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The Moderating Role of Chronological Age on the Relationship Between Psychological Age and Facets of Health: A Longitudinal Analysis

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The Moderating Role of Chronological Age on the Relationship Between Psychological Age and Facets of Health: A Longitudinal Analysis

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Abstract

Past research has consistently found a negative relationship between psychological age and health. Nearly all of that research, however, has been cross-sectional, and the few panel studies that exist include only a single aspect of health and measured with older adults. The present study sought to replicate and expand on a recent 2-wave cross-lagged panel investigation that explored the causal interplay between several dimensions of health and psychological age in middle age and older adults. In the current study employees ($N = 409$), ranging in age from 22 to 70, from six manufacturing organizations participated in three surveys approximately 1.5 years apart, and two clinical health assessments approximately 3 years apart. Using cross-lagged panel path analysis, negative relationships were found between psychological age and four types of health. Chronological age was found to moderate these relationships, with different predictive patterns discovered for older and younger individuals. Psychological age predicted health for older adults, while for younger adults health predicted psychological age. The pattern of the relationship varied for each aspect of health, and also across age groups. Two theories, stereotype embodiment theory and social comparison theory, may explain the dissimilarities between the age groups in the results. Future research should explore the effect that other moderators, such as gender and employment status, play in the association between health and psychological assessments of age.

Keywords: psychological age, subjective age, subjective health, health, longitudinal, cross-lagged panel, path analysis, stereotype embodiment theory

Introduction

It is ironic that while the population in Western industrialized nations is aging, the stigma associated with older ages is thriving. On the one hand, the baby boom that followed the end of World War II as well as medical advances have given rise to a growing older population. This trend is expected to continue into the foreseeable future. In fact, the last projection from the U. S. Census Bureau (2012) indicates a more than twofold increase for those age 65 and older by 2060. On the other hand, negative age stereotypes abound, resulting in this large constituency becoming disenfranchised. This friction is evident in the workplace. Many of the highly skilled and deeply entrenched workers throughout the private and public sectors are part of this baby boom generation, and the knowledge they possess is essential to organizations remaining competitive. At the same time, older workers have been labeled as less motivated, unwilling to take risks or change, unable to learn new skills and technology, and inherently unhealthy (Hedge, Borman, & Lammlein, 2006; Ng & Feldman, 2012; Posthuma & Campion, 2009). Although these conflicting notions are not supported by research (Ng & Feldman, 2013; Posthuma & Campion, 2009), it remains that, generally speaking, the older a worker's age, the less valuable his or her contribution in the workplace is perceived to be.

It appears that the heart of the problem for bias against older workers is the number derived from chronological age (CA). An underlying assumption is that individuals who share a common CA are highly similar in many ways, including in regards to health related abilities and limitations. While there are general developmental similarities among individuals in an age group, there are no hard and fast rules about at what age one crosses from one stage of development to the next or when physical and mental health declines not only commence but become irreversible (Kail & Cavanaugh, 2013). For example, many adults progress into old age

without experiencing substantial health declines, a point overlooked in most research that focuses on group averages (Rowe & Kahn, 1987).

CA may be an easily accessible variable, but it is nothing more than an indicator of time elapsed since birth (Schwall, 2012). Researchers studying aging workers have expressed misgivings about the inadequacy of using CA as a proxy of expected behaviors and events and have sought other means of measuring individual age (e.g., Blau, 1956; Hedge et al., 2006; Truxillo & Fraccaroli, 2013). One promising alternative is psychological age (PA), which is a subjective assessment of one's own age. PA has been studied across many disciplines for decades, and health factors have consistently been found to be related to PA (e.g., Demakakos, Gjonca, & Nazroo, 2007; Hubley & Russell, 2009). What remains unclear is if these relationships are consistent across multiple aspects and measurements of health. Furthermore, few studies have looked at these relationships longitudinally, and those findings have been contradictory (e.g., Markides & Boldt, 1983; Spuling, Miche, Wurm, & Wahl, 2013).

Building on prior research, the objective of this study is to further investigate the association between health and PA through the partial replication and expansion of a recently published study (Spuling et al., 2013). Stereotype embodiment theory (Levy, 2009) provides the rationale behind the hypotheses and research questions that will be tested. Consistent with that study, I include multiple dimensions of health (i.e., general, physical, functional, and mental) and examine the strength of the relationship between PA and these separate health dimensions, and search for evidence for the causal direction of relationships between health and PA. The inclusion of three time points of measurement and a consideration of the moderating role of CA expand on the Spuling et al. study and other past research. Additionally, while prior investigations have tended to focus on middle aged and older community dwellers (e.g.,

Daatland, 2007; Guralnik et al., 1994; Markides & Boldt, 1983; Pinquart, 2001; Sargent-Cox, Anstey, & Luszcz, 2012), the participants in this study are all working adults, a population vastly under-represented in this line of research, and cover a broad range of CAs. I begin by defining PA and health before laying out the theoretical framework.

Psychological Age

There are a variety of nomenclatures used for PA, as well as a number of different ways to measure the construct. One of the earliest attempts to measure PA was the Ages of Me instrument (Kastenbaum, Derbin, Sabanti, & Artt, 1972) which considered self-assigned age (how old one feels), other-assigned age (the age another assesses the individual to be), and the agreement between the two. This early, exploratory work indicated an inclination for PA to be lower than CA; however the relationship was nonlinear, suggesting some other factor(s) beyond CA may contribute to one's PA. In other words, while CA is likely influential in determining PA, it is not the only determinant of PA. This finding has been echoed repeatedly in virtually all studies that have examined the relationship between CA and PA, regardless of what the construct was named (e.g., cognitive age, subjective age, felt age) or how it was measured (e.g., single item or multiple items) (e.g., Barak, 1987; Barak & Gould, 1985; Barnes-Farrell & Piotrowski, 1989; Bultena & Powers, 1978; Logan, Ward, & Spitze, 1992; Peters, 1971; Underhill & Cadwell, 1983).

Distinct framing has also been used to measure PA. One approach has been to ask individuals to categorize themselves in some way, such as the arbitrary classification of young, middle-age, or old (e.g., Logan et al., 1992), or by an age group (e.g., twenties, thirties, etc.; e.g., Henderson, Goldsmith, & Flynn, 1995). Another frequently used perspective is that of comparison. This can be a comparison of an aspect of one's self to another person (e.g., how old

one looks compared to another of the same age; Kotter-Grühn & Hess, 2012), or a self-comparison (e.g., the age one feels compared to actual CA, such as younger or older; Montepare & Clements, 2001). Perhaps the most straightforward method of getting at this comparison is to ask how old the person feels (i.e., felt age), irrespective of CA (e.g., Barnes-Farrell & Piotrowski, 1989; Kotter-Grühn & Hess, 2012; Mock & Eibach, 2011; Underhill & Cadwell, 1983) and then calculate the magnitude and direction of the discrepancy with CA. For this thesis PA is used as an umbrella term capturing the concept of individual perceived age; the proportional discrepancy between felt age (FA), indexed in years, and CA (i.e., PDPA) is the measurement used to capture the PA construct.

Multidimensionality of Health

Health is abstract and cannot be directly measured, but instead relies on indirect measurement (McDowell, 2006). Health measures are often used as proxy indicators for the presence of or susceptibility for developing health disorders, or for how health disorders affect normal functioning. The concept of health is widely recognized as more than the mere absence of illness (Keyes & Grzwacz, 2002; World Health Organization, 1948). The World Health Organization (1948) defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." Nonetheless, health is commonly measured according to the presence of chronic illnesses (Antonovsky, 1996; McDowell, 2006), and it is important to note that the bulk of the items used in this study measure health in relation to illness.

Health can be conceptualized as a multidimensional construct, often framed in one of four ways. *General health* is the assessment of one's overall health. *Physical health* considers the number and type of illness diagnoses (e.g., diabetes) and health impediments (e.g., hearing loss)

affecting an individual. *Functional health* is based on the impairment of daily activities that result from physical health conditions. *Mental health* evaluates the presence of mental disorders as well the level of social and psychological functioning.

There are two main manners in which the different dimensions of health are explored through research: subjective/self report measures of health and physiological/clinical indicators of health. *Subjective assessments* are based on self-report, while *clinical assessments* are based on the evaluation of health by someone other than the subject, such as a medical or other trained professional.

Self-reported measures of the different health dimensions are commonly used in psychological research. For example, general health is typically captured using a single item that rates an individual's perception of overall health. Physical health can be measured by asking an individual to indicate whether he or she has been diagnosed with or experienced a given medical condition. This often includes chronic conditions; for example, diabetes, hypertension, arthritis, hearing loss, or vision deterioration. Assessment of functional health may involve a person reporting types of activities that are reduced due to health conditions. Mental health is estimated based on responses to a questionnaire.

Different techniques are used to clinically assess health. General health may be based on expert judgment derived from an array of standardized tests, observations, and questioning (e.g., blood pressure readings, listening to heart and lungs). Physical health is often based on health indicators that are used in determining risk for or presence of illness, such as through blood pressure readings, weight, and height. Evaluation of functional health involves measuring the ability to perform various tasks. Clinical evaluation of mental health is determined through structured interviews conducted by a professional or trained layperson.

The Relationship Between the Dimensions of Health and Both CA and PA

Published investigations reveal that both CA and PA are related to each of the facets of subjectively assessed health. For example, studies have found a negative relationship between subjective general health and CA, such that perceptions of general health decrease as CA increases (Orfila, Ferrer, Lamarca, & Alonso, 2000). This was supported by a meta-analysis conducted on longitudinal studies that assessed subjective health changes in older adults (Pinquart, 2001). PA has also been shown to have a negative relationship with subjective general health for middle-aged adults (Hubley & Russell, 2009; Stephan, Demulier, & Terracciano, 2012) and women (Hubley & Russell, 2009).

Past research has demonstrated a negative relationship between poor physical health and PA (i.e., poorer health related to higher PA; e.g., Markides & Boldt, 1983; Spuling et. al, 2013). Similar negative relationships have been found between clinical indices of poor physical health (e.g., blood pressure, cholesterol levels, and body mass index) and CA (e.g., Ng & Feldman, 2013).

Hubley and Russell (2009) found that higher (i.e., less impaired) subjective functional health ratings were related to lower PA assessments in men as well as for both women and men 70 years old and older, while another study showed that better subjective functional health amongst elderly participants was related to lower risk of mortality and lower chance of being admitted to an assisted living facility (Guralnik et al., 1994). Furthermore, the prevalence rate for and number of musculoskeletal disorders (an indicator of functional health) an individual is diagnosed with are known to increase with CA (Urwin et al., 1998).

Research has also shown a connection between mental health and age, such that those who feel younger than their CA are less susceptible to major depressive episodes (Keyes &

Westhof, 2012). Another study indicates that there is a substantially higher risk for onset of mental health disorders for people under 30 years older, and the risk decreases with age (Kessler, Berglund, Demler, Jin, Merikangas, & Walters, 2005).

Based on existing empirical evidence, it is expected that a relationship between the various facets of health and PA will be found in the present dataset. Subjective assessments of each the four health facets, and clinical assessments of physical and functional health are examined independently. Few studies have utilized clinically assessed health measures; however, on the basis of previously mentioned connections between CA and both physical and functional health, it is reasonable to expect PA and clinical physical and functional health to also be connected. With that in mind, the subsequent hypotheses state the expected relationship between the two constructs.

Hypothesis 1: General health is negatively related to PA.

Hypothesis 2: Physical health:

a: Subjective physical health is negatively related to PA.

b: Clinical physical health is negatively related to PA.

Hypothesis 3: Functional health:

a: Subjective functional health is negatively related to PA.

b: Clinically assessed functional health is negatively related to PA.

Hypothesis 4: Subjective mental health is negatively related to PA.

Direction of PA-Health Relationship

Although evidence of negative stereotypes about aging and the elderly are prevalent in Western cultures and the United States in particular, not everyone holds unfavorable views towards aging and not all aged people experience old age in a detrimental way. According to the

recently proposed stereotype embodiment theory (SET; Levy, 2009), stereotypical beliefs about old age, health, and functioning are social constructs that can become self-fulfilling prophecies. This embodiment is based on a lifetime of assimilation of positive and negative stereotypes about old age that operate subconsciously until an individual crosses an arbitrary societal boundary into old age (e.g., receiving senior discounts for goods or services). At that time the internalized positive or negative general orientation of aging manifests through cognitive and physical functioning, and through health behaviors and outcomes. The same logic may apply to entering into other equally arbitrary life stages, such as adulthood and middle age. In essence, the stereotypes one ascribes to his or her PA will generate thoughts and behaviors that give rise to the materialization and personification of the stereotype. Accordingly, the SET prospective is that PA is an antecedent to health assessment and actions, or, more plainly, PA is a driver to health outcomes.

Recent research lends support to this theoretical explanation. One study found that those who expected a decline in health as a result of aging reported worse health six-years later (Wurm, Tesch-Römer, & Tomasik, 2007). Another investigation revealed similar findings, with PA being predictive of future health outcomes (Spuling et al., 2013). Both studies tested for temporal ordering and uncovered a stronger relationship from PA to health than from health to PA. However, both studies used only two time points and had an overlapping wave of data from the same longitudinal research project (i.e., the German Aging Survey), whose participants are age 40 and older, so generalizability of these findings is uncertain and causation can only be inferred to a limited extent.

Sargent-Cox, Anstey, and Luszcz (2012) conducted a longitudinal study of adults 65 years and old that looked at functional health measures and perspective of aging at five time

points over a 16-year period. They observed that older adults (ages ranged from 65 to103 years old at baseline) who had negative views of aging experienced sharp declines in functional health (i.e., balance, gait speed, and chair rising). These findings reveal the long-term impact negative age-related beliefs can have on health.

More substantiation comes by way of results from a meta-analysis based on 19 "longitudinal" studies that explored the influence of PA on health (Westerhof, Miche, Brothers, Barrett, Diehl, Montepare, Wahl, & Wurm, 2014). PA, which was assessed several different ways in the included studies, was found to have a significant, albeit small, effect on health. It is worth mentioning that most of the studies included in the meta-analysis only involve two time points, so they were not truly longitudinal, so it is difficult to say if the direction of influence remains consistent over time.

Taken together, these cross-lagged panel and longitudinal studies support the idea that those who maintain a positive attitude toward old age throughout life will likely have a positive experience upon entering old age and may take actions necessary to bring about such an experience (Sargent-Cox, Anstey, & Luszcz, 2012), or, more plainly stated, that PA contributes to health. While findings from other research have suggested the opposite temporal ordering of health-PA (e.g., Choi, DiNitto, & Kim, 2014; Heckhausen & Krueger, 1993; Markides & Boldt, 1983; Stephan, Chalabaev, Kottero-Grühn, & Jaconelli, 2013), most have been from cross-sectional studies, meaning temporal ordering has been inferred. The existing literature provides a more robust case for PA being an antecedent to health.

Hypothesis 5: PA is an antecedent to health; evidence for this temporal ordering is stronger than evidence for health serving as an antecedent to PA.

Strength of Relationship Between PA and Dimensions of Health

Past research involving multiple health dimensions reveals that differing facets of health have varied associations with PA (e.g., Hubley & Russell, 2009; Spuling et. al, 2013). For example, Hubley & Russell (2009) found the strongest relationship between PA and general health, and the weakest relationship between PA and mental health, although both relationships were statistically significant. Meanwhile, Spuling, Miche, Wurm, and Wahl (2013) discovered a connection between PA and both physical and mental health, but not functional health. However, there is a lack of longitudinal studies that have explored the relationship between PA and several dimensions of health. The few cross-lagged panel studies that have multiple health dimensions (Spuling et al., 2013; Wurm et al., 2007) have only included two time points, meaning it is unclear whether the relationships they observed holds over time. As a result, it is not clear whether the pattern and strength of the PA-health relationship is the same or different for the separate dimensions of health. It may be the case that the relationship between each of the health dimensions and PA will be dissimilar from each other. The nature of the relationship between PA and the differing aspects of health will be investigated as part of this study.

Research Question 1: Does the strength and pattern of the PA-health relationship differ by health dimension?

Chronological Age as a Moderator of Health–PA Relationships

CA may moderate the PA-health relationship. Past research has observed age differential drivers of FA-CA discrepancies by age decade, with health being predictive for those in their twenties, work ability predictive for those in their thirties, and mental resources predictive for those in their forties and fifties (Johnson, McGonagle, Barnes-Farrell, & Morrow, 2009). Hubley and Russell (2009) found differences in relationships between PA and health outcomes (e.g., physical health, functional health, self-rated health, and health satisfaction) based on age (young-

old: 55-69; old-old: 60-79). Likewise, a recent meta-analysis (Westerhof et al., 2014) found PA had a stronger positive effect on health for younger adults compared to older adults (age range was 57 to 85).

The CA moderating effect may be explained from a SET frame. Stereotypes about old age are likely to be more salient as one ages. For instance, those with negative views of aging may notice every little ache or pain and consider it as confirmation of the anticipated health decline that comes with increased age, while those with positive beliefs about aging might attribute it to over exertion.

Therefore, the following hypothesis propose the expected effect CA will have on the PA-health relationship:

Hypothesis 6: CA will moderate the relationship between PA and health. The relationship will be stronger for older workers compared to younger workers.

It is unknown whether or not the influence of CA moderates the PA-Health relationship consistently among the different facets of health. This effect will be explored as part of this study.

Research Question 2: Is the moderating role of CA consistent across the different facets of health?

Current Study

The majority of research that has explored the connection between health and PA has been cross sectional, and the cross-lagged panel and longitudinal studies that do exist tend to focus on a single dimension and type of assessment (i.e., subjective or clinical) of health. Furthermore, these studies have produced inconsistent results. The lack of longitudinal research that includes multiple dimensions of health and the conflicting findings of strength of influence

beckon further examination of the relationship between PA and health. In answer to this call, I have attempted to not only replicate the findings of Spuling et al. (2013), but to also expand on their findings by using a methodology that includes utilizing a sample of working adults whose ages span from 20s to 70s, multiple facets of health measured both subjectively and clinically, and three-wave longitudinal analysis.

Using existing data from a recent longitudinal study of aging and work capacity among manufacturing workers, this study examines four health dimensions. CA was included as a potential moderator of the relationship between PA and the health constructs. While Spuling et al. (2013) used a two-wave cross-lagged panel design to examine data from two time points, 6-years apart, this study uses self-report items from three time points, approximately 1.5 years apart, making a true longitudinal analysis of subjectively assessed facets of health and PA possible. Inclusions of multi-facets of health will afford a more detailed exploration of the influence PA has on health outcomes. Each facet of health was tested separately. Figure 1 represents the conceptual model being tested.

Methods

Participants

Participants for this study were part of a 3-wave longitudinal, interdisciplinary research project examining aging, musculoskeletal disorders, and work capacity. Individuals were recruited from six medium-sized light-manufacturing companies in the Northeast U.S. All employees within each organization were eligible to participate. Approximately 40% of eligible employees elected to participate in the study (range 29.2% - 52.7%). There was an average of 1.6 years lag in data collect between Time 1 (T1) and Time 2 (T2), and an average of 1.2 years between T2 and Time 3 (T3). Surveys were gathered at all three time points, while clinical health

assessments were performed at T1 and T3. Several criteria were used for inclusion in the present study. Participants must have (a) completed all surveys and clinical assessments, (b) provided responses to the PA item on all surveys, (c) provided gender and CA at T1, and (d) have responses to a minimum of 50% of items for each facet of health at each time point. A total of 772 employees completed the T1 survey, and of those 532 took part in the first clinical assessment. From those participants, 441 met the first criterion by completing the T2 and T3 surveys and the second clinical assessment (57.1% retention rate). An addition 32 did not provide responses to the PA item on at least one survey and therefore did not meet the second inclusion criterion, leaving 409 participants, all of whom meet the third and fourth inclusion criteria. The average age of participants was 47.9 (*SD* = 9.83 years), the majority of the sample had either a college or graduate degrees (40.8%) or some college (24.7%), and were male (72.6%). Most were Caucasian[1] (84.6%; 4.9% Latino or Hispanic, 4.2 % Black, 5.6% Asian, and 2.4% Native American). Average tenure was 15.7 years (*SD* = 11.9 years) and the majority had an annual household income greater than $75,000 (66.5%).

