mediators and moderators in the relationship between age and stress.

**Indicates relation is only significant in younger adults.*

In summary, the negative relation between age and stress may be partially explained through higher resilience, and less social-emotional coping with age. Along these lines, the T allele of the *OXTR* rs1042778 SNP appeared to be protective against stress for resilient individuals. Moreover, the G allele of the *OXTR* rs53576 SNP appeared to confer more use of mal-adaptive coping strategies (social-emotional coping) with age. Alternatively increased use of avoidant coping was also linked with age, and this was related to higher stress in older adults (Table 2). Moreover, the TT genotype of

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the rs16147 SNP for *NPY* appeared to be a vulnerability factor in this regard, where only in these carriers was there a significant positive relationship between avoidant coping and stress. Finally, the C allele for the *NPY* rs16147 SNP may be protective against stress with age. Taken together (Figure F1) these results suggest that the relation between age and stress is mediated by both resilience and certain forms of coping, and that these relationships may be different depending on certain SNPs.

The relationship between identity and stress. Given the relation between social identity and depression, it is no surprise that identity is also negatively related to stress (Table 1; Table 2). This direct relationship, however, was again contingent upon age and genetics. Here, age and both SNPs for *OXTR* acted as moderators. Specifically, only in younger adults and carriers of the *OXTR* rs1042778 T allele (homozygous or heterozygous), was there a significant, negative, relationship between identity and stress (Table F3; Figure F2). Moreover, individuals carrying the G allele for the *OXTR* rs53576 SNP tended to exhibit a stronger negative relationship between social identity and stress, suggesting that in these carriers, identity is more important for mental health (Table F3; Figure F2).

Table F3

The moderating roles of age and SNPs for OXTR, NPY, & BDNF (Hayes' PROCESS Model 1) in the relationship between social identity and stress.

Moderator	Moderator Level	<i>B</i>	<i>SE</i>	<i>p</i>	Lower-bound 95% CI	Upper-bound 95% CI
Age	Older	-.1320	.2026	.5150	-.5302	.2662
	Younger	-.3290	.0771	.0000	-.4805	-.1776
OXTR rs1042778	GG	-.2857	.1634	.0817	-.6077	.0363
	GT, TT	-.5747	.1200	.0000	-.8111	-.3383
OXTR rs53576	AA	-.1169	.3623	.7471	-.8307	.5968
	AG, GG	-.4973	.1007	.0000	-.6957	-.2989
NPY rs16147	TT	-.5319	.1860	.0046	-.8983	-.1655
	TC, CC	-.4424	.1148	.0002	-.6685	-.2162
BDNF rs6265	GG	-.4466	.1194	.0002	-.6818	-.2113
	GA, AA	-.5075	.1768	.0045	-.8557	-.1592

Note: Significant confidence intervals are bolded; past and present medical conditions are included as covariates.

When age along with all SNPs (for *OXTR*, *NPY*, and *BDNF*) were analyzed for moderated mediation effects, only age as well as SNPs for *OXTR*, and *NPY* moderated mediations within the relationship between identity and stress.⁸ In this way, resilience mediated the relationship between identity and stress, where age differentially moderated this relationship (Table F4; Figure F2). In this way, identity was only significantly, negatively, related to resilience in younger individuals ($B = -.1048$, $SE = .0463$, $LLCI = -.2166$, $ULCI = -.0310$), but resilience was only related to stress in older adults ($B = .2087$, $SE = .0893$, $LLCI = .0467$, $ULCI = .3964$; Table 2; Table F4; Figure F2). This suggests that resilience may play a stronger role in the mental health of older adults, while identity may be more important for younger individuals.

⁸ Hayes' PROCESS models 7 and 14 were assessed for all SNPs (rs1042778, rs53576, rs3796863, rs16147, and rs6265), and non-significant moderated mediations in the relation between identity and stress are presented in Appendix E.

Moreover, age moderated the mediating role of avoidant coping. Here, in both variants there was a positive relationship between identity and avoidant coping, but there was only a significant positive relationship between avoidant coping and stress in older individuals ($B = -.0526$, $SE = .0356$, $LLCI = -.1613$, $ULCI = -.0050$; Table 1; Table F4; Figure F2). Alternatively, *OXTR* moderated the mediating role of emotion-focused coping, where only in individuals with the T allele for the rs1042778 *OXTR* variant was there a significant negative relationship between identity and emotion-focused coping, but in both variants there was a significant negative relationship between emotion-focused coping and stress ($B = -.1064$, $SE = .0562$, $LLCI = -.2393$, $ULCI = -.0142$; Table 1; Table F4; Figure F2). Finally, *NPY* moderated the mediation of avoidant coping in the relationship between identity and stress, where in all carriers, there was a positive relationship between identity and avoidant coping, but only in individuals homozygous for the T allele was there a positive relationship between avoidant coping and stress ($B = -.0636$, $SE = .0434$, $LLCI = -.1957$, $ULCI = -.0058$; Table 1; Table F4; Figure F2).

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Table F4

The mediating roles of resilience and coping, along with the moderating roles of age and SNPs for OXTR and NPY in the relationship between identity and stress.