Measures

Psychological age. PA was measured with the following question: "Some people feel older or younger than they are. How old do you feel?" The age (in years) was used as in indicator of *felt age* (FA). This item, adapted from an item originally introduced by Underhill and Cadwell (1983), has been included in the National Survey of Midlife Development in the United States (MIDUS; Brim et al., 2000) and has been used in many published studies on PA (e.g., Barrett, 2003, 2005; Choi, DiNitto, & Kim, 2014; Demakakos, Gjonca, & Nazroo, 2007; Hughes & Schweder, 2002; Spuling et. al, 2013; Stephan, Chalabaev, Kotter-Grühn, & Jaconelli, 2012;

[1] Participants were able to select multiple racial/ethnical identities. However, an overwhelming majority identified as Caucasian.

Stephan, Demulier, & Terracciano, 2012; Ward, 2010). Much of the research involving PA utilizes FA-CA discrepancy scores (e.g., Barrett, 2003 and 2005; Bergland, Nicolaisen, & Thorsen, 2014; Choi, DiNitto, & Kim, 2014; Mock & Eibach, 2011; Spuling et. al, 2013; Stephan, Chalabaev, Kotter-Grühn, & Jaconelli, 2013), however discrepancy scores on their own do not take into account that the older an individual is the greater the discrepancy can be. To control for this, a proportional discrepancy score was calculated by subtracting CA from FA, then dividing the difference by CA: (FA – CA)/CA (PDPA; cf. Kotter-Grühn & Hess, 2012; Rubin & Berntsen, 2006). The PDPA score can easily be interpreted as the percentage older or younger an individual feels compared to his or her CA (e.g., a person with a score of +.25 feels 25% older, while a person with a score of -.25 feels 25% younger).

Subjective health. Subjective health was assessed at all three time points using self-report items from four health dimensions: general health, physical health, functional health, and mental health. (For a complete list of survey items, see Appendix A).

General health (GH). GH measured individual self-perception of his or her own health. The single-item question from the SF-12 (Ware, Kosinski, & Keller, 1996), an instrument designed to assess health and well-being, inquired, "In general would you say your health is…," with an answer scale ranging from 1 (excellent) to 5 (poor). Numerous studies have demonstrated that this item is a good indicator of overall health (see McDowell, 2006).

Physical health (SPH). SPH consists of items that indicate health problems.

The first scale inquired whether any body area had been seriously injured in the prior year (Miranda, Punnett, Gore, & Boyer, 2011). Participants were asked to identify eight body areas (e.g., low back, wrist or forearm, or knee) that had been injured in the previous 12 months,

with responses being either yes (coded as 1) or no (coded as 0). Items were summed, with a higher scale score indicating more body areas being injured during the prior year.

The next scale measured pain and limited motion (Miranda, Punnett, & Gore, 2014) and asked, "During the past 3 months, how much pain, aching or stiffness/limited motion have you had in the areas shown on the diagram below?" The diagram showed an outline drawing of an adult human body with numbers representing different body areas (i.e., area 1 = neck, 2 = shoulder, 3 = wrist or forearm, 4 = hands, 5 = low back, 6 = knee, 7 = foot). Answer choices ranged from none (0) to extreme (4). Responses were recoded to signify no pain or limited motion (0) or any amount of pain or limited motion (1), and then summed. Higher values indicate pain or limited motion experienced in more body areas.

Arthritis was quantified with a question created for this study: "Has a doctor or other healthcare provider told you that you currently have arthritis or joint pain, and is it currently being treated with medication?" Response options were "no" (0), "yes, not being treated" (1), or "yes, being treated (2).

Auditory and visual impairment were measured using two items from the National Health Interview Study (Botman, Moore, Moriarity, & Parsons, 2000; Fowler, 1996). The vision questions asked, "Do you have trouble seeing, even when wearing glasses or contact lenses?" (0 = no, 1 = yes). Participants were asked to choose a statement that best described their unaided hearing (1 = good, 4 = deaf).

Functional health (SFH). SFH is comprised of scales and items that assessed physical functioning limitations due to a physical health problem. The SF-12v.1 (Ware, Kosinski, & Keller, 1996) was used to calculate a physical component score (PCS), which features norm-based standardized scores that have been empirically shown to be valid, reliable, and comparable

to SF-36 scores (e.g., cross-sectional US sample: Ware, Kosinski, & Keller, 1996; cross-cultural sample: Gandek et al, 1998; longitudinal sample: Jenkinson et al, 1997; for scoring instructions see Ware, Kosinski, & Keller, 1998).

A single item asked how current health limits vigorous activites (e.g., running, lifting heavy objects, or participating in strenuous sports), with response options of "not limited at all" (1), "limited a little" (2), or "limited a lot" (3) (Ware & Sherbourne, 1992).

Three-items each measured work and sleep difficulties experienced in the previous week due to musculoskeletal issues on a five-point scale (1 = not limited at all/no difficulty, 5 = unable to work or do regular activities/so much difficulty that I can't sleep) (Miranda, Punnett, & Gore, 2014). A mean score for each (work and sleep) was computed from these values. As Miranda, Punnett, and Gore (2014) did not provide psychometric properties for these scales, additional testing was conducted to verify the appropriateness of composite score. Principal axis factor analyses supported a single factor solution for each scale, with loadings ranging between .72 and .76 for the work scale, and between .59 and .77 for the sleep scale. Coefficient alpha indicated acceptable internal consistency for the sleep scale (.71). The work scale displayed lower internal consistency (.59).

Seeing and hearing limitation were each measured with a single item on a five-point scale (e.g., "In the past 4 weeks, how often did you have difficulty at work with the following? Seeing your work or reading clearly, 0 = none of the time, 4 = all of the time) (Lerner, Amick, Rogers, Malspeis, Bungary, & Cynn, 2001).

Mental health (MH). Items from the SF-12 (Ware, Kosinski & Keller, 1996) were used to create the mental component scale (MCS; for scoring instructions see Ware, Kosinski, &

Keller, 1998). As with the PCS, the scores are norm-based and are known to be valid and reliable indicators of mental well-being.

Clinical health measures were obtained during two on-site physical health assessments that took place in conjunction with survey collection at time 1 and time 3 during normal working hours, with an almost three-year lag in between assessments. A thorough description of measures and procedures used has previously been published (Cote, Kenny, Dussetschleger, Farr, Chaurasia, & Cherniack, 2014). They are summarized below.

Physical health (CPH). (See Appendix B for details on each measure.) Three clinical assessed items were used for CPH**.** High blood pressure (i.e., hypertension; National Heart, Lung, and Blood Institute, 2012a) was determined through manual measurements of systolic and diastolic blood pressure. These values were categorized into ranges that are consistent with established hypertension categories (Pickering et al., 2005).

Overweight and obesity was determined by computing individual BMI. Height in centimeters was measured using a vertical anthropometer, and a balance scale was used to obtain weight in kilograms; participants were barefoot for both assessments. BMI was calculated from these measurements using the following formula (Center for Disease Control [CDC], 2011):

$$\text{BMI} = \text{weight (kg)}/([\text{height (m)}]^2$$

BMI was categorized as underweight, normal, overweight, or obese.

Waist circumference was determined using a measuring tape wrapped around the body at the level of the uppermost ridge of the pelvic bone. Participants were clothed for the measurement, and values were recorded in centimeters to the nearest half-centimeter. These values were then divided into gendered categories used to diagnose, or indicate risk of developing, metabolic syndrome (Males: ≥102 cm. = high risk, 94 cm. – 101 cm. = elevated risk,

≤93 cm. = normal risk; Females: ≥ 88 cm. = high risk, 80 cm – 87 cm = elevated risk, ≤ 80 cm = normal risk; Grundy, Cleeman, Daniels, Donato, Eckel, Franklin, et. al., 2005).

Functional health (CFH). Measures of musculoskeletal health for five body areas (hand, shoulder, neck, trunk, and leg) were identified by subject matter experts and were used to evaluate how physical health problems were interfering with functioning. Sample- and gender-specific norms based on T1 clinical assessment values were created for each of the measures for each body areas by recoding score according to quartile values. Scores below the median reflected worse musculoskeletal health functioning compared to the sample average and were assigned negative points. Scores at the median indicated average functioning compared to the sample and received zero points. Finally, scores above the median represented better than average functioning and were given positive points. When multiple measures were used to assess a given body area the points were summed. A ±30-point range was possible for each body area, with negative scores equaling below average functioning for the given body area and positive score signally above average function for the given body area. See Appendix C for details on the measurements for each body area.

Moderator. Participants were grouped according to T1 CA as follows: under 50 years old (N = 224; T1 CA: M = 40.92, SD = 7.269; 72.3% male, 72.3% married, 81.7% white, 70.2% some college or higher, 63% income of $75,000 or higher) or 50 years or older (N = 185, T1 CA M = 56.44, SD = 4.178; 72.3%, male, 81.6% married, 88.1% white, 66.5% some college or higher, 70.3% income of $75,000 or higher). The age of 50 was used as the basis for grouping because it to denote the societal boundary of old age that could theoretically trigger embodiment of old age stereotypes. In the United States it is commonly known that at this age an individual is eligible to become a member of the American Association of Retired Persons (AARP), a

nationally recognized organization that advocates and provides information and services for people age 50 and over (see www.AARP.org).

Demographic and control measures. Demographic and control measures include CA, marital status, gender, and income. Prior research has demonstrated a strong relationship with CA and PA, and no or weak relationships with remaining demographic factors and PA (e.g., Barak & Stern, 1986; Bergland, Nicolaisen, & Thorsen, 2014). However, all of these factors have been shown to have significant relationships with health (e.g., marital status: Robles, Slatcher, Trombello, & McGinn, 2014; gender: National Heart, Lung, and Blood Institute, 2012b; and income: Economou & Theodeossiou, 2011).

Results

Descriptive Results

Descriptive analyses were carried out with SPSS version 21 (IBM Corporation, 2012) to determine if participants who met the study inclusion criteria (included) differed in their responses to study variables from those who did not meet the inclusion criteria (excluded). This comparison was conducted only for participants that completed the T1 survey because this was the first data collected and failure to partake in this foundation step automatically excluded an individual from further analyses. Table 1 provides descriptive statistics for each group. With few exceptions, excluded participants were not significantly different from included participants. A higher proportion of those included compared to those excluded were married or living with a partner or widowed, while a smaller proportion of included participants were divorced or separated or single or never married. Significantly more excluded individuals identified as Latino. Included participants had significantly higher income than those who were excluded. In regards to measures of health, those who were included had significantly higher PCS (M = 50.79,

SD = 7.302; vs. *M* = 49.68, *SD* = 7.122) and lower hypertension (*M* = 2.03, *SD* = .0826; vs. *M* = 2.19, *SD* = 1.009). However, the magnitude off all differences was small.

Data Preparation

Missing data. To be able to retain as many participants as possible in any given analysis, missing responses were imputed for survey measures using item-level regression. This single imputation approach is considered a good option for low missing rates (e.g., approximately 5% or less) because it takes into consideration individual differences in responses (Roth, Switzer, and Switzer, 1999; and Schafer, 1999). Items were first diagnosed to determine the amount of missingness. For scaled measure this was done at the item level (see Appendix D for complete list of variables with missing data). All survey items met the criteria for single imputation[2]. See Table 2 for a comparison of pre- and post-imputation means and standard errors for study variables. Following this procedure, all subjective health measures were recoded to facilitate interpretation of analyses results, so that higher values indicated better health.

Clinical health measures were also evaluated for missingness. For clinical physical health (CPH) there were 18 (4.4%) cases with at least one missing value from any of the related measures at either time point. While the proportion of missingness was small, imputation was not performed because there was only one time point of data, which was not enough to predict the

[2] Regression analysis was used to generate weights to compute predicted values for the missing responses. For example, suppose general health at T2 was missing one response. This item was entered as the dependent variable, and the T1 and T3 responses were entered as the independent variables. Using the unstandardized coeffients, a regression equation was written to compute a new variable to represent the predicted responses: $T2\ General\ Health = constant + \beta_1(T1\ General\ Health) + \beta_2(T3\ General\ Health)$. In order to prevent imputed values being used to impute another value, all missing responses were predicted first, and then missing values were replaced. The predicted responses were rounded to conform to the response options for the item. Scales were recomputed post-imputation. When missing was very small (< 5) the imputation had no effect on the sample statistics; for all other cases, imputation resulted in only a small downward bias with slightly smaller means and standard errors.

missing value. As such, the overall sample size for the CPH analyses was reduced to 391. As with the survey items, the CPH items were recoded so that higher values indicated better health.

Clinical functional health (CFH) had a high proportion (approximately 32%) of participants missing values for at least one item, primarily shoulder and leg measures. As with CPH, imputation of missing values was not performed. However, the limited number of participants available for analyses severely affected power to detect effects in the model testing. Therefore, CFH was excluded from further analyses and model testing.

Physical and functional dimensions of health can each be viewed as cumulative, so that the more items indicating better health, the better an individual's health is for that dimension. As such, composite factor scores were created to represent each of those health dimensions. In order to compute composite scores for physical health and functional health a series of analyses were carried out. The first step entailed conducting principal component analyses (PCAs) with varimax rotation for both physical (subjective and clinical) and subjective functional health (SFH). Results for subjective physical health indicated a two-factor solution. Factor one included auditory impairment, visual impairment, and arthritis (loadings ranged from .572 to .716); and factor two included serious injury and bodily pain (loadings .669 and .857). Results for CPH revealed a one factor solution (loadings ranged from .563 to .879). Results for SFH indicated a two-factor solution. The first factor included PCS, work limitation, sleep limitation, and activity limitation (loadings ranged from .679 to .844). The second factor included visual limitation and auditory limitation (loadings .898 and .900, respectively). Because the metrics of measurement for the subjectively assessed physical and functional items were substantially different, the second step was to compute standardized *z*-scores for each of the subjective physical and functional items. Step three was to sum and average the *z*-scores according to the factors

indicated in the PCAs. Finally, the two composite factor scores for subjective physical health were summed to form an indicator of subjective physical health (SPHz). The same procedure was followed for subjective functional health (SFHz). To create the composite factor score for CPH the individual items at each time point were summed (i.e., hypertension + BMI + waist circumference; CPH). The second and third steps were not required for the clinical physical health items because the metric of measurement was similar. Means, standard deviations, and bivariate correlations between the health variables, PA, CA, and control variables at each time point are reported in Table 3. With the exception of mental health at T1 and T3, PA was negatively and significantly related to each dimension of health at all timepoints.

Consistent with past research utilizing cross-lagged panel models (e.g., Elovainio et al., 2015) residual values were generated for each health facet at each time point to account for the potential confounding effect of the control variables. Using separate linear regression models, T1 gender, CA, marital status, and income were used to predict each dimension of health at each time, and the unstandardized residuals were saved (GHr = general health residual; SPHzr = subjective physical health z-score residual; SFHzr = subjective functional health z-score residual; MHr = mental health residual; CPHr = clinical physical health residual).

Multi-Group Invariance Testing

Prior to testing the relationship between PA and the different dimensions of health, and temporal ordering, as per Hypothesis 6 it was necessary to determine if the PA-health relationship was invariant for the younger and older age groups. Invariance between the groups would indicate the relationship was not significantly different for the separate age groups and subsequent modeling testing could be conducted without considering age. However, if results reveal a variation in the relationship according to age group separate analyses for younger and

older age groups would be needed to carry out further model testing. Following guidelines from Kenny (2011) on testing for differences between groups, each dimension of health was separately and systematically tested for group invariance using the following nested models (all based on the M4 from later cross-lagged panel model testing):

a. Configural model: all paths freely estimated across groups; used as comparison model
b. Invariance of paths
    1. Autoregressive paths only constrained to be equal across groups (nested in model a)
    2. Both autoregressive and cross-lagged paths constrained to be equal across groups (nested in model b1)
c. Invariance of intercepts (i.e., constrain intercepts to be equal across groups; nested in model b2)
d. Invariance of error variances (i.e., constrain error variance to be equal across groups; nested in model c)
e. Invariance of correlations (i.e., constrain intra-wave correlations; nested in model d)

These and subsequent models were tested in Mplus 6.13 (Muthén & Muthén, 2010) using ML estimation and were based on covariance matrices. (See Table 4 for the covariance matrices used for the multi-group invariance testing.) Each ensuing model was nested in the previous model. Chi-square difference testing was conducted at each step, with statistically significant differences (indicated with a p-value less than .05) indicating that the PDPA-health relationship was different according to age category. Table 5 displays the results of these analyses, which revealed variability across age groups for all aspects of health, indicating that separate analyses were required for each age group for all dimensions of health. These results suggest initial

support for Hypothesis 6, which stated that CA would moderate the relationship between PA and health. Additionally, these results signal that the moderating role of CA is consistent across all facets of health, answering Research Question 2.

Cross-Lagged Panel Model Testing

A series of four multi-group cross-lagged path models were used to test the relationship between the different facets of health and PA, with separate analyses conducted for the younger and older age groups as well as for each health dimension. Figures 2-5 illustrate the models that were tested for each facet of health.

M1: Null model; autoregressive paths only (Figure 2)

M2: Cross-lagged paths from Health to PDPA and autoregressive paths (Figure 3)

M3: Hypothesized model; cross-lagged paths from PDPA to Health and autoregressive paths (Figure 4)

M4: Cross-lagged paths from PDPA to Health, Health to PDPA, and autoregressive paths (Figure 5)

Because later models were nested in prior models (i.e., M2 and M3 were nested in M1, M4 was nested in M1, M2, and M3), chi-square difference tests were employed to assess the fit of each proposed model compared to a previous model. If the difference was statistically significant the more parameterized model (i.e., the model with fewer degrees of freedom) has better fit. If the difference was not statistically significant, both models fit the data equally well and the less parameterized model (i.e., the model with more degrees of freedom) is favored (Werner & Schermelleh-Engel, 2010). However, the chi-square test is a test of how well the data exactly fits the models, which is an unrealistic expectation (Little, 2013). Because of that, alternative fit indices were used to evaluate the overall fit of each model; those included the root

mean square error of approximation (RMSEA; Steiger & Lind, 1980) and its 90% confidence interval (CI), the comparative fit index (CFI; Bentler, 1990), and the Tucker-Lewis Index (TLI; Bentler & Bonett, 1980; Tucker & Lewis, 1973). These alternative measures assess fit according to how well the model approximates the data (Little, 2013). With RMSEA, good fit is signaled with a value of .05 or less (Little, 2013). The 90% CI lower boundary ideally is at or near 0, and upper boundary should be less than .08. For CFI and TLI, values greater than .90 are considered acceptable fit, and values greater than .95 indicate very good fit (Hu & Bentler, 1999; Little, 2013). In addition, parameter estimates with an alpha level of less than .05 were considered to be statistically significant. All parameters were freely estimated.

Under 50 age group model testing results. Table 6 lists the fit statistics and model comparisons for each dimension of health for the under age 50 group. Aside from physical health, model comparisons favored M2 (Health → PDPA) for all facets of health, with M2 have significantly better fit than M1 (*general health*: $\Delta\chi^2[\Delta df = 3] = 15.674$, $p < .001$; *subjective functional health*: $\Delta\chi^2[\Delta df = 3] = 11.639$, $p < .01$; *mental health*: $\Delta\chi^2[\Delta df = 3] = 11.639$, $p < .01$), and no significant difference from M4. For SPH there was no significant difference in model comparisons. However, with exception CPH, M2 provided the best fit to the data, with alternative fit indices indicating reasonable fit for each dimension of health (*general health*: RMSEA = 0.0, 90% CI [0.0, .054], CFI = 1.00, TLI = 1.031; *subjective physical health*: RMSEA = 0.0, 90% CI [0.0, 0.0], CFI = 1.00, TLI = 1.046; *subjective functional health*: RMSEA = .023, 90% CI [0.0, .117], CFI = .999, TLI = .993; *mental health*: RMSEA = .023, 90% CI [0.0, .117], CFI = .999, TLI = .993). The autoregressive only model (M1) provided the best fit for CPH ($\chi^2[2] = 1.072$, p > .05, RMSEA = 0.0, 90% CI [0.0, .110], CFI = 1.00, TLI = 1.008).

Appendix E shows the graphical representation of each of the models as well as their parameter estimates for the under 50-age group. All autoregressive (stability) paths were statistically significant. Uniformly in all subjective health models, the paths from T1 PDPA to T3 PDPA and from T1 health to T3 health had smaller coefficients compared to paths from T1 PDPA to T2 PDPA and T2 PDPA to T3 PDPA, or T1 health to T2 health and T2 health to T3 health. This is as expected with autoregressive paths, namely that the relationship between adjacent time points is stronger than relationships between nonadjacent time points (Little, 2013). Cross-lagged path coefficients in M2-M4 consistently showed a negative relationship between PDPA for all aspects of health, signaling support for hypotheses 1-4. However, the only significant causal paths between the two constructs were found in M2 and M4, both of which include cross-lagged paths leading from health to PDPA. Therefore, results for participants the under age 50 age group do not support Hypothesis 5; i.e., PA was not an antecedent for health. Furthermore, the significant cross-lagged paths between health and PDPA varied according to facet of health. For GH only the path from T2 GHr to T3 PDPA was statistically significant (b = -.039, β = -.202, p < .01). With SFH it was the path from T1 SFHzr to T3 PDPA (b = -.026, β = -.184, p < .01). MH had a significant path from T1 MHr to T2 PDPA (b = -.004, β = -.192, p < 01). Both SPH and CPH had no significant paths between PDPA and health. Intra-wave correlations between PAPA and health were significant only at T1 for all subjective health dimensions, and were not significant at either time point for CPH.

A fifth model (M5), based on trimming non-significant cross-lagged paths from the best fitting of the prior models, was tested for each facet of subjective health. This model testing was not performed for CPH because there were no significant cross-lagged paths. The under 50 GH M5 removed the two non-significant cross-lagged paths from M2 and resulted in a better fitting

model ($\Delta\chi^2[\Delta df = 2] = 1.045$, p = NS; RMSEA = 0.0, 90% CI [0.0, .043]; CFI = 1.00; TLI = 1.026; see Figure 6). Trimmed M5 for SPH removed all cross-lagged paths from SPH to PDPA (see Figure 7), resulting in a model identical to the autoregressive only model (M1). The change in chi-square from M2 was not statistically significant ($\Delta\chi^2[\Delta df = 3] = 6.371$, p = NS), and while the alternative fit indices pointed to acceptable model fit (RMSEA = .023, 90% CI [0.0, .092]; CFI = 997; TLI = 994), M2 had better model fit. Even though the cross-lagged paths from SPH to PDPA were non-significant in M2, it appears that even the weak relationship is meaningful in the context of the full model. M5 for SFH trimmed two paths from M2, resulting in a better fitting model ($\Delta\chi^2[\Delta df = 3] = .329$, p = NS; RMSEA = .017, 90% CI [0.0, .096]; CFI = .999; TLI = .996; see Figure 8). For MH M5 two paths were pruned from M2 (see figure 9). The change in chi-square was not statistically significant and the remaining fit indices signaled an acceptable model ($\Delta\chi^2[\Delta df = 2] = 4.976$, p = NS; RMSEA = .054, 90% CI [0.0, .117]; CFI = .985; TLI = .959), but M2 appeared to fit the data better. As with SPH, the inclusion of the weak, non-significant paths seem to be relevant to the MH-PA relationship. See Figure 10 for the best fitting model for CPH (i.e., M1).

50 and older age group model testing results. Table 7 shows the fit statistics and model comparisons results for each dimension of health for the 50 and older age group. Unlike the younger age group, model comparisons revealed M3 (PDPA → Health) as the favored model for most health facets. M3 had significantly better fit than M1 (*subjective physical health*: $\Delta\chi^2[\Delta df = 3] = 14.72$, $p < .05$; *subjective functional health*: $\Delta\chi^2[\Delta df = 3] = 16.49$, $p < .001$; *mental health*: $\Delta\chi^2[\Delta df = 3] = 7.887$, $p < .05$; *clinical physical health*: $\Delta\chi^2[\Delta df = 1] = 2.305$, $p < .05$) and no significant difference from M4 for the same aspects of health. The one exception was GH, which favored M4 over M1 ($\Delta\chi^2[\Delta df = 6] = 24.03$, $p < .05$), M2 ($\Delta\chi^2[\Delta df = 3] = 11.32$, $p < .05$), and

M3 ($\Delta\chi^2[\Delta df = 3] = 12.69$, $p < .01$); this model indicates a reciprocal relationship between PDPA and GH. Alternative fit indices corroborate those conclusions (*subjective physical health* M3: RMSEA = 0.0, 90% CI [0.0, .085], CFI = 1.00, TLI = 1.028; *subjective functional health* M3: RMSEA = 0.0, 90% CI [0.0, 0.0], CFI = 1.00, TLI = 1.051; *mental health* M3: RMSEA = 0.0, 90% CI [0.0, .121], CFI = 1.00, TLI = 1.003; *clinical physical health*: RMSEA = 0.0, 90% CI [0.0, .098], CFI = 1.00, TLI = 1.026; *general health* M4: Saturated model – RMSEA = 0.0, 90% CI [0.0, 0.0], CFI = 1.00, TLI = 1.00).

Diagrams of the models for the age 50 and older group, including parameter estimates, are presented in Appendix F. Similar to the younger age group, nearly all autoregressive paths were statistically significant, with the exception of GH M3 and M4. For these two models the path from T1 GH to T3 GH was non-significant. Both models include cross-lagged paths from PDPA to health. For all models the nature of the autoregressive paths were as they were with the younger age group: adjacent time points were more strongly related than distal time points. All cross-lagged path coefficients from PDPA to health, and most cross-lagged paths from health to PDPA, were negative. The cross-lagged paths from health to PDPA that were positive (i.e., GH: T1 GHr to T3 PDPA; SPH: T1 SPHzr and T2 SPHzr to T3 PDPA; SFH: T2 SFHzr to T3 PDPA; MH: T1 MHr to T3 PDPA) were also weak and non-significant. That being the case, the evidence partially supports the predictions from Hypotheses 1-4 that PDPA and health are negatively related.

The pattern of significant cross-lagged paths was less consistent for the older age group. Beginning with GH, M4 suggested a reciprocal relationship between the two constructs. The paths from T1 GHr to T2 PDPA ($b = -.044$, $\beta = -.222$, $p < .001$) and from T2 PDPA to T3 GHr ($b = -.837$, $\beta = -.169$, $p < .01$) were both statistically significant. SPH had a single significant cross-

lagged path in M3, from T1 PDPA to T2 SPHzr (b = -1.899, β = -.228, $p < .001$). For SFH both T1 PDPA to T2 SFHrz (b = -1.633, β = -.187, $p < .01$) and T2 PDPA to T3 SFHrz (b = -1.452, β = -.147, $p < .05$) in M3 were significant. With MH, even though M3 was favored according to the fit indices, no cross-lagged paths were significant in any of the models tested. However, because M3 produced better fit than M1 there appears to be some sort of important cross-lagged connection between PDPA and MHr. There were no significant paths for any of the CPH models, but, as with mental health, M3 produced the best model fit indices, indicating that path may be meaningful. Based on these mixed results, there is partial support for Hypothesis 5. Finally, for the most part intra-wave correlations between PDPA and health were only significant at T1; only mental health had no significant intra-wave correlations.

For each subjective health facet for the 50 and over age group, a fifth model (M5), which trimmed non-significant cross-lagged paths, was assessed. As with the younger group, this step was not performed for CPH as there were no significant cross-lagged paths. GH M5 pulled out the four non-significant paths from M4, resulting in better model fit ($\Delta\chi^2[\Delta df = 5] = 4.876$, p = NS; RMSEA = 0.0, 90% CI [0.0, .101]; CFI = 1.0; TLI = 1.001; see Figure 11). The pared down M5 for SPH deleted two paths from M3. This model demonstrated improved fit over M3 ($\Delta\chi^2[\Delta df = 2] = 1.296$, p = NS; RMSEA = 0.0, 90% CI [0.0, .068]; CFI = 1; TLI = 1.02; see Figure 12). M5 for SFH removed one path from M3 and generated a better fitting model ($\Delta\chi^2[\Delta df = 1] = .635$, p = NS; RMSEA = 0.0, 90% CI [0.0, .035]; CFI = 1.0; TLI = 1.04; see Figure 13). Seeing that there were no significant cross-lagged paths in the prior MH models, MH M5 was the same as M1 (i.e., autoregressive only). The change in chi-square from M3 was statistically significant ($\Delta\chi^2[\Delta df = 3] = 7.887$, $p < .05$), and the alterative fit indices pointed to an

acceptable fit (RMSEA = .065, 90% CI [0.0, .127]; CFI = .984; TLI = .963; see Figure 14), but it was worse fit than M3. The final model for CPH is depicted in Figure 15.

Alternative Model Testing

Because the basis of this thesis hinges on the notion that there is a predictive relationship between PDPA and health, alternative models based on the best fitting of models 1-4 for each health facet for each age group were tested with paths reversed, such that future constructs predict past constructs. It was expected that these alternative models would produce worse fit.

The alternative (Alt) models for the under 50-age group, based on M2 for all subjective health facets and on M1 for CPH, generated the predicted results (see Appendix G for graphical representation of each model). Even though the chi-square for GH Alt M2 was not statistically significant, alternative fit indices indicated worse fit than M2 ($\chi^2[df = 3] = 6.61$, p = NS; RMSEA = .073, 90% CI [0.0, .15]; CFI = .99; TLI = .951). SPH Alt M2 also produced a non-significant chi-square and acceptable, but worse model fit ($\chi^2[df = 3] = 5.298$, p = NS; RMSEA = .058, 90% CI [0.0, .139]; CFI = .992; TLI = .961). Alt M2 for both SFH and MH gave rise to statistically significant chi-square statistic and poor model fit (*subjective functional health*: $\chi^2[\Delta df = 3] = 12.12$, $p < .01$; RMSEA = .116, 90% CI [.053, .118]; CFI = .962; TLI = .821; *mental health*: $\chi^2[\Delta df = 3] = 19.06$, $p < .001$; RMSEA = .155, 90% CI [.093, .224]; CFI = .931; TLI = .679). CPH Alt M1 was not statistically significant, but alternative fit indices pointed to worse model fit ($\chi^2[df = 2] = 1.976$, p = NS; RMSEA = .000, 90% CI [0.0, .132]; CFI = 1.00; TLI = 1.00).

The 50 and older age group alternative models are displayed in Appendix H. For GH the alternative model was based on M4. Because this is a saturated model, and therefore produces the same perfect model fit indices, it is not possible to determine if the fit is worse, better, or the same. The remaining alternative models (Alt M3) were based on M3 for each health facet. Alt

M3 for both SPH and SFH yielded significant chi-squares and poor model fit as indicated by the alternative fit indices (*subjective physical health*: $\chi^2[df = 3] = 1.296$, $p < .001$; RMSEA = .167, 90% CI [.099, .244]; CFI = .951; TLI = .773; *subjective functional health*: $\chi^2[df = 3] = 18.03$, $p < .001$; RMSEA = .165, 90% CI [.097, .241]; CFI = .941; TLI = .725). MH Alt M3 resulted in a non-significant chi-square, but alternative fit indices pointed to worse fit than M3 ($\chi^2[df = 3] = 7.703$, p = NS; RMSEA = .092, 90% CI [0.0, .175]; CFI = .984; TLI = .926). CPH Alt M3 generated significant results and poor model fit according to alternative fit indices ($\chi^2[df = 1] = 6.644$, $p < .01$; RMSEA = .175, 90% CI [.068, .310]; CFI = .97; TLI = .852).

Strength of PA-Health Relationship

To explore Research Question 1, which asks if the strength of the PDPA-health relationship is the same for each dimension of health, I examined the pattern of the relationship by turning to the path coefficients from the nested model testing (see Tables 8 and 9). Both age groups had different paths that were statistically significant for each type of health.

Based on these significant paths and the value of their standardized coefficients (ranging from -.184 to -.202 for those under 50, and -.187 to -.23 for those 50 and older), for the younger group general health has the strongest relationship with PDPA (β = -.202), followed by mental health (β = -.194) and subjective functional health (β = -.184). The weakest relationship was between physical health (subjective and clinical) and PDPA as demonstrated by no significant cross-lagged paths. The older age group showed the strongest relationship between general health and PDPA (β = -.169 and -.222), followed by subjective functional health (β = -.147 and -.187) and subjective physical health (β = -.23). Clinical physical health (β = -.174) and mental health (no significant cross-lagged path coefficients) had the weakest relationship with PDPA.

Accordingly, it appears that there is variation in the health-PDPA relationship according to both age and type of health and assessment technique (subjective or clinical). It is important to remember that the separate health facets were assessed in different ways, including being measured on different scales that are not necessarily equivalent, and do not display the same variability, either of which could affect the magnitude of covariation.

Post-Hoc Analyses

As noted earlier, past research has found the PA-Health relationship to have a small effect size. In an effort to understand how much of PA can be attributed to prior PA and how much to health, two hierarchical regression analyses were conducted for both younger and older age groups using T3 PDPA as the dependent variable (see Table 10).

Analysis one entered prior PDPA in step 1 (T1 & T2 PDPA); step 2 entered all T1 health factors (i.e., GHr, SPHzr, SFHzr, MHr, and CPHr); at step 3 all T2 health factors were entered (GHr, SPHzr, SFHzr, and MHr); and with Step 4 all T3 health factors were entered (GHr, SPHzr, SFHzr, MHr, and CPHr). For the younger age group, prior PDPA explained 26.4% of T3 PDPA variance, with an extra 7.3% explained by prior and current health (step 1: $R^2 = .269$, $p < .001$; step 2: $\Delta R^2 = .043$, $p < .05$; step 3: $\Delta R^2 = .027$, p = NS; step 4: $\Delta R^2 = .004$, p = NS; total $R^2 = .342$). For the older age group 32.3% of variance was explained by prior PDPA, and only an additional 5.1% was explained by health (step 1: $R^2 = .323$, $p < .001$, step 2: $\Delta R^2 = .01$, p = NS; step 3: $\Delta R^2 = .009$, p = NS; step 4: $\Delta R^2 = .032$, p = NS; total $R^2 = .374$).

However, the order in which variables are entered into a hierarchical regression analysis matters (Cohen, Cohen, West, & Aiken, 2003). Variables entered at earlier steps tend to parcel out larger amounts of variance so that variables entered in later steps have less variance to account for. Order of entry should be based on expected causal ordering. Because this study

concerns causal ordering an additional hierarchical regression analysis was conducted where health variables were entered prior to PDPA. As with analyses one, T3 PDPA was treated as the DV.

Analysis two entered all T1 health variables at step 1, all T2 health variables at step 2, all T3 health variables at step 3, and T1 and T2 PDPA at step 4. Results varied by age group. For the younger age group, health and PDPA at T1 and T2 each accounted for a significant amount of variance (step 1: $R^2 = .121$, $p < .001$; step 2: $\Delta R^2 = .043$, $p < .05$; step 3: $\Delta R^2 = .011$, $p =$ NS; step 4: $\Delta R^2 = .168$, $p < .001$; Total $R^2 = .342$), with 17.5% of variance explained by past and current health and an additional 16.7% explained by prior PDPA. For the older age group only T3 health and T1 and T2 PDPA resulted in significant incremental portions of variance being accounted for (step 1: $R^2 = .043$, $p =$ NS; step 2: $\Delta R^2 = .037$, $p =$ NS; step 3: $\Delta R^2 = .105$, $p < .001$; step 4: $\Delta R^2 = .19$, $p < .001$; Total $R^2 = .374$). Slightly more variance was accounted for by past and current health (18.4%) and by prior PDPA (19%) than was seen with the younger group.

Discussion

This study sought to replicate and expand on existing research on the association between PA and health. Using longitudinal (two- and three-wave) data from individuals employed in the manufacturing sector I explored the temporal ordering of the relationship across four types of health (general, subjective and clinical physical, functional, and mental) using the magnitude of the discrepancy between FA and CA as the measure of PA. Generally speaking, and consistent with past research, each health facet was negatively related with PA, meaning that better general, physical, functional and mental health was associated with a lower PA assessment. That said, several anticipated negative paths between PA and health were not statistically significant, indicating mixed support for Hypotheses 1-4. Only clinical physical health had negative cross-

lagged paths in all models, confirming Hypothesis 2b. There was mixed support for PA being an antecedent to health, and CA, as expected, moderated the PA-health relationship for all facets of health. Contrary to my prediction, for individuals under age 50 results indicate that the direction of influence was from health to future PA. However, for individuals age 50 and older the order of influence was as hypothesized, namely that PA was predictive of future health, for all but general health. These mixed results signify partial support for Hypothesis 5. The strength and pattern of the PA-health relationship varied across types of health and for age groups, answering Research Question 1. Given the differences in the results for the two age groups, CA did moderate the relationship between PA and health, and the relationship was stronger for older workers, supporting Hypothesis 6. The moderation was consistent for all aspects of health, answering Research Question 2.

Several of my findings corroborate Spuling et al.'s (2013) work. Intra-wave correlations demonstrated that better general, physical, functional, and mental health equated to a younger PA relative to one's CA, with stronger associations for the older participants. Final models from the cross-lagged paths analyses revealed the strongest association for both age groups with general health, and overall, the cross-lagged paths were stronger for older individuals. I also found a reciprocal relationship between general health and PA.

In other regards, these results are somewhat different from the Spuling et al. (2013) findings. Mental health showed no relationship with PA for older participants, but the relationship was present for younger individuals, while functional health was significantly related to PA for both age groups in contrast to Spuling et al. Further, the predictive order of the PA-health relationship was different for young and older participants. These differences may partially be explained by the dissimilarities of our participants. Spuling et al. surveyed

community dwelling adults age 40 and older, with an average age of 61, and while it was not reported it might be safe to assume that a large portion of their participants were not employed. My participants were all employed and covered a broader age range (early 20s to early 70s). It is possible that employment status acts as a moderator to the health-PA connection. I also used somewhat different measures of physical, functional, and mental health, which may account for some of the disagreement. Finally, my inclusion of clinical assessments of physical health expanded on Spuling et al. and others work, even though a significant relationship did not emerge.

The reciprocal relationship between PA and general health for older individuals may imply that one construct is used to form the other. Spuling et al. (2013) suggested the concepts used to evaluate general health (e.g., feeling optimistic and energetic), as well as health itself, may be used in evaluating PA. This is not to suggest the two are interchangeable. That said, the cross-sectional correlations between PA and health for older adults were strongest for general health (see Table 4).

It is not surprising that cross-lagged paths in the subjective physical health analyses were significant only for the older group. The indicators of subjective physical health that were utilized consisted of ailments more common with older adults. Several of the items assessed musculoskeletal health and were symptoms of musculoskeletal disorders (MSDs), which are known to be associated with repetitive movements and poor posture. Older individuals have had more opportunities to engage in those behaviors, thereby compounding their risk of experiencing MSDs, and the chance of being diagnosed with one or more of these disorders increases with age (Urwin et al., 1998). Even though the cross-lagged paths were not statistically significant for

younger people, the final model was one that included the paths. This may indicate the onset of MSDs that have yet to be exacerbated to be point of awareness.

Likewise, the finding that mental health was only associated with PA for younger persons is consistent with past research. Others have reported a decreased risk for mental illness as one ages, with highest risk factors for individuals under age 30 (Kessler, Berglund, Demler, Jin, Merikangas, & Walters, 2005). There is a possibility, though, that older adults with mental health disorders chose not to participate in all or any of the surveys for this study, or those that did participate answered the mental well-being questions felt less compelled to answer truthfully as younger respondents; alternatively, these individuals may have self-selected out of the workforce.