Model	Mediator	Moderator	Moderator Level	B	SE	Lower-bound 95% CI	Upper-bound 95% CI
7	Resilience	Age ¹	Older	.0060	.0340	-.0641	.0727
			Younger*	-.0988	.0308	-.1676	-.0461
14	Resilience	Age ¹	Older*	-.2487	.0874	-.4373	-.0898
			Younger	-.0400	.0305	-.1046	.0149
14 ¹	EF Coping	Age ²	Older	-.0884	.0567	-.2066	.0191
			Younger	-.0885	.0276	-.1533	-.0430
	PF Coping		Older	-.0108	.0244	-.0760	.0272
			Younger	-.0140	.0113	-.0458	.0009
	SE Coping		Older	-.0022	.0156	-.0519	.0177
			Younger	.0030	.0113	-.0177	.0301
	AV Coping		Older*	.0554	.0347	.0066	.1548
			Younger	.0028	.0102	-.0147	.0278
7	EF Coping	OXTR rs1042778 ²	GG	-.0417	.0413	-.1403	.0285
			GT, TT*	-.1480	.0477	-.2601	-.0684
	PF Coping		GG	-.0141	.0420	-.0985	.0742
			GT, TT	-.0389	.0285	-.111	.0054
	SE Coping		GG	-.0286	.0328	-.1246	.0164
			GT, TT	-.0098	.0246	-.0707	.0327
	AV Coping		GG	.0036	.0273	-.0418	.0744
			GT, TT	.0012	.0119	-.0162	.0373
14	EF Coping	NPY ² rs16147	TT	-.0986	.0518	-.2193	-.0151
			TC, CC	-.1055	.0436	-.2056	-.0341
	PF Coping		TT	-.0598	.0485	-.1870	.0171
			TC, CC	-.0195	.0187	-.0758	.0038
	SE Coping		TT	-.0169	.0221	-.0827	.0085
			TC, CC	-.0176	.0200	-.0755	.0092
	AV Coping		TT*	.0480	.0348	.0027	.1637
			TC, CC	-.0156	.0190	-.0728	.0090

*Note: EF = emotion-focused; PF = problem-focused; SE = social-emotional, and AV = avoidant coping. Index of moderated mediation for model 7 & 14 reported in-text. Significant mediations are bolded. *Indicates significant moderated mediation. Past and present medical conditions, gender, and consumption of alcohol are included as covariates. ¹Indicates model also contains ethnicity as a covariate. ²Indicates model also contains medication use, as well as past and present smoking status as covariates.*

Figure F2

A conceptual summary of Tables 9 and 10, of the mediators and moderators in the relationship between social identity and stress.

In summary, the relationship between identity and stress was partially explained through less reliance on emotion-focused coping, and higher resilience. This relation was also mediated by avoidant coping, where avoidant coping was related to higher stress. These relationships were also contingent upon age and SNPs. In this way, a negative relation between identity and stress was contingent upon younger age, along with the presence of the G allele of the rs53576 *OXTR* SNP, and the T allele of the rs1042778 *OXTR* SNP. Similarly, as before, identity may be more beneficial to mental health in younger individuals, as also shown through the dependency of the relation between identity and resilience on younger age. Moreover, a negative relationship between identity and maladaptive coping (emotion-focused) was dependent on being a carrier of the *OXTR* rs1024778 T allele. Alternatively, the negative relation between resilience and

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stress, along with the positive relation between avoidant coping and stress were both contingent upon older age, suggesting that differential coping and resilience may be more important to mental health in older individuals. On the other hand, the positive relation between avoidant coping and stress was also contingent upon carrying the TT genotype for the *NPY* rs16147 SNP. Taken together, these findings suggest that the relationship between identity and stress, in some similar and differing ways to the relation between identity and depression, depends on numerous psychosocial factors as well as age and genetics (Figure F2).

Appendix G: Reliability Analyses

Table G1

The reliability analyses of coping and psychosocial variables.

Scale	Construct	Cronbach's Alpha		
		Older Adults	Younger Adults	Older and Younger Combined
Centre for Epidemiologic Studies Short Depression Scale-10	Depression	.70	.82	.81
Connor Davidson Resilience Scale-Revised	Resilience	.84	.86	.87
Identification with (Retirement) Community Scale	Social Identification	.75	.83	.84
Scope- Short Form	Other-Blame	.74	.85	.83
	Self-Blame	.70	.68	.73
	Rumination	.68	.78	.79
	Emotional containment	.48	.60	.59
	Social support	.70	.62	.64
	Activity	.50	.65	.64
	Denial	.46	.56	.54
	Cognitive restructuring	.73	.52	.57
	Problem solving	.65	.71	.70
	Passive	.19	.40	.34
	Humour	.88	.93	.92
	Wishful thinking	.07	.42	.41
	Emotional expression	.59	.64	.63
Scope- Factor Analysis	EF Coping	.75	.72	.76
	PF Coping	.70	.61	.62
	SE Coping	.63	.66	.66
	AV Coping	.38	.39	.38

EF is emotion-focused; PF is problem-focused; SE is social-emotional, and AV is avoidant coping.

Appendix H: Hardy-Weinberg Equilibrium Analyses

Table H1

The observed and expected values, along with χ^2 values for the SNPs for OXTR, NPY, and BDNF.

SNP	Genotype	Observed Frequency	Expected Frequency	χ^2
OXTR rs1042778	GG	88	89.16	.10
	GT	119	116.67	
	TT	37	38.16	
	Total	244	244	
OXTR rs53576	GG	115	116.36	.08
	GA	107	104.28	
	AA	22	23.36	
	Total	244	244	
NPY rs16147	CC	53	56.58	.84
	CT	129	121.83	
	TT	62	65.58	
	Total	244	244	
BDNF rs6265	GG	161	163.49	1.22
	GA	75	70.01	
	AA	5	7.49	
	Total	241	241	