The measures used to capture clinical physical health may explain why no significant cross-lagged paths were found. Blood pressure, BMI, and waist circumference, singularly or jointly, are often used to indicate risk of developing certain diseases, but individuals may not consciously think about any of these items or the potential risk they represent. It may be that in order for clinical health items to garner conscious attention they must be severe, manifesting themselves in a way that invokes extreme emotional responses, such as fear of death, or impair normal functioning. People with such serious health problems are likely not working, or may not participate into a research study.

The age related differences in the causal pathways for each dimension of health provide some support for SET. Passage through the old age portal (in this case, the milestone age of 50) triggers expected age-related health outcomes, resulting in the direction of influence from PA to health. Evidence for this was strongest with functional health, as seen with consistent significant paths from prior PA to future functional health assessment. This may be because impairment to

daily functioning is more difficult to ignore than other types of health. For instance, with physical health simply acknowledging the diagnosis of a health condition does not mean that ailment is at the forefront of one's mind. Furthermore, physical health may spark acute symptoms that are more discernable at some times rather than others, and the condition may improve or resolve completely over time. This may be why only one significant cross-lagged path was found for physical health for older individuals.

At the same time, there is an indication that SET only applies to those who have crossed over into "old age." A separate explanation for younger people may be social comparison theory (SCT; Festinger, 1954), which asserts that individuals naturally engage in a cycle of normative comparisons of one's own opinions and abilities to those of similar others. When differences between self and other are detected a person will tend to alter the non-confirmative opinion to be more in line with the in-group norm, or work to improve an ability so as to be comparatively above average. Subsequent updates to SCT have proposed that the comparative process serves a self-enhancement function as one ages, with comparisons being made more selectively to promote positive self-evaluation (Heckhausen & Krueger, 1993). In the context of aging and health, the comparative group is generally one's similar aged peers. Shared group opinions and abilities about health and age tend to adjust to account for discrepancies between stereotypical expectations and personal experiences associated with increasing life stages, so that older-aged groups differ from younger-aged groups in their perception of what is "normal" for a given age. Therefore, even though there is a general negative stereotype regarding aging and accompanying declining health expectations, as a person gets closer to being categorized by society as being old, personal and peer experiences may exert greater influence on the evaluation and action process than those broader negative stereotype assumptions. In other words, an individual will

compare his or her own opinions and abilities about health to those of similar-aged peers and, upon discovering a discrepancy between self and group, will take actions to alter his or her opinion to be in line with or improve ability (i.e., take steps to improve health) to be better than the group. The better one's health becomes as a result of this effort, the younger a person will feel because it is incompatible with the negative societal stereotypes related to increased age and declining health and more in line with stereotypes associated with younger age groups. Once the threshold into old age is crossed, however, the power of a lifetime of assimilated age stereotypes kicks in, engaging the shift of influence from SCT to SET. However, this explanation is speculative. This study did not have measures that could be used to assess mechanism described, such as the Comparison Orientation scale (Gibbons & Buunk, 1999).

The contrasting causal direction seen for the younger people in this study is consistent with the alternative SCT explanation. All four types of health for this group favored paths flowing from past health to future PA, such that better self-evaluated health resulted in a younger PA. This finding corroborates findings from prior research (e.g., Johnson, McGonagle, Barnes-Farrell, & Morrow, 2009). Considering the average CA for this group was in the early 40s, the social comparison self-evaluation process may have been especially active. Inching closer to entry into old age and anticipating health declines, the comparison of health reality being better than expected could have driven PA down. Experimental research has demonstrated that favorable social comparisons produced better functional health. Stephan, Chalabaev, Kottero-Grühn, and Jaconelli (2013) tested older adults handgrip strength. Participants who were told after an initial handgrip task that they were stronger and performed better than 80% of their peers exhibited significantly stronger handgrip strength in a second handgrip task when compared to those not given the same feedback.

There is also empirical support for the SCT explanation for the PA-health relationship. A multi-wave study by Markides and Boldt (1983) found that those who had worse subjective health at the initial assessment, or who experienced greater declines in health from Time 1 to Time 2, were more likely to have reported increasing their age categorization (e.g., middle-age to old) at the second assessment. Other research (Heckhausen & Krueger, 1993) revealed that adults in three distinct age groups (young: < 40 years old; middle: 40 to 59 years old; and old: 60 years or older) all expected increasing developmental declines and decreasing gains, beginning in middle age. However, individuals within each age group not only expected personal change to be less detrimental than the change experienced by others in the same age group, they also had developmental ambitions similar to the more desirable age group adjacent to their own group (i.e., young desired to develop qualities attributed to middle-aged; middle-aged wished to be more like the young, and old strived for middle-aged qualities).

Workplace Implications

Findings from this study could be useful to organizations employing older workers. It is known that health is a driver in many retirement decisions. My results demonstrate that psychological age assessment is related to future health outcomes. Organizations wishing to have forewarning of employees departing the workplace due to ill health could easily ask the felt age question used in this study and compute the proportional discrepancy between FA and CA. This information could be used for interventions aimed at supporting health of at-risk individuals. Or organizations might plan for hiring replacement workers earlier enough for adequate training and knowledge transfer to minimize the information drain that occurs when long-term employees retire.

Another possibility would be to look for ways of manipulating PA. There is evidence of PA being changed due to outside influence. An organization may be able to overcome negative age-related stereotypes that are detrimental to PA through a targeted and persistent campaign that contradicts those stereotypes.

Limitations

There are limitations to this study that should be addressed in future research. The subjective physical and functional health measures were heavily focused on musculoskeletal health. Even though it is likely individuals would be attuned to the affects of MSDs on their bodies, there are obviously other maladies that someone could be diagnosed with and that could impair functioning, such as heart disease, diabetes, or cancers. It may be unrealistic to attempt to survey for every possible ailment, but assessing the most commonly experienced health conditions is reasonable. While I argued that each aspect of health could be conceived as being cumulative, it may be that some diseases have a stronger association with PA than others. As such, item-by-item analysis may further enlighten PA-health research.

Nearly all PA-health investigations have relied solely on self-reporting. This study did include clinical health measures, but they were limited in their scope. Incorporating a range of clinically assessed measures of health in addition to the commonly utilized self-report measures would provide not only discriminant validity but also allow for additional comparisons of PA-health relationships according to assessment technique. Past researchers have found significant positive associations between PA and clinical physical health, including health blood pressure and blood sugar readings, cholesterol levels, and BMI (Demakakos, Gjonca, and Nazroo, 2007; Ng & Feldman, 2013), and clinical functional health of mobility related issues, such as rising from a chair, gait speed, and balance (Sargent-Cox, Anstey, & Luszcz, 2012). Even so, there is a

void in this field of study of investigations employing multiple assessment techniques, especially longitudinally. This may be due to the added burden of clinical assessments to research, most notably the cost in terms of time, money, and other resources. Future research should consider investigating health ailments that potentially impair functioning, such as measures of musculoskeletal (e.g., carpal tunnel syndrome, tendinitis) and cognitive (e.g., anxiety, mild cognitive impairment) disorders, and include clinical measures of both physical (i.e., diagnosing conditions) and functional (i.e., how the same health conditions affect daily functioning) health. Function impairing diseases may be less ignorable than other types of disorders and therefore have greater influence on PA evaluation.

Unfortunately, the small number of female participants prevented the examination of gender in this study. That said, gender differences in the health-PA relationship likely exist, although they are not commonly studied. Role theory proposes that individuals are aware of and conform to societal behavior expectations, or roles (Biddle, 1986). These roles, which have their basis in stereotypical beliefs and behaviors (e.g., Eagly & Steffan, 1984), may vary according to individual characteristics, such as gender. Empirical findings related to gender and health support the argument that same age-group men and women experience health and age differently. For example, older women indicate worse subjective health and feel older compared to older men (Barrett, 2005; Pinquart & Sörgensen, 2001). The health differences may be due to higher rates of disability and chronic illness for older women compared to men (Fuller-Thomson, Yu, Nuru-Jeter, Guralnik, & Minkler, 2009), while PA differences might be explained by society views of aging. As described by Barrett (2005),

> Aging is viewed as a more negative experience for women as a result of the cultural preference for youth and constructions of gender that define women primarily in terms of

> their attractiveness to men and their reproductive potential. For men, in contrast, aging has some positive connotations as qualities that are highly valued for men in our culture and, in fact, are linked with power (i.e., competence, autonomy, and earning potential) often are enhanced with age. (p. 177)

As a result of these gendered health and cultural aging disparities the aging process may be more salient for women than it is for men.

Future Research

Future research may want to consider other moderating factors, such as health behaviors or hazardous working conditions, which may also affect the PA-health connection. Increased levels of health behaviors, such as walking to work or using stairs instead of elevators, have been demonstrated to improve health and quality of life (U.S. Department of Health and Human Services, 1996). It may be that one's health determines the amount of health behaviors enacted, which in turn affects PA. For example, someone with type 2 diabetes may begin taking a walk for 30 minutes everyday. As result of the increased health-promoting activity, this person reports a younger PA as compared to their PA prior to engaging in this health behavior on a regular basis. Or it could be that PA influences how much health behaviors are incorporated into daily life, and those behaviors affect health. A person with a PA greater than their CA may feel too old to take part in health behaviors, and as a result their health declines. Research has demonstrated that the health behavior of others can impact a person's own health behaviors (Gibbons & Gerrard, 1997), which support the SCT perspective. Other investigations have shown that having a positive view of aging led to increased health behaviors (Levy & Meyers, 2004), which lends credence to SET.

Hazardous working conditions may also moderate the PA-health relationship. For instance, jobs that involve repetitive movements, awkward body postures, strenuous effort, and/or vibrations are associated with an increased risk for MSD (Punnett & Wegman, 2004). Other workplace conditions, such as exposure to hazardous chemicals and poor ventilation, are also detrimental to health (Braveman, Egerter, & Williams, 2011). When working conditions are more hazardous, it is likely that the influence of the exogenous variable would be weakened, whereas when there are few if any hazardous working conditions the impact would be strengthened. For example, increasingly hazardous working conditions may exacerbate a person's existing health problems, which in turn could make that person feel older (SCT explanation). Or the absence of hazardous working conditions would mean that PA's influence on health would be unimpeded (supporting SET).

Most existing work exploring the health-PA association has involved older participants, and has not included employment status in the analysis. There is research indicating employment status has an effect on health (e.g., Benach, Gimeno, & Benavides, 2002; Repetti, Matthews, & Waldron, 1989; Virtanen, Kivimäki, Joensuu, Virtanen, Elovainio, & Vahtera, 2005), as well as on PA (e.g., Barak & Stern, 2006), so it may be that employment status has a moderating effect on the PA-health relationship. Future research should consider various aspects of employment status, including full- versus part-time positions, temporary versus permanent employment, and employment versus retirement.

Alternative explanations for the PA-health relationship warrant investigation. It may be that PA acts as a moderator rather than predictor. It is recognized that the onset of heath declines varies from person to person, with some remaining a healthy well into old age while others experience the consequences of disease early on. While there is a general increased likelihood of

developing certain conditions with age, we do not yet fully understand why some seem to beat the odds and maintain health longer. PA may account for some of these differences. Perhaps larger proportional discrepancies in FA-CA act as a lever, pulling health status toward healthy or unhealthy. This hypothesized effect may only apply to older individuals, and for that reason research should explore the limitations of such an interaction.

A large percentage of research on the associations and determinations of PA have focused on health. However, as seen in this and other studies, health has only a small effect on PA. Perhaps it is time to investigation other contributors of PA and to exploration of the stability of the construct. Marketing researchers began this in the 1980s and 1990s, but their efforts have mainly focused on different ways individuals perceive their age (e.g., Barak, 1987; Barak & Gould, 1985; Barak & Stern, 1986; Wilkes, 1992). An area mostly ignored has been situational context. Using experimental manipulation, a technique rare in PA research, Eibach, Mock, & Courtney (2010) were able to cause changes in assessments of PA in adults over age 40 by distorting font clarity of printed text and through ageism primes, such that those who were asked to read small and faintly printed text felt significantly older than those who read large and boldly printed text. The effect was more pronounced when primed with negative age stereotypes. Another study found relationships between PA and work and life stressors and strains (Barnes-Farrell, Rumery, & Swody, 2002). This suggests that context matters, and that PA may be more volatile than stable. It is unknown what other contextual factors may influence PA, either positively or negatively, or how long adjustment to PA assessment lasts. It may be that there is a default baseline PA that individuals remain at most of the time until a given experience triggers a change. For example, changes in self-efficacy may result in like changes in PA. That effect may remain engaged until attention is drawn away from the efficacious thoughts.

Another opportune area for research is in understanding the positive and negative boundaries of PA. As previously noted, individuals over the age of 30 tend to report feeling younger, and those under age 30 tend to feel older (Barnes-Farrell & Piotrowski, 1989). It is assumed that these discrepancies are a good thing, but there are instances when feeling older or younger may cause negative affect. For example, an older adult may report feeling child like (e.g., eight-years old). This may indicate feeling carefree and playful, or it may mean feeling powerless and ignored, both sensations of childhood. Likewise, feeling old (e.g., 80-years old) may suggest a sense of wisdom or represent feeling decrepit. Simply knowing if a person feels older or younger ignores the meaning being placed on that assessment. Using the proportional discrepancy of PA and CA would further allow investigations of how the magnitude of the discrepancy in and of itself factors into the positive or negative connotation.

Conclusions

In conclusion, this study sought to replicate and expand on prior research that has explored the relationship between psychological age and health, specifically by conducting longitudinal analyses that included the magnitude of the discrepancy between FA and CA (i.e., PDPA = [FA-CA]/CA) and multiple facets of health using a sample of employed adults covering a broad age range. Results were somewhat unique compared to prior investigations. Cross-lagged panel path analyses revealed differences in the direction of influence according to chronological age and according to dimension of health, as well as variation in the pattern of the relationship. For those under age 50 the direction was from subjective health to PA, but the pattern of relationship was not consistent across all time points. However, for those age 50 and older the influence was from PA to health. This lends further credence to propositions put forth by SET, namely that psychologically crossing over into “old age” triggers the manifestation of health

disorders that are stereotypically associated with advanced years. Evidence for this was strongest for functional health, which is congruent with societal stereotypes associating age with a decline in functioning. But, for other health dimensions the pattern of relationship was not as uniform. These longitudinal findings reveal that the PA-health relationship is less stable over than previously believed to be from prior cross-sectional and two-wave studies.

The age related differences detected in this study suggest that the PA-health relationship becomes more powerful as individuals move into older life stages. The strength of the relationship was stronger for the older participants compared to younger, and it may grow stronger as individuals transition from employment to retirement and beyond. Considering the overwhelming majority of research on this topic has been conducted with older individuals who are assumed to be retired and has consistently shown PA and health to be related, and that declines in health are a main factor in retirement decisions, this proposition is logical. Longitudinal studies that follow individuals from working status and well into retirement would be needed to test this possibility.

The reciprocal relationship observed between GH and PA for the older participants echoes finding from Spuling et al. (2013) and further substantiates the idea that both constructs inform the evaluation of each other. For both age group the strongest relationship was with GH, but the emergence of the reciprocal association for older individuals suggests that health becomes more important in determining how old one feels, and that subjective age plays a role in evaluating overall health.

True longitudinal research in this field of study is scarce, as is the inclusion of several aspects of health. Even more rare is the examination of working adults and a broad age range. Replication of this study with employed adults from diverse professions is needed to support and

extend these findings. Other moderators, such as gender, health protection, health behaviors, and employment status, should be examined to understand what role, if any, they play in the health-psychological age link.

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Table 1. *T1 Descriptive Statistics for Included and Excluded Participants and Test Results Comparing Responses from the Groups*

	Included (n = 409)					Excluded (n = 363)								
	N	Missing	% Missing[1]	Mean	SD	N	Missing	% Missing[1]	Mean	SD	Variable Type[2]	Test Type[3]	df	Value
Independent Variable														
PA	409	0	0.0%	41.57	10.789	352	11	3.0%	39.96	13.294	Cont	t-test	759	-1.837
Demographic and Control Variables														
Marital Status	407	2	0.5%	1.54	1.028	362	1	0.3%	1.88	1.257	Cat	Chi-Square	3	18.585***
Latino	409	0	0.0%	0.05	0.216	363	0	0.0%	0.10	0.303	Cat	Chi-Square	1	7.908**
White	409	0	0.0%	0.85	0.361	363	0	0.0%	0.81	0.395	Cat	Chi-Square	1	2.031
Black	409	0	0.0%	0.04	0.200	363	0	0.0%	0.07	0.263	Cat	Chi-Square	1	3.853*
American Indian	409	0	0.0%	0.02	0.155	363	0	0.0%	0.02	0.156	Cat	Chi-Square	1	0.001
Asian	409	0	0.0%	0.06	0.231	363	0	0.0%	0.04	0.199	Cat	Chi-Square	1	0.914
Education	408	1	0.2%	3.24	1.075	361	2	0.6%	2.92	1.114	Ord	Mann-Whitney	N/A	*U* = 62023***
Income	405	4	1.0%	3.89	1.044	353	10	2.8%	3.65	1.158	Int	Mann-Whitney	N/A	*U* = 63596**
Tenure	408	1	0.2%	15.68	11.884	356	7	1.9%	14.71	12.788	Cont	t-Test	764	-1.086
Moderator Variables														
Gender	409	0	0.0%	1.27	0.446	363	0	0.0%	1.32	0.466	Cat	Chi-Square	1	1.71
T1_Age	409	0	0.0%	47.94	9.827	361	2	0.6%	46.70	12.014	Cont	t-Test	768	-1.567
Subjective Health														
General Health														
General Health	409	0	0.0%	2.45	0.766	358	5	1.4%	2.66	0.750	Ord	Mann-Whitney	N/A	*U* = 62513

Table 1, cont. *T1 Descriptive Statistics for Participants and Dropout and Test Results Comparing Responses from the Groups, cont.*

	N	Missing	% Missing[1]	Mean	SD	N	Missing	% Missing[1]	Mean	SD	Variable Type[2]	Test Type[3]	df	Value
Physical Health														
Serious Injury	409	0	0.0%	0.34	0.742	363	0	0.0%	0.42	0.811	Cont	t-test	770	1.324
Pain	409	0	0.0%	2.52	1.890	363	0	0.0%	2.67	2.050	Cont	t-test	770	1.011
Arthritis	406	3	0.7%	0.31	0.592	360	3	0.8%	0.25	0.528	Ord	Mann-Whitney	N/A	70743
Seeing Difficulty	409	0	0.0%	0.17	0.375	362	1	0.3%	0.16	0.370	Cat	Chi-Square	1	0.045
Hearing Difficulty	408	1	0.2%	1.32	0.534	363	0	0.0%	1.35	0.562	Ord	Mann-Whitney	N/A	*U* = 72317
Functional Health														
PCS	394	14	3.4%	50.79	7.302	337	26	**7.2%**	49.68	7.122	Cont	t-test	729	(-2.074)*
Activity Limit	406	3	0.7%	1.62	0.652	360	3	0.8%	1.66	0.662	Int	Mann-Whitney	N/A	*U* = 70780
Sleep Difficulty	407	2	0.5%	1.14	0.372	361	2	0.6%	1.17	0.399	Int	Mann-Whitney	N/A	*U* = 69893
Sleep Deficit	407	2	0.5%	0.28	1.113	359	4	1.1%	0.34	1.240	Cont	t-test	764	0.728
Work Difficulty	408	1	0.2%	1.23	0.410	362	1	0.3%	1.29	0.480	Int	Mann-Whitney	N/A	*U* = 69363
Seeing Limitation	404	5	1.2%	0.59	1.006	358	5	1.4%	0.59	1.072	Int	Mann-Whitney	N/A	*U* = 70741
Hearing Limitation	405	4	1.0%	0.71	1.067	359	4	1.1%	0.86	1.214	Int	Mann-Whitney	N/A	*U* = 68989
Mental Health														
MCS	395	14	3.4%	51.57	8.351	337	26	**7.2%**	52.16	8.646	Cont	t-test	730	0.933

Table 1, cont. *T1 Descriptive Statistics for Participants and Dropout and Test Results Comparing Responses from the Groups, cont.*

	N	Missing	% Missing[1]	Mean	SD	N	Missing	% Missing[1]	Mean	SD	Variable Type[2]	Test Type[3]	df	Value
Clinical Health[4]														
Physical Health														
Hypertension	409	0	0.0%	2.03	0.826	361	2	0.6%	2.19	1.009	Cat	Chi-Square	3	19.319***
BMI	407	2	0.5%	2.20	0.761	321	42	**11.6%**	2.18	0.783	Cat	Chi-Square	3	2.135
Waist circumference	403	6	1.5%	2.17	0.855	321	42	**11.6%**	2.23	0.838	Cat	Chi-Square	2	0.889
Functional Health														
Hand	408	1	0.2%	-1.07	23.335	322	41	**11.3%**	-1.77	23.465	Int	t-Test	728	-0.404
Neck	408	1	0.2%	-0.77	15.753	322	41	**11.3%**	-2.72	16.715	Int	t-Test	728	-1.618
Shoulder	359	50	**12.2%**	-0.52	17.944	285	78	**21.5%**	0.50	18.054	Int	t-Test	642	0.716
Trunk	408	1	0.2%	-0.60	11.175	323	40	**11.0%**	0.20	10.965	Int	t-Test	729	0.971
Leg	394	15	3.7%	-6.62	22.537	304	59	**16.3%**	-7.11	22.068	Int	t-Test	696	-0.282

* p < .05; ** p < .01; *** p < .001

[1]Bolded values indicate greater than 5% missing.

[2]Variable types: Cat = Categorical, Cont = Continous, Int = Interval, Ord = Ordinal

[3]Based on guidelines from UCLA Institute for Digital Research and Education (n.d.)

[4]Information collected at time of clinical health evaluation

Table 2. *Comparison of sample statistics pre- and post-imputation.*

	Pre-Imputation				Post-Imputation			
	Valid N	Missing N	Mean	SE	Valid N	Missing N	Mean	SE
T1								
PA	409	0	41.6	0.533	409	0	41.6	.533
Marital Status	407	2	1.5	.051	407	2	1.5	.051
Income	405	4	3.9	.052	405	4	3.9	.052
General Health	409	0	2.5	.038	409	0	2.5	.038
Serious Injury	409	0	.3	.037	409	0	.3	.037
Pain	409	0	2.5	.093	409	0	2.5	.093
Arthritis	406	3	.3	.029	408	1	.3	.029
Seeing	409	0	.2	.019	409	0	.2	.019
Hearing	**408**	1	**1.3**	**.026**	**409**	0	**1.3**	**.026**
PCS	**395**	14	**50.8**	**.367**	**407**	2	**50.8**	**.360**
Activity Limit	406	3	1.6	.032	406	3	1.6	.032
Sleep Limit	**407**	2	**1.1**	**.018**	**409**	0	**1.1**	**.018**
Sleep Deficit	**407**	2	**.3**	**.055**	**409**	0	**.3**	**.055**
Work Limit	**408**	1	**1.2**	**.020**	**409**	0	**1.2**	**.020**
Seeing Limit	**404**	5	**.6**	**.050**	**409**	0	**.6**	**.050**
Hearing Limit	**405**	4	**.7**	**.053**	**409**	0	**.7**	**.053**
MCS	**395**	14	**51.6**	**.420**	**407**	2	**51.5**	**.416**
T2								
PA	409	0	42.9	.526	409	0	42.9	.526
Maritial Status	406	3	1.5	.050	406	3	1.5	.050
Income	403	6	4.0	.049	403	6	4.0	.049
General Health	**408**	1	**2.5**	**.039**	**409**	0	**2.5**	**.039**
Serious Injury	409	0	.4	.039	409	0	.4	.039
Pain	409	0	2.8	.104	409	0	2.8	.104
Arthritis	**407**	2	**.3**	**.029**	**408**	1	**.3**	**.029**
Seeing	409	0	.2	.018	409	0	.2	.018
Hearing	409	0	1.3	.027	409	0	1.3	.027
PCS	**375**	34	**50.8**	**.360**	**408**	1	**50.7**	**.344**
Activity Limit	**406**	3	**1.6**	**.032**	**409**	0	**1.6**	**.032**
Sleep Limit	**404**	5	**1.2**	**.019**	**409**	0	**1.2**	**.019**
Sleep Deficit	407	2	.3	.058	407	2	.3	.058
Work Limit	**405**	4	**1.3**	**.023**	**408**	1	**1.3**	**.022**
Seeing Limit	**405**	4	**.6**	**.049**	**409**	0	**.6**	**.048**
Hearing Limit	**404**	5	**.8**	**.055**	**409**	0	**.8**	**.054**
Work Ability	**402**	7	**9.3**	**.052**	**409**	0	**9.3**	**.052**
Two Years	**403**	6	**2.9**	**.014**	**409**	0	**2.9**	**.014**
MCS	**375**	34	**51.7**	**.46175**	**408**	1	**51.4**	**.449**

Table 2, cont. *Comparison of sample statistics pre- and post-imputation.*

	Pre-Imputation				Post-Imputation			
	Valid N	Missing N	Mean	SE	Valid N	Missing N	Mean	SE
T3								
PA	409	0	44.8	.520	409	0	44.8	.520
Marital Status	409	0	1.5	.049	409	0	1.5	.049
Income	396	13	4.2	.061	396	13	4.2	.061
General Health	409	0	2.5	.037	409	0	2.5	.037
Serious Injury	409	0	.4	.041	409	0	.4	.041
Pain	409	0	2.6	.097	409	0	2.6	.097
Arthritis	407	2	.3	.028	407	2	.3	.028
Seeing	409	0	.2	.018	409	0	.2	.018
Hearing	409	0	1.4	.029	409	0	1.4	.029
PCS	**401**	8	**50.1**	**.370**	**407**	2	**50.1**	**.366**
Activity Limit	409	0	1.7	.032	409	0	1.7	.032
Seeing Limit	409	0	1.2	.020	409	0	1.2	.020
Sleep Deficit	408	1	.4	.050	408	1	.4	.050
Work Limit	408	1	1.3	.024	408	1	1.3	.024
Seeing Limit	**408**	1	**.6**	**.048**	**409**	0	**.6**	**.048**
Hearing Limit	**407**	2	**.8**	**.058**	**409**	0	**.9**	**.058**
MCS	**401**	8	**52.1**	**.440**	**407**	2	**52.0**	**.440**

Bolded items were imputed.

Table 3. *Means, standard deviations, and bivariate correlations of health, PA, CA, and control variables at each time point*.

		M	*SD*	*N*	Bivariate Correlations									
	T1				1	2	3	4	5	6	7	8	9	10
1	T1 CA	47.94	9.827	409	1									
2	T1 Marital Stat	1.54	1.026	409	-.272***	1								
3	Gender	1.27	0.446	409	.037	.127*	1							
4	T1 Income	3.90	1.042	409	.155**	-.401***	-.215***	1						
5	T1 PDPA	-6.37	8.374	409	-.306***	-.02	.037	-.021	1					
6	T1 GH	3.56	0.759	409	-.046	.025	-.073	.176***	-.237***	1				
7	T1 SPHz	0.00	1.132	409	-.172***	-.007	-.039	.049	-.145**	.258***	1			
8	T1 SFHz	0.00	1.277	409	-.240***	.041	-.075	.106*	-.129**	.285***	.556***	1		
9	T1 MH	51.51	8.384	407	.112*	-.004	-.05	.013	-.222***	.215***	.202***	.113*	1	
10	T1 CPH	6.63	1.900	391	-.234***	.057	.016	.075	-.069	.312***	.244***	.275***	-.006	1
	T2				1	2	3	4	5	6	7	8	9	
1	T1 CA	47.94	9.827	409	1									
2	T1 Marital Status	1.54	1.026	409	-.272***	1								
3	Gender	1.27	0.446	409	.037	.127**	1							
4	T1 Income	3.90	1.042	409	.155**	-.401***	-.215***	1						
5	T2 PDPA	-6.59	8.417	409	-.329***	.004	0	-.057	1					
6	T2 GH	3.53	0.786	409	-.039	-.004	-.110*	.074	-.185***	1				
7	T2 SPHz	0.00	1.170	409	-.137**	.045	-.053	.029	-.147**	.285***	1			
8	T2 SFHz	0.00	1.292	409	-.224***	.065	-.028	.085	-.081	.366***	.485***	1		
9	T2 MH	51.41	9.060	408	.093	-.08	-.08	.110*	-.231***	.203***	.195***	.173***	1	
	T3				1	2	3	4	5	6	7	8	9	10
1	T1 CA	47.94	9.827	409	1									
2	T1 Maritial Status	1.54	1.026	409	-.272***	1								
3	Gender	1.27	0.446	409	.037	.127**	1							
4	T1 Income	3.90	1.042	409	.155**	-.401***	-.215***	1						
5	T3 PDPA	-5.98	8.514	409	-.350***	.068	.028	.004	1					
6	T3 GH	3.49	0.751	409	-.017	.003	-.037	.138**	-.260***	1				
7	T3 SPHz	0.00	1.173	409	-.160***	-.015	-.078	.068	-.02	.303***	1			
8	T3 SFHz	0.00	1.323	409	-.239***	-.019	-.044	.142**	-.088	.334***	.498***	1		
9	T3 MH	51.51	8.384	407	.112*	-.004	-.05	.013	-.179***	.149**	.155**	.112*	1	
10	T3 CPH	6.25	1.908	391	-.193***	.076	.044	.04	-.016	.261***	.155**	.259***	.033	1

CA = chronological age; PDPA = proportinal discrecpancy psycholocial age ([PA-CA]/CA); GH = general health; SPHz = subjective physical health z-scored; SFHz = subjective functional health z-scored; CPH = clinical physical health.

* = $p < .05$; ** = $p < .01$; *** = $p < .001$

Table 4. *Covariance (bottom half) and **correlation (top half)** matrices.*

Under 50 Age Group (*n* = 224)

General Health Covariance\Correlation Matrix

	M	*SD*	1	2	3	4	5	6
1 T1PDPA	-0.11	0.185	*.034*	**-.207****	**.34*****	**-.137***	**.381*****	**-.139***
2 T1 GHr	-0.01	0.768	*-.029***	*.59*	**-.128**	**.597*****	**-.241*****	**.599*****
3 T2 PDPA	-0.11	0.189	*.012****	*-.019*	*.036*	**-.132***	**.452*****	**-.139***
4 T2 GHr	0.00	0.812	*-.021**	*.373****	*-.02**	*.066*	**-.295*****	**.654*****
5 T3 PA-CA	-0.08	0.158	*.011****	*-.029****	*.013****	*-.038****	*.025*	**-.272*****
6 T3 GHr	-0.01	0.775	*-.02**	*.357****	*-.02**	*.411****	*-.033****	*.6*

Subjective Physical Health Covariance\Correlation Matrix

	M	*SD*	1	2	3	4	5	6
1 T1 PDPA	-0.11	0.185	*.034*	**-.147***	**.34*****	**-.105**	**.381*****	**-.071**
2 T1 SPHzr	-0.01	1.096	*-.03**	*1.202*	**-.147***	**.532*****	**-.16***	**.501*****
3 T2 PDPA	-0.11	0.189	*.012****	*-.03**	*.036*	**-.14***	**.452*****	**-.087**
4 T2 SPHzr	0.01	1.092	*-.021*	*.637****	*-.029**	*1.192*	**-.19****	**.573*****
5 T3 PDPA	-0.08	0.158	*.011****	*-.028**	*.013****	*-.033***	*.025*	**-.155***
6 T3 SPHzr	0.00	0.990	*-.013*	*.544****	*-.016*	*.619****	*-.024**	*.979*

Subjective Functional Health Covariance\Correlation Matrix

	M	*SD*	1	2	3	4	5	6
1 T1 PDPA	-0.11	0.185	*.034*	**-.137***	**.34*****	**.008**	**.381*****	**-.069**
2 T1 SFHzr	0.01	1.136	*-.029**	*1.291*	**-.134***	**.477*****	**-.259*****	**.462*****
3 T2 PDPA	-0.11	0.189	*.012****	*-.029**	*.036*	**-.028**	**.452*****	**-.029**
4 T2 SFHzr	0.00	1.187	*.002*	*.643****	*-.028*	*1.41*	**-.117**	**.475*****
5 T3 PDPA	-0.08	0.158	*.011****	*-.046****	*.013****	*-.082*	*.025*	**-.124**
6 T3 SFHzr	-0.02	1.133	*-.014*	*.595****	*-.006*	*.64****	*-.022*	*1.285*

Mental Health Covariance\Correlation Matrix

	M	*SD*	1	2	3	4	5	6
1 T1 PDPA	-0.11	0.185	*.034*	**-.230*****	**.34*****	**-.165***	**.381*****	**-.057**
2 T1 MHr	-0.07	8.672	*-.368****	75.205	**-.262*****	**.426*****	**-.251*****	**.377*****
3 T2 PDPA	-0.11	0.189	*.012****	-.43***	.036	**-.228*****	**.452*****	**-.104**
4 T2 MHr	-0.18	9.254	*-.282**	34.3***	-.398***	85.642	**-.243*****	**.516*****
5 T3 PDPA	-0.08	0.158	*.011****	-.343***	.013***	-.355***	.025	**-.153***
6 T3 MHr	0.12	9.267	*-.096*	30.37***	-.182	44.378***	-.224*	85.879

Clinical Physical Health Covariance\Correlation Matrix

	M	*SD*	1	2	3	4
1 T1 PDPA	-0.11	0.185	*.034*	**-.130**	**.381*****	**-.123**
2 T1 CPHr	-0.02	1.832	*-.045*	*3.355*	**-.111**	**.847*****
3 T3 PDPA	-0.08	0.158	*.011*	*-.032*	*.025*	**-.107**
4 T3 CPHr	-0.05	1.941	*-.045*	*3.013****	*-.033*	*3.769*

Table 4, Cont.. *Covariance (bottom half) and **correlation (top half)** matrices.*

50 and Over Age Group (*n* = 185)

General Health Covariance\Correlation Matrix

	M	*SD*	1	2	3	4	5	6
1 T1PDPA	-0.15	0.148	*0.022*	**-.314*****	**.504*****	**-.256*****	**.401*****	**-.281*****
2 T1 GHr	0.01	0.709	*-.033****	*.503*	**-.358*****	**.649*****	**-.17***	**.537*****
3 T2 PDPA	-0.15	0.142	*.011****	*-.036****	*.02*	**-.316*****	**.544*****	**-.395*****
4 T2 GHr	-0.01	0.738	*-.028****	*.34****	*-.033****	*.545*	**-.193****	**.7*****
5 T3 PA-CA	-0.15	0.156	*.009****	*-.019**	*.012****	*-.022***	*.024*	**-.301*****
6 T3 GHr	0.02	0.703	*-.029****	*.268****	*-.039****	*.363****	*-.033****	*.494*

Subjecitve Physical Health Covariance\Correlation Matrix

	M	*SD*	1	2	3	4	5	6
1 T1 PDPA	-0.15	0.148	*.022*	**-.275*****	**.504*****	**-.362*****	**.401*****	**-.19****
2 T1 SPHzr	0.01	1.131	*-.046****	*1.279*	**-.169***	**.552*****	**-.071**	**.531*****
3 T2 PDPA	-0.15	0.142	*.011****	*-.027**	*.02*	**-.270*****	**.544*****	**-.136**
4 T2 SPHzr	-0.01	1.232	*-.066****	*.769****	*-.047****	*1.518*	**-.138**	**.628*****
5 T3 PDPA	-0.15	0.156	*.009****	*-.013*	*.012****	*-.027*	*.024*	**-.034**
6 T3 SPHzr	0.00	1.323	*-0.037*	*0.795*	*-0.026*	*1.023*	-0.007	*1.75*

Subjective Functional Health Covariance\Correlation Matrix

	M	*SD*	1	2	3	4	5	6
1 T1 PDPA	-0.15	0.148	*.022*	**-.281*****	**.504*****	**-.298*****	**.401*****	**-.315*****
2 T1 SFHzr	-0.02	1.325	*-.055****	*1.756*	**-.146***	**.449*****	**-.142**	**.446*****
3 T2 PDPA	-0.15	0.142	*.011****	*-.027**	*.02*	**-.200****	**.544*****	**-.289*****
4 T2 SFHzr	0.00	1.319	*-.058****	*.784****	*-.037***	*1.74*	**-.137**	**.549*****
5 T3 PDPA	-0.15	0.156	*.009****	*-.029*	*.012****	*-.028*	*.024*	**-.248*****
6 T3 SFHzr	0.02	1.403	*-.065****	*.829****	*-.058****	*1.015****	*-.054****	*1.97*

Mental Health Covariance\Correlation Matrix

	M	*SD*	1	2	3	4	5	6
1 T1 PDPA	-0.15	0.148	*.022*	**-.134**	**.504*****	**-.177***	**.401*****	**-.202****
2 T1 MHr	0.08	7.878	*-.157*	*62.069*	**-.103**	**.557*****	**-.03**	**.558*****
3 T2 PDPA	-0.15	0.142	*.011****	*-.115*	*.02*	**-.174***	**.544*****	**-.226****
4 T2 MHr	0.22	8.605	*-.226**	*37.743****	*-.212**	*74.038*	**-.156***	**.609*****
5 T3 PDPA	-0.15	0.156	*.009****	*-.037*	*.012****	*-.21**	*.024*	**-.153***
6 T3 MHr	-0.14	8.138	*-.244***	*35.643****	*-.261***	*42.449****	*-.194**	*66.221*

Clinical Physical Health Covariance\Correlation Matrix

	M	*SD*	1	2	3	4
1 T1 PDPA	-0.15	0.185	*.022*	**-.173***	**.401*****	**-.205****
2 T1 CPHr	0.02	1.832	*-.048**	*3.372*	**-.080**	**.764*****
3 T3 PDPA	-0.15	0.158	*.009***	*-.023*	*.024*	**-.077**
4 T3 CPHr	0.06	1.941	*-.054***	*2.475****	*-.022*	*3.108*

PDPA = proportional discrepancy psychological age ([PA-CA]/CA); GHr = general health residual; SPHzr = subjective physical health z-score residual; SFHzr = subjective functional health z-score residual; MHr = mental health residual; CPHr = clinical physical health residual. Bottom half of matrix are covariances (italicized); top half of matrix are correlations (**bold**).

Table 5. *Multi-group invariance testing model fit by health dimension.*

Type of Health/Model	Invariance Model	χ2	df	Model Comparison	Δχ2	Δdf	p	Group Differences?
General Health	a) Configural (no constraints)	0	0	--	--	--	--	
	b) Constrain paths							
	1) Autoregressive only	13.845	6	vs. a	13.845	6	*	Yes
	2) Autoregressive & cross-lag	23.137	12	vs. b1	9.292	6	NS	No
	c) Constrain intercepts	43.511	18	vs. b2	20.374	6	***	Yes
	d) Constrain error variance	91.571	24	vs. c	48.06	6	***	Yes
	e) Complete invariance	96.7	27	vs. d	5.129	3	NS	No
Subj. Physical Health	a) Configural (no constraints)	0	0	--	--	--	--	--
	b) Constrain paths							
	1) Autoregressive only	14.43	6	vs. a	14.43	6	*	Yes
	2) Autoregressive & cross-lag	25.285	12	vs.b1	10.855	6	NS	No
	c) Constrain intercepts	45.044	18	vs. b2	19.759	6	***	Yes
	d) Constrain error variance	94.061	24	vs. c	49.017	6	***	Yes
	e) Constrain intra-wave correlations	98.146	27	vs. d	4.085	3	NS	No
Subj. Functional Health	a) Configural (no constraints)	0	0	--	--	--	--	--
	b) Constrain paths							
	1) Autoregressive only	11.112	6	vs. a	11.112	6	NS	No
	2) Autoregressive & cross-lag	30.369	12	vs.b1	19.257	6	***	Yes
	c) Constrain intercepts	50.45	18	vs. b2	20.081	6	***	Yes
	d) Constrain error variance	99.816	24	vs. c	49.366	6	***	Yes
	e) Constrain intra-wave correlations	102.68	27	vs. d	2.859	3	NS	No
Mental Health	a) Configural (no constraints)	0	0	--	--	--	--	--
	b) Constrain paths							
	1) Autoregressive only	13.953	6	vs. a	13.953	6	*	Yes
	2) Autoregressive & cross-lag	26.309	12	vs.b1	12.356	6	NS	No
	c) Constrain intercepts	45.912	18	vs. b2	19.603	6	***	Yes
	d) Constrain error variance	97.94	24	vs. c	52.028	6	***	Yes
	e) Constrain intra-wave correlations	98.156	27	vs. d	0.216	3	NS	No
Clinical Physical Health	a) Configural (no constraints)	0	0		--	--	--	--
	b) Constrain paths							
	1) Autoregressive only	9.455	2	vs. a	9.455	2	**	Yes
	2) Autoregressive & cross-lag	9.593	4	vs.b1	0.138	2	NS	No
	c)Constrain intercepts	28.172	8	vs. b2	18.579	4	***	Yes
	d) Constrain error variance	40.055	12	vs. c	11.883	4	**	Yes
	e) Constrain intra-wave correlations	40.834	14	vs. d	0.779	2	NS	No

Indicates whether the chi-square difference test was statistically significant. * = $p < .05$; ** = $p < .01$; *** = $p < .001$. Statistically significant results indicate group differences.

Table 6. Model fit and comparison statistics for under age 50 group.

Model	$\chi2$	*df*	Model Comparison	$\Delta\chi2$	Δdf	*p*	RMSEA	RSMEA 90% CI	CFI	TLI	Better fit?
General Health											
M1: Autoregressive only	16.333	6	--	--	--	*	.088	.038, .14	.971	.932	--
M2: Health → PA	.659	3	M1	15.674	3	***	0	0, .054	1	1.031	Yes
M3: PA → Health	15.607	3	M1	.726	3	NS	.137	.075, .207	.964	.833	No
M4: Reciprocal Paths	0	0	M1	16.333	6	*	0	0, 0	1	1	Yes
			M2	.659	3	NS					No
			M3	15.607	3	***					Yes
M5: Trimmed M2	1.704	5	M2	1.045	2	NS	0	0, .043	1	1.026	Yes
Alt M2: Health → PA	6.61	3	--	--	--	NS	.073	0, .15	.99	.951	No
Subjective Physical Health											
M1: Autoregressive only	6.694	6	--	--	--	NS	.023	0, .092	.997	.994	--
M2: Health → PA	.323	3	M1	6.371	3	NS	0	0, 0	1	1.046	Yes
M3: PA → Health	6.365	3	M1	.329	3	NS	.071	0, .148	.988	.943	No
M4: Reciprocal Paths	0	0	M1	6.694	6	NS	0	0, 0	1	1	No
			M2	.323	3	NS					No
			M3	6.365	3	NS					No
M5: Trimmed M2 (same as	6.694	6	M2	6.371	3	NS	.023	0, .092	.997	.994	No
Alt M2: Health → PA	5.298	3	**--**	**--**	**--**	**NS**	.058	0, .139	.992	.961	No
Subjective Functional Health											
M1: Autoregressive only	14.986	6	--	--	--	*	.082	.030, .135	.0962	.912	--
M2: Health → PA	3.347	3	M1	11.639	3	**	.023	0, .117	.999	.993	Yes
M3: PA → Health	11.693	3	M1	3.293	3	NS	.114	.050, .186	.963	.829	No
M4: Reciprical Paths	0	0	M1	14.986	6	*	0	0, 0	1	1	Yes
			M2	3.347	3	NS					No
			M3	11.693	3	**					Yes
M5: Trimmed M2	5.326	5	M2	1.979	2	NS	.017	0, .096	.999	.996	Yes
Alt M2: Health → PA	12.118	3	**--**	**--**	**--**	**	.116	.053, .188	.962	.821	No
Mental Health											
M1: Autoregressive only	17.327	6	--	--	--	**	.092	.043, .144	.950	.883	--
M2: Health → PA	2.651	3	M1	14.676	3	***	0	0, .108	1	1.007	Yes
M3: PA → Health	14.552	3	M1	.434	3	NS	.131	.069, .202	.949	.762	No
M4: Reciprical Paths	0	0	M1	14.986	6	*	0	0 ,0	1	1	Yes
			M2	3.347	3	NS					No
			M3	11.693	3	**					Yes
M5: Trimmed model	8.323	5	M2	5.672	2	NS	.054	0, .117	.985	.959	No
Alt M2: Health → PA	19.059	3	--	--	--	***	.155	.093, .224	.931	.679	No
Clinical Physical Health											
M1: Autoregressive only	1.072	2	--	--	--	NS	0	0, .110	1	1.008	--
M2: Health → PA	.121	1	M1	.0951	1	NS	0	0,.125	1	1.015	No
M3: PA → Health	.950	1	M1	.122	1	NS	0	0, .175	1	1.001	No
M4: Reciprocal Paths	2.651	0	M1	1.072	2	NS	0	0, 0	1	1	No
			M2	.121	1	NS					No
			M3	.950	1	NS					No
Alt M1: Autoregressive	1.976	2	**--**	**--**	**--**	NS	0	0, .132	1	1	No

Bold model signal best fitting models. * $p < .05$; ** $p < .01$; *** $p < .001$; NS = not statistically significant. A statistically significant model comparison indicates that the model fits the data better than the model it is being compared to. Better fit determined by the change in chi-square and by examining the alternative fit indices. See Appendices E and G for diagrams of each model.

Table 7. Model fit and comparison statistics for 50 and older age group.

Model	χ2	*df*	Model Comparison	Δχ2	Δ*df*	p	RMSEA	RSMEA 90% CI	CFI	TLI	Better fit?
General Health											
M1: Autoregressive only	24.037	6	--	--	--	***	.127	.077, .183	.951	.886	--
M2: Health → PA	11.317	3	M1	12.720	3	**	.122	.052, .202	.978	.895	Yes
M3: PA → Health	12.686	3	M1	11.351	3	**	.132	.063, .211	.974	.878	Yes
M4: Reciprocal Paths	0	0	M1	24.037	6	***	0	0, 0	1	1	Yes
			M2	11.317	3	*					Yes
			M3	12.686	3	**					Yes
M5: Trimmed M4	4.876	5	M4	4.876	5	NS	0	0, .101	1	1.001	Same
Alt M4: Reversed Paths	0	0	M4	0	0	NS	0	0, 0	1	1	Same
Subjective Physical Health											
M1: Autoregressive only	15.914	6	--	--	--	*	.095	.039, .152	.967	.924	--
M2: Health → PA	14.63	3	M1	1.284	3	NS	.145	.076, .223	.962	.822	No
M3: PA → Health	1.197	3	M1	14.717	3	*	0	0, .085	1	1.028	Yes
M4: Reciprical Paths	0	0	M1	15.914	6	*	0	0, 0	1	1	Yes
			M2	14.63	3	*					Yes
			M3	1.197	3	NS					No
M5: Trimmed M3	2.493	5	M3	1.296	2	NS	0	0, .068	1	1.023	Yes
Alt M3: PA → Health (Reversed paths)	18.503	3	--	--	--	***	.167	.099, .244	.951	0.773	No
Subjective Functional Health											
M1: Autoregressive only	16.747	6	--	--	--	*	.098	.044, .156	.957	.900	--
M2: Health → PA	16.455	3	M1	.292	3	NS	.156	.088, .233	.946	.750	Yes
M3: PA → Health	.258	3	M1	16.489	3	***	0	0, 0	1	1.051	Yes
M4: Reciprical Paths	0	0	M1	16.747	6	*	0	0, 0	1	1	Yes
			M2	16.455	3	*					
			M3	.258	3	NS					
M5: Trimmed M3	.893	4	M3	.635	1	*	0	0, .035	1	1.043	Yes
Alt M3: PA → Health (Reversed Paths)	18.025	3	--	--	--	***	.165	.097, .241	.941	.725	No
Mental Health											
M1: Autoregressive only	10.672	6	--	--	--	NS	.065	0, .127	.984	.963	--
M2: Health → PA	7.836	3	M1	2.836	3	NS	.093	.004, .176	.984	.924	No
M3: PA → Health	2.785	3	M1	7.887	3	*	0	0, .121	1	1.003	Yes
M4: Reciprical Paths	0	0	M1	10.672	6	NS	0	0 ,0	1	1	No
			M2	7.836	3	*					Yes
			M3	2.785	3	NS					No
M5: Trimmed M3	10.672	6	M3	2.836	2	NS	.065	0, .127	.984	.963	No
Alt M3: PA → Health (Reversed Paths)	7.703	3	--	--	--	NS	.092	0, .175	.984	.926	No
Clinical Physical Health											
M1: Autoregressive only	2.328	2	--	--	--	NS	.03	0, .152	.998	.996	--
M2: Health → PA	2.307	1	M1	.021	1	NS	.084	0,.233	.993	.965	No
M3: PA → Health	.023	1	M1	2.305	1	NS	0	0, .098	1	1.026	Yes
M4: Reciprocal Paths	0	0	M1	2.328	2	NS	0	0, 0	1	1	No
			M2	2.307	1	NS					No
			M3	.023	1	NS					No
M5: Trimmed M3	2.328	2	M3	2.305	1	NS	.03	0, .152	.998	.996	No
Alt M3: PA → Health (Reversed Paths)	6.644	1	--	--	--	**	.175	.068, .31	.97	.852	No

Bold model signal best fitting models. * $p < .05$; ** $p < .01$; *** $p < .001$; NS = not statistically significant. A statistically significant model comparison indicates that the model fits the data better than the model it is being compared to. Better fit determined by the change in chi-square and by examining the alternative fit indices. See Appendices E and G for diagrams of each model.

Table 8. *Unstandardized and standardized coefficients for under 50 age group (n = 224).*

	General Health		Sub. Physcial Health		Sub. Functional Health		Mental Health		Clin. Physical Health	
	b	β	*b*	β	*b*	β	*b*	β	*b*	β
Model 1: Autoregressive Only										
T1 PA to T2 PA	.347***	.340***	.346***	.339***	.357***	.348***	.340***	.333***	--	--
T1 PA to T3 PA	.219***	.256***	.219***	.256***	.217***	.254***	.220***	.258***	.326***	.381***
T2 PA to T3 PA	.305***	.365***	.308***	.369***	.309***	.371***	.309***	.369***	--	--
T1 Health to T2 Health	.628***	.595***	.524***	.528***	.489***	.470***	.432***	.409***	--	--
T1 Health to T3 Health	.326***	.327***	.247***	.275***	.299**	.301**	.201**	.190**	.898***	.847**
T2 Health to T3 Health	.426***	.451***	.382***	.422***	.315***	.330***	.430***	.429***	--	--
T1 PA with T1 Health	-.029**	-.207***	-.030*	-.148*	-.029*	-.139*	-.371***	-.232***	-.043	-.127
T2 PA with T2 Health	-.008	-.069	-.011	-.069	-.019	-.103	-.176	-.119	--	--
T3 PA with T3 Health	-.005	.047	-.006	-.058	-.003	-.026	-.045	-.043	-.002	-.016
Model 2: Health → PA										
T1 PA to T2 PA	.335***	.327***	.332***	.324***	.344***	.336***	.295***	289***	--	--
T1 PA to T3 PA	.196***	.230***	.212***	.248***	.200***	.234***	.202***	.237***	.319***	.373***
T2 PA to T3 PA	.287***	.344***	.296***	.355***	.295***	.354***	.281***	.336***	--	--
T1 Health to T2 Health	.631***	.597***	.530***	.532***	.498***	.477***	.455***	.426***	--	--
T1 Health to T3 Health	.328***	.325***	.248***	.274***	.304***	.305***	.204***	.191***	.898***	.847***
T2 Health to T3 Health	.438***	.459***	.387***	.427***	.315***	.330***	.434***	.434***	--	--
T1 PA with T1 Health	.029**	-.207***	.030*	-.148*	-.029*	-.139*	-.370***	-.232***	-.043	-.127
T2 PA with T2 Health	-.008	-.069	-.011	-.069	-.019	-.101	-.174	-.120	--	--
T3 PA with T3 Health	-.005	-.073	-.006	-.057	-.003	-.025	-.040	-.039	-.002	-.016
T1 Health to T2 PA	-.015	-.060	-.017	-.099	-.015	-.088	-.004**	-.192**	--	--
T1 Health to T3 PA	-.006	-.029	-.002	-.014	-.026**	-.184**	-.001	-.070	-.005	-.063
T2 Health to T3 PA	-.039**	-.202**	-.015	-.107	.002	.012	-.002	-.099	--	--
Model 3: PA → Health										
T1 PA to T2 PA	.349***	.341***	.349***	.341***	.349***	.341***	.349***	.341***	--	--
T1 PA to T3 PA	.219***	.256***	.219***	.256***	.219***	.256***	.219***	.256***	.326***	.381***
T2 PA to T3 PA	.308***	.368***	.308***	.368***	.308***	.368***	.308***	.368***	--	--
T1 Health to T2 Health	.625***	.592***	.520***	.523***	.500***	.480***	.413***	.390***	--	--
T1 Health to T3 Health	.323***	.324***	.249***	.277***	.296***	.297***	.219***	.206***	.896***	.846***
T2 Health to T3 Health	.423***	.488***	.383***	.423***	.326***	.340***	.438***	.436***	--	--
T1 PA with T1 Health	-.029**	-.207***	-.030*	-.148*	-.029*	-.139*	-.371***	-.232***	-.043	-.127
T2 PA with T2 Health	-.008	-.070	-.011	-.069	-.019	-.102	-.180	-.122	--	--
T3 PA with T3 Health	-.006	-.076	-.006	-.057	-.003	-.025	-.041	-.039	-.002	-.016
T1 PA to T2 Health	-.062	-.014	-.169	-.029	.473	.074	-3.831	-.077	--	--
T1 PA to T3 Health	.001	.000	.056	.010	-.343	-.056	2.366	.047	-.133	-.013
T2 PA to T3 Health	-.160	-.039	.041	.008	.430	.072	1.657	.034	--	--

Table 8, cont. *Unstandardized and standardized coefficients for under 50 age group (n = 224).*

	General Health		Sub. Physcial Health		Sub. Functional Health		Mental Health		Clin. Physical Health	
	b	β	*b*	β	*b*	β	*b*	β	*b*	β
Model 4: Reciprocal Paths (Saturated Model)										
T1 PA to T2 PA	.336***	.328***	.334***	.326***	.336***	.328***	.304***	.297***	--	--
T1 PA to T3 PA	.196***	.230***	.211***	.247***	.201***	.236***	.200***	.234***	.319***	.373***
T2 PA to T3 PA	.290***	.347***	.290***	.354***	.294***	.352***	.280***	.335***	--	--
T1 Health to T2 Health	.629***	.595***	.526***	.528***	.509***	.487***	.437***	.409***	--	--
T1 Health to T3 Health	.325***	.323***	.250***	.277***	.301***	.302***	.222***	.208***	.896***	.846***
T2 Health to T3 Health	.435***	.456***	.388***	.428***	.325***	.341***	.442***	.442***	--	--
T1 PA with T1 Health	-.029**	-.207***	-.029*	-.148*	-.029*	-.139*	-.370***	-.232***	-.043	-.127
T2 PA with T2 Health	-.008	-.069	-.008	-.069	-.019	-.101	-.173	-.120	--	--
T3 PA with T3 Health	-.005	-.073	-.005	-.057	-.003	-.025	-.040	-.039	-.002	-.016
T1 Health to T2 PA	-.015	-.060	-.017	-.099	-.015	-.089	-.004**	-.190**	--	--
T1 Health to T3 PA	-.006	-.028	-.002	-.014	-.026**	-.184**	-.001	-.070	-.005	-.062
T2 Health to T3 PA	-.039**	-.202**	-.015	-.107	.002	.012	-.002	-.099	--	--
T1 PA to T2 Health	-.059	-.013	-.164	-.028	.480	.075	-3.578	-.071	--	--
T1 PA to T3 Health	.008	.002	.058	.011	-.340	-.055	2.407	.048	-.132	-.013
T2 PA to T3 Health	-.154	-.038	.045	.009	.433	.072	1.720	.035	--	--

PDPA = proportional discrepancy psychological age ([FA-CA]/CA).
* = $p < .05$; ** = $p < .01$; *** = $p < .001$

Table 9. *Unstandardized and standardized coefficients for 50 and older age group (n = 185).*

	General Health		Sub. Physical Health		Sub. Functional Health		Mental Health		Clin. Physical Health	
	b	β	*b*	β	*b*	β	*b*	β	*b*	β
Model 1: Autoregressive Only										
T1 PA to T2 PA	.477***	.499***	.460***	.486***	.473***	.496***	.473***	.496***	--	--
T1 PA to T3 PA	.178*	.171*	.176*	.169*	.175*	.168*	.178*	.170*	.424***	.403***
T2 PA to T3 PA	.478***	.440***	.504***	456***	.490***	.448***	.502***	.457***	--	--
T1 Health to T2 Health	.659***	.640***	.597***	.550***	.446***	.448***	.606***	.556***	--	--
T1 Health to T3 Health	.151*	.154*	.309***	.256***	.261***	.247***	.330***	.320***	.734***	.764***
T2 Health to T3 Health	.570***	.596***	.515***	.480***	.466***	.438***	.407***	.431***	--	--
T1 PA with T1 Health	-.033***	-.314***	-.046***	-.273***	-.055***	-.281***	-.161	-.138	-.047*	-.174*
T2 PA with T2 Health	-.006	-.090	-.013	-.104	-.009	-.061	-.079	-.091	--	--
T3 PA with T3 Health	-.009	-.140	.005	.038	-.013	-.091	-.014	-.018	-.003	-.021
Model 2: Health → PA										
T1 PA to T2 PA	.410***	.429***	.449***	.474***	.470***	.494***	.467***	.490***	--	--
T1 PA to T3 PA	.185*	.179***	.197*	.188*	.168*	.161*	.176*	.169*	.422***	.401***
T2 PA to T3 PA	.486***	.448***	.510***	.460***	.490***	.448***	.495***	.452***	--	--
T1 Health to T2 Health	.676***	.649***	.602***	.552***	.447***	.449***	.610***	.558***	--	--
T1 Health to T3 Health	.142*	.143*	.311***	.266***	.265***	.250***	.329***	.319***	.734***	.764***
T2 Health to T3 Health	.578***	.607***	.516***	.481***	.464***	.436***	.408***	.432***	--	--
T1 PA with T1 Health	-.033***	-.314***	-.046***	-.273***	-.055***	-.281***	-.161	-.139	-.047*	-.174*
T2 PA with T2 Health	-.006	-.094	-.013	-.108	-.009	-.061	-.008	-.091	--	--
T3 PA with T3 Health	-.009	-.137	.004	.035	-.013	-.092	-.015	-.020	-.003	-.02
T1 Health to T2 PA	-.045***	-.224***	-.005	-.041	-.001	-.008	-.001	-.041	--	--
T1 Health to T3 PA	.019	.089	.005	.040	-.004	-.037	.002	.099	-.001	-.01
T2 Health to T3 PA	-.014	-.066	.004	.031	.002	.015	-.002	-.104	--	--
Model 3: PA → Health										
T1 PA to T2 PA	.482***	.504***	.482***	.504***	.482***	.504***	.482***	.504***	--	--
T1 PA to T3 PA	.179*	.170*	.179*	.170*	.179*	.170*	.179*	.170*	.422***	.401***
T2 PA to T3 PA	.505***	.459***	.505***	.459***	.505***	.459***	.505***	.459***	--	--
T1 Health to T2 Health	.637***	.619***	.530***	.487***	.394***	.396***	.590***	.541***	--	--
T1 Health to T3 Health	.103	.106	.317***	.271***	.240***	.226***	.327***	.317***	.722***	.752***
T2 Health to T3 Health	.547***	.580***	.539***	.502***	.428***	.402***	.386***	.409***	--	--
T1 PA with T1 Health	-.033***	-.314***	-.046***	-.273***	-.055***	-.281***	-.160	-.138	-.047*	-.174*
T2 PA with T2 Health	-.007	-.097	-.013	-.104	-.008	-.060	-.079	-.091	--	--
T3 PA with T3 Health	-.008	-.133	.004	.035	-.013	-.090	-.015	-.019	-.003	-.02
T1 PA to T2 Health	-.321	-.065	-1.906***	-.230***	-1.633**	-.187**	-6.263	-.108	--	--
T1 PA to T3 Health	.076	-.016	.509	.057	-.527	-.056	-1.725	-.032	-.876	-.074
T2 PA to T3 Health	-.831**	-.171**	.164	.018	-1.452*	-.147*	-5.926	-.104	--	--

Table 9, cont. *Unstandardized and standardized coefficients for 50 and older age group (n = 185).*

	General Health		Sub. Physical Health		Sub. Functional Health		Mental Health		Clin. Physical Health	
	b	β	*b*	β	*b*	β	*b*	β	*b*	β
Model 4: Reciprocal Paths (Saturated Model)										
T1 PA to T2 PA	.416***	.434***	.474***	.495***	.481***	.502***	.474***	.495***	--	--
T1 PA to T3 PA	.188*	.179*	.199**	.189**	.174*	.165*	.199**	.189**	.42***	.399***
T2 PA to T3 PA	.516***	.470***	.510***	.465***	.506***	.460***	.510***	.465***	--	--
T1 Health to T2 Health	.657***	.631***	.534***	490***	.394***	.396***	.534***	490***	--	--
T1 Health to T3 Health	.093	.094	.318***	.272***	.243***	.229***	.318***	.272***	.721***	.752***
T2 Health to T3 Health	.554***	.582***	.540***	.503***	.426***	.400***	.540***	.503***	--	--
T1 PA with T1 Health	-.033***	-.314***	-.046***	-.273***	-.055***	-.281***	-.046***	-.273***	-.047*	-.174*
T2 PA with T2 Health	-.006	-.094	-.013	-.104	-.008	-.060	-.013	-.104	--	--
T3 PA with T3 Health	-.008	-.133	.004	.035	-.013	-.090	.004	.035	-.003	-.02
T1 Health to T2 PA	-.044***	-.222***	-.004	-.033	-.001	-.005	.005	.033	--	--
T1 Health to T3 PA	.021	.095	.005	.040	-.004	-.034	.004	.040	-.001	-.01
T2 Health to T3 PA	-.013	-.061	.004	.032	.002	.018	.166	.032	--	--
T1 PA to T2 Health	-.292	-.059	-1.899***	-.228***	-1.622**	-.187**	-1.899***	-.228	--	--
T1 PA to T3 Health	-.080	-.017	.514	.058	-.523	-.055	.514	.058	-.876	-.074
T2 PA to T3 Health	-.837**	-.169**	.166	.018	-1.453*	-.147*	.166	.018	--	--

PDPA = proportional discrepancy psychological age ([FA-CA]/CA).
* = $p < .05$; ** = $p < .01$; *** = $p < .001$

Table 10. *Heirarchal regression results for analyses exploring the proportion of variance in T3 PDPA(DV) explained by past PDPA and by past and present health (IVs).*

	Under 50			50 and over		
	R^2	Δ*R*^2	*p*	*R*^2	Δ*R*^2	*p*
Analysis 1						
Step 1: enter T1 & T2 PDPA	.269	.269	< .001	.323	.323	< .001
Step 2: enter all T1 health	.312	.043	< .05	.333	.01	NS
Step 3: enter all T2 health	.339	.027	NS	.343	.009	NS
Step 4: enter all T3 health	.342	.004	NS	.374	.032	NS
Analysis 2						
Step 1: enter all T1 health	.121	.121	< .001	.043	.043	NS
Step 2: enter all T2 health	.164	.043	< .05	.079	.037	NS
Step 3: enter all T3 health	.175	.011	NS	.184	.105	< .001
Step 4: enter T1 & T2 PDPA	.342	.168	< .001	.374	.19	< .001

Notes: PDPA = proportional discrepancy of psychological and chronological age ([PA-CA]/CA). T1, T2, and T3 health each included subjective measures of general, physical, functional, and mental health. T1 and T3 also include clinical physical health measures.

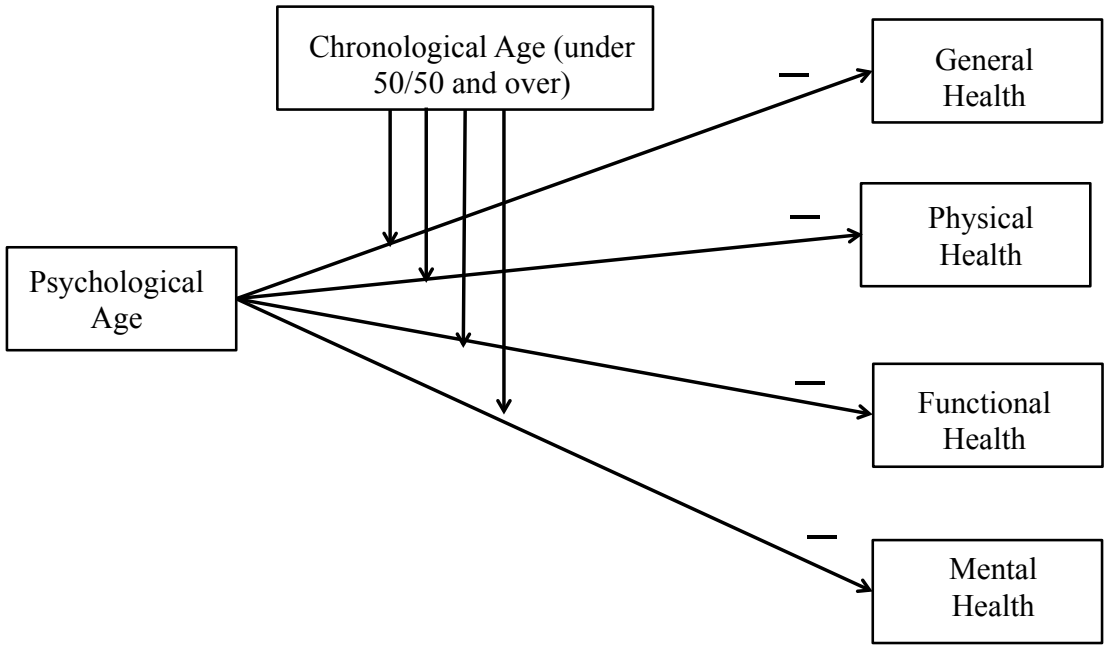
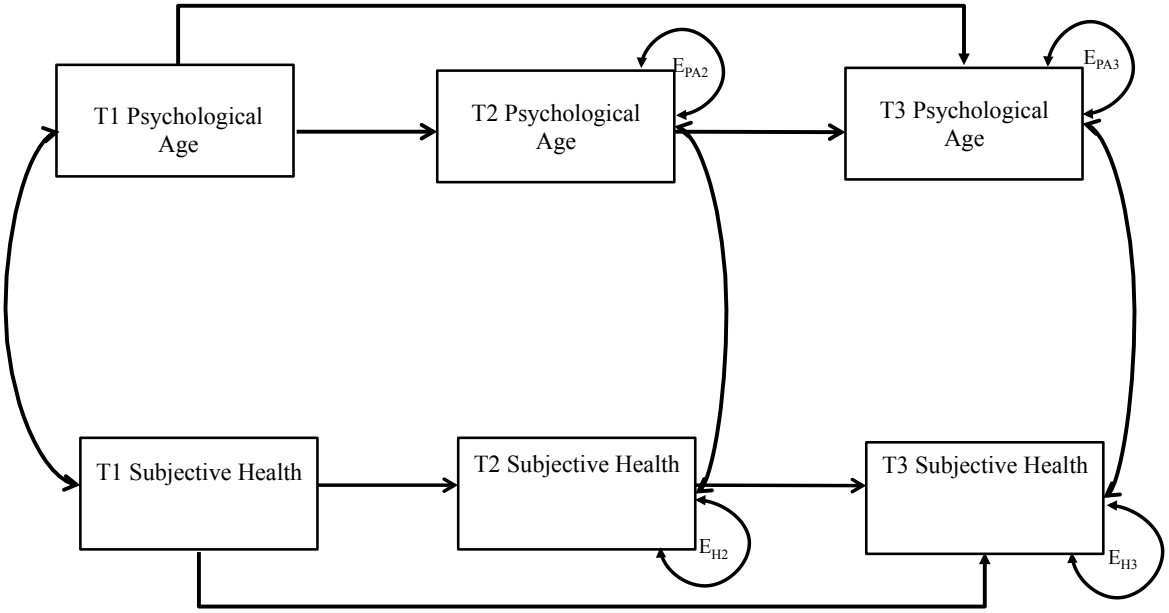


Figure 1. Conceptual model for proposed study. Psychological age was expected to predict four facets of health outcomes: General health, physical health, functional health, and mental health. Each health facet was subjectively assessed through self-report. Chronological age was expected to moderate the relationship between psychological age and health.

(a) Subjective health



(b) Clinical health

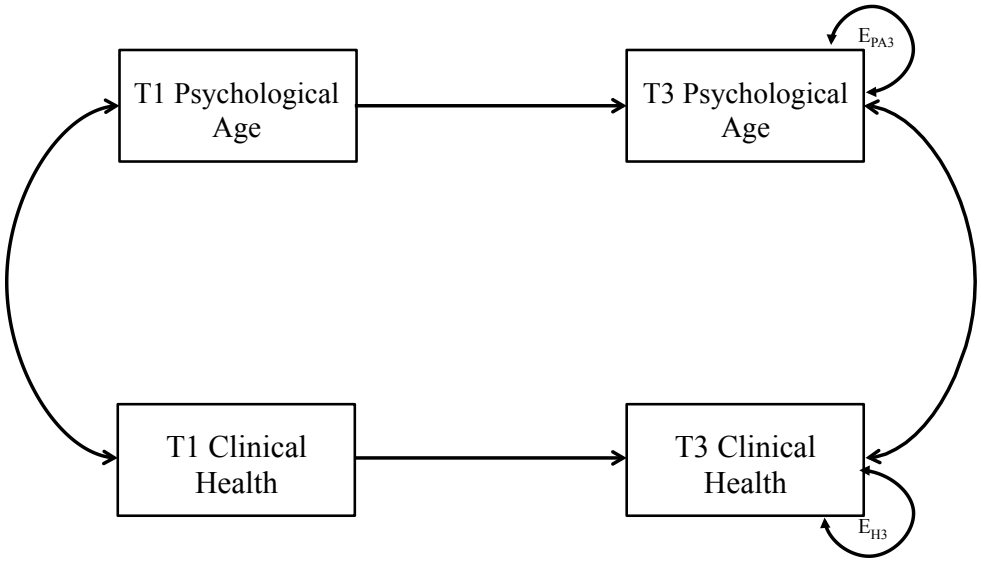
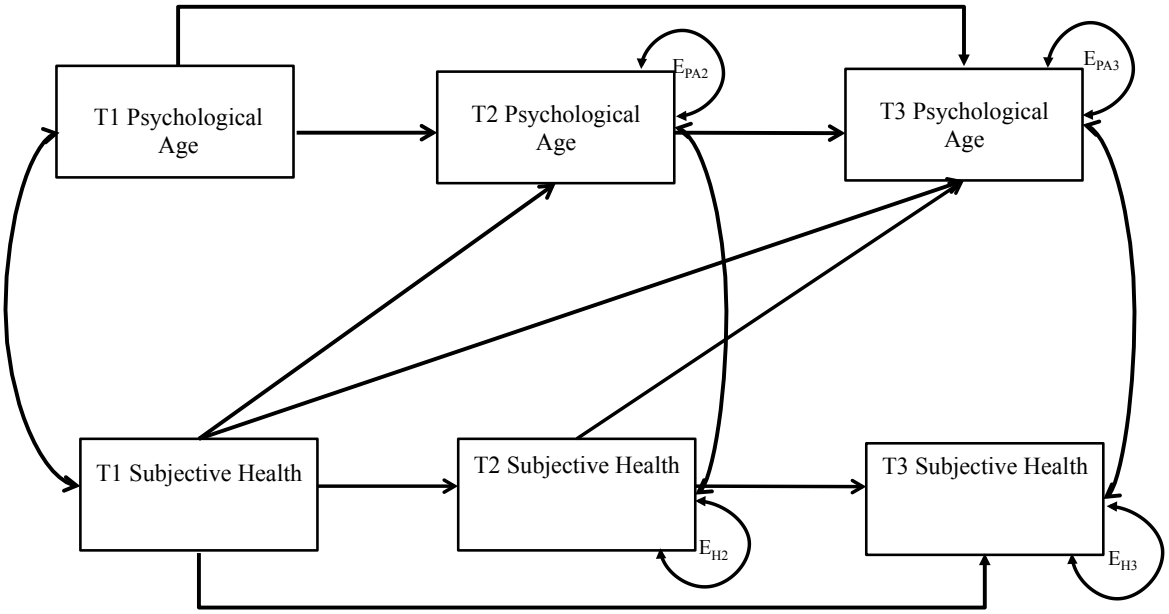


Figure 2. Model 1: Null model; autoregressive paths only.

(a) Subjective health



(b) Clinical health

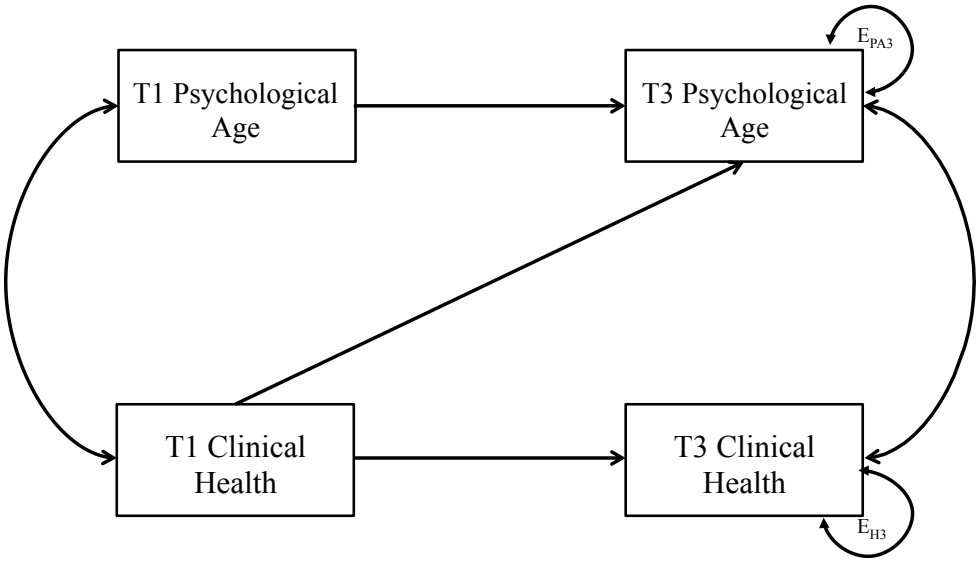
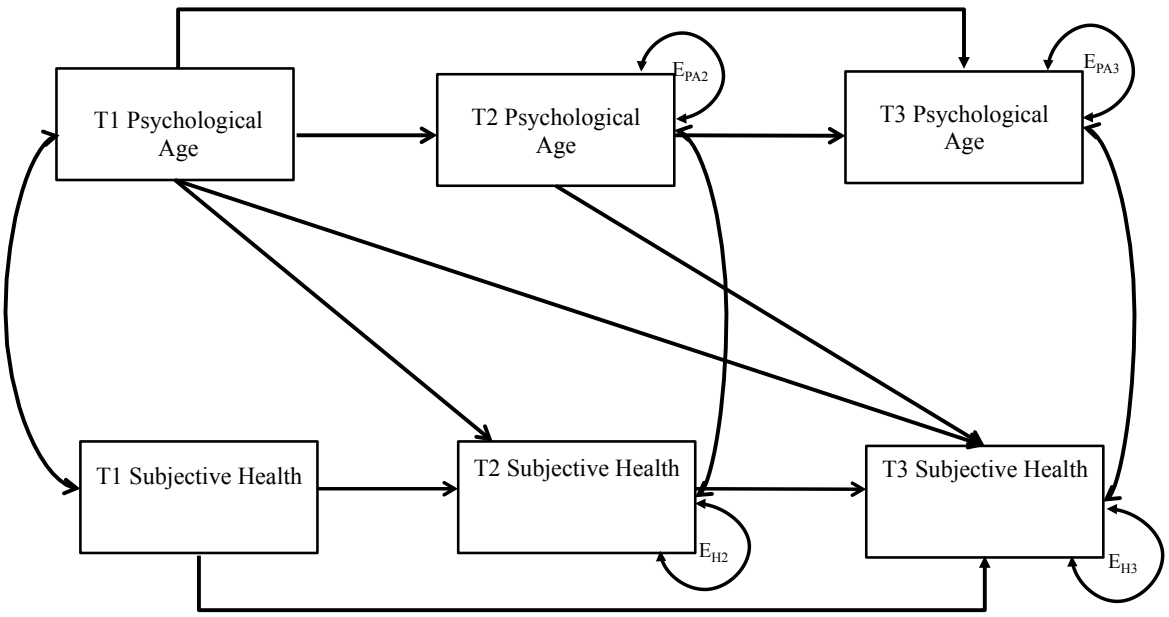


Figure 3. Model 2: Cross-lagged paths from health to psychological age in addition to the autoregressive paths.

(a) Subjective health



(b) Clinical health

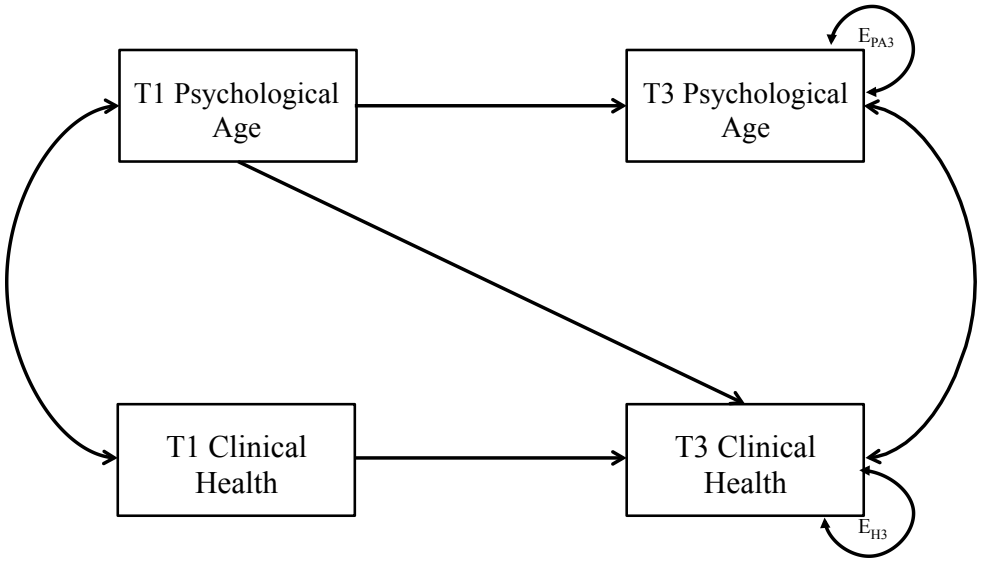
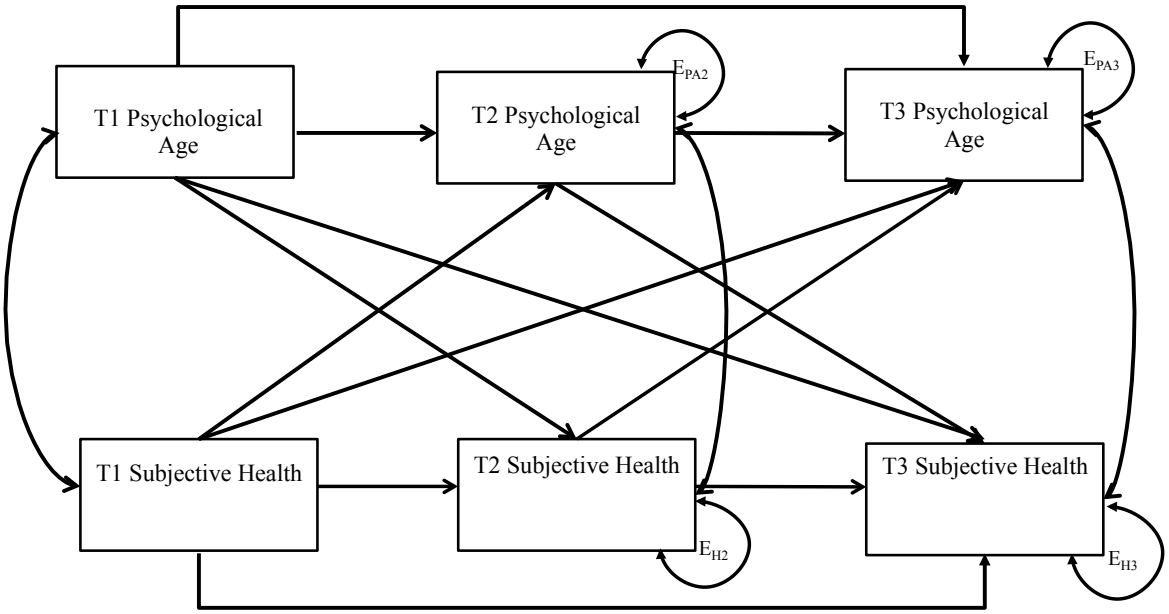


Figure 4. Model 3: Hypothesized model; cross-lagged paths from psychological age to health as well as autoregressive paths.

(a) Subjective health



(b) Clinical health

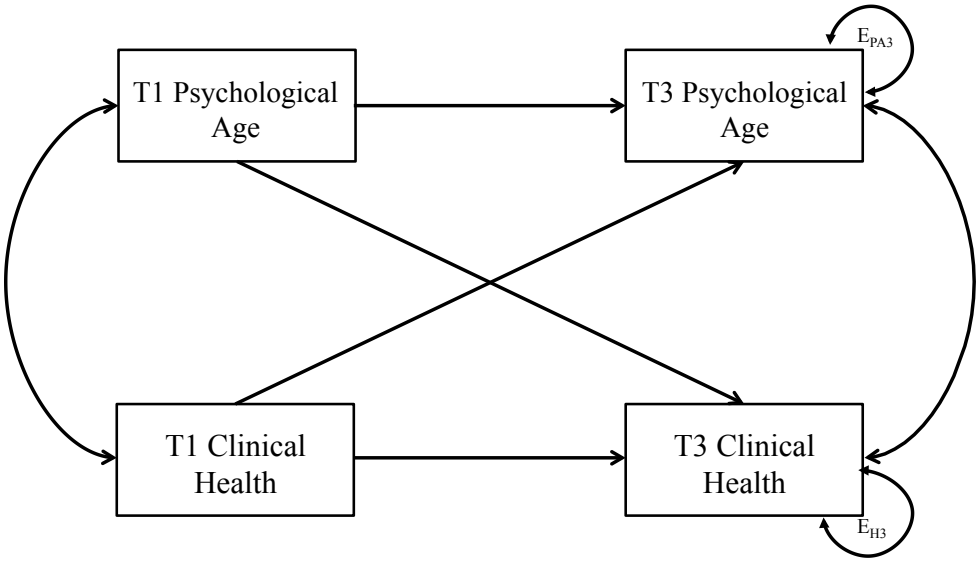
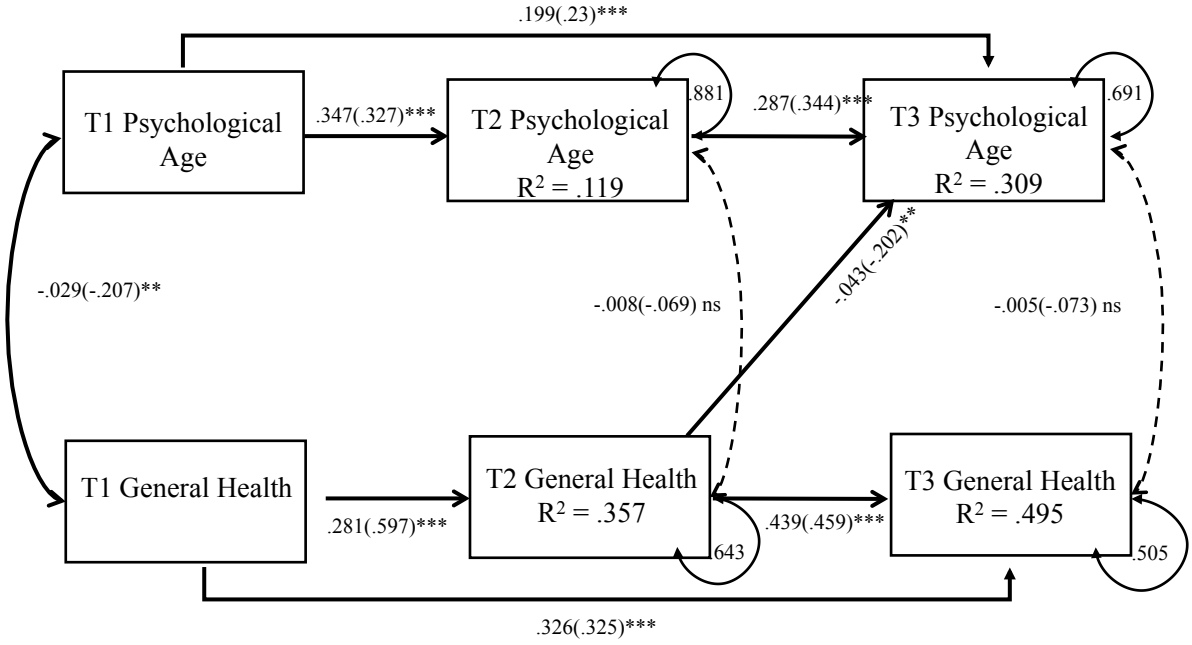


Figure 5. Model 4: Reciprocal relationship; cross-lagged panel paths from psychological age to health, and health to psychological age, as well as the autoregressive paths.

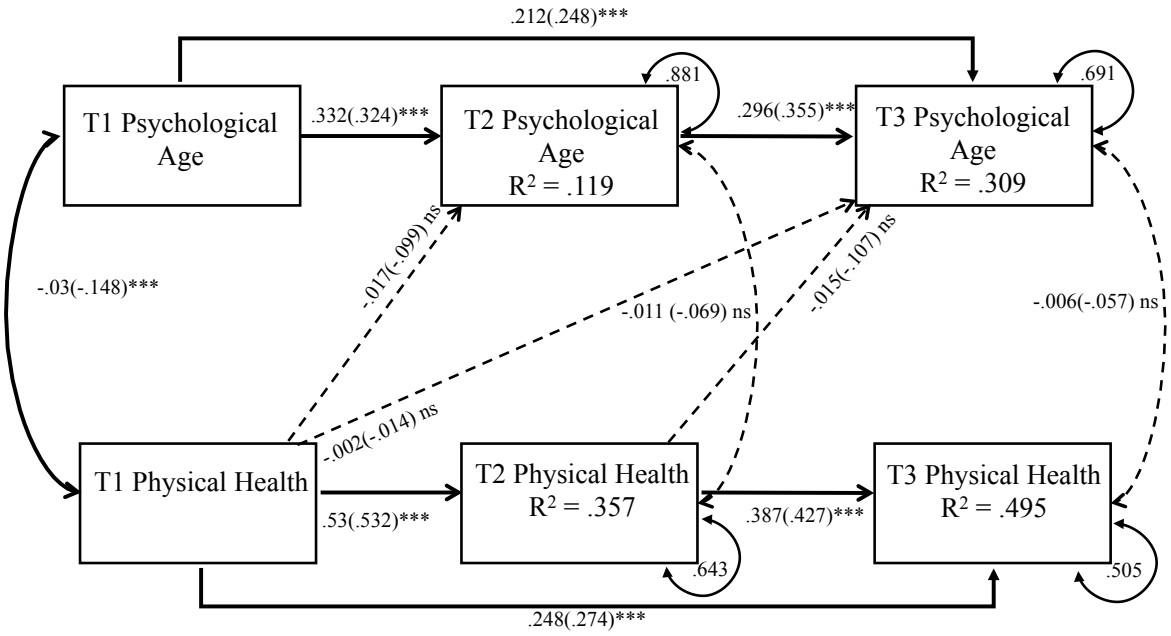
Under 50 General Health M5: Trimmed General Health → Psychological Age



Model fit: $\chi^2(5) = 1.704$; RMSEA = .0, 90% CI: [.000, .043]; CFI = .1; TFI = .1.026

Figure 6. General health final model (M5) for under age 50 group. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). Unstandardized (standardized) parameter estimates provided. Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Under 50 Subjective Physical Health M2: Physical Health → Psychological Age



Model fit: $\chi^2(3) = .323$; RMSEA = .0, 90% CI: [.000, .000]; CFI = 1.000; TFI = 1.046

Figure 7. Subjective physical health final model (M2) for under age 50 group. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). Unstandardized (standardized) parameter estimates provided. Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

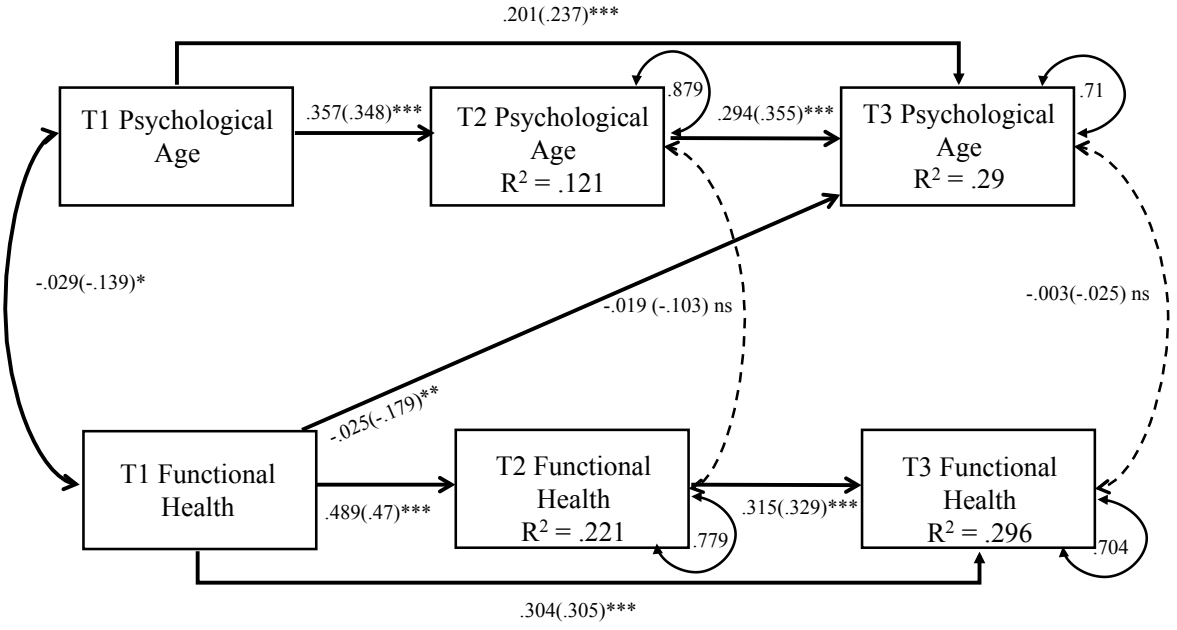
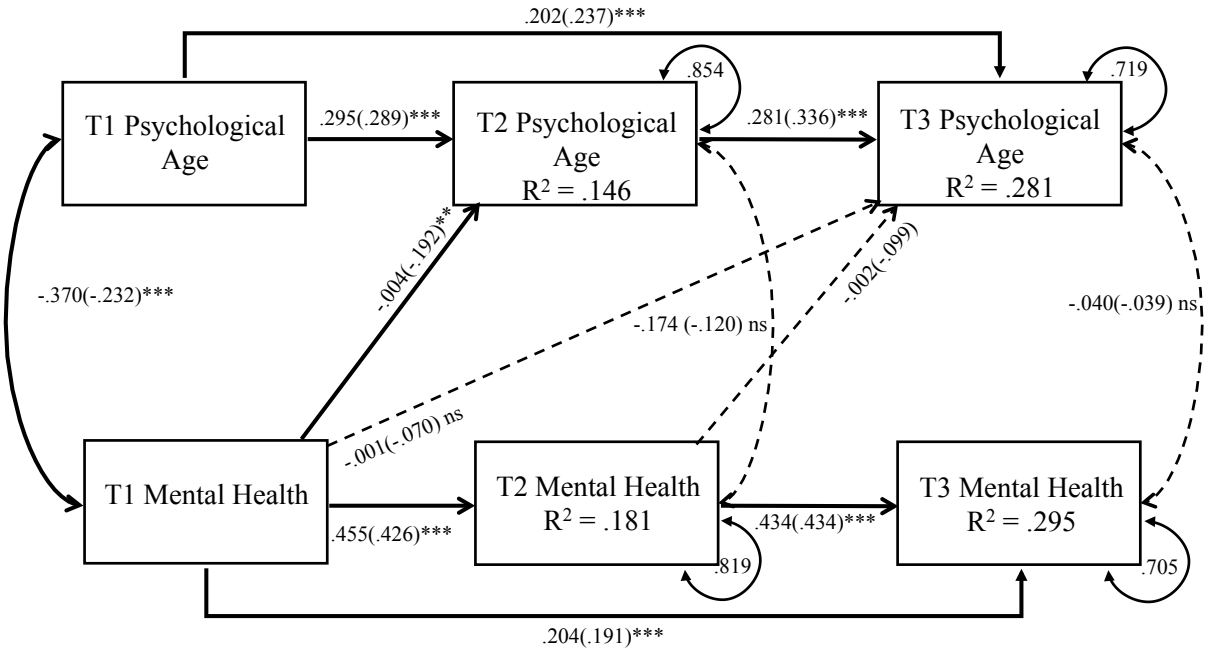


Figure 8. Subjective function health final model (M5) for under age 50 group. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). Unstandardized (standardized) parameter estimates provided. Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

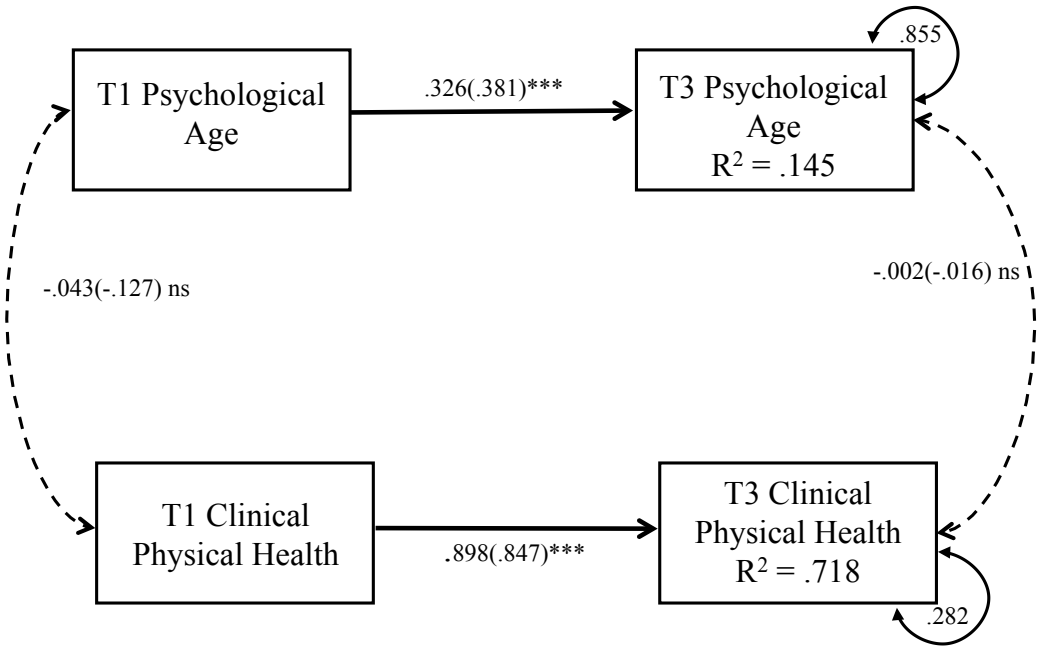
Under 50 Mental Health M2: Mental Health → Psychological Age



Model fit: $\chi^2(3) = 2.651$; RMSEA = .000, 90% CI: [.000, .108]; CFI = 1.00; TFI = 1.007

Figure 9. Mental health final model (M2) for under age 50 group. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). Unstandardized (standardized) parameter estimates provided. Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

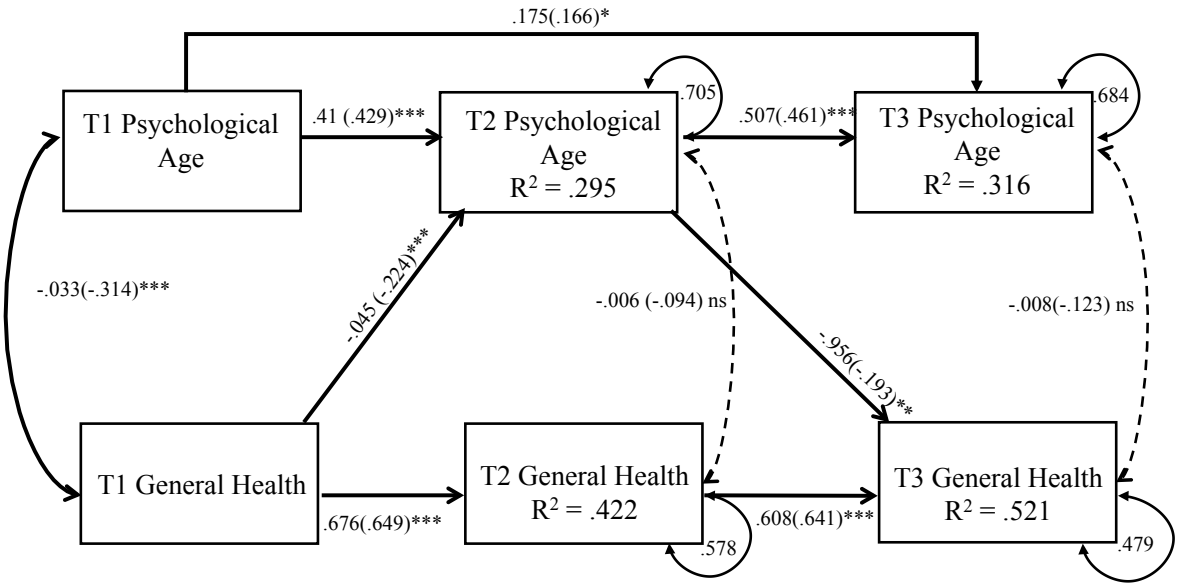
Under 50 Clinical Physical Health M1: Autoregressive Only



Model fit: $\chi^2(2)$ 1.072; RMSEA = .000, 90% CI: [.000, .110]; CFI = 1.00; TFI = 1.008

Figure 10. Clinical physical health final model (M1) for under age 50 group. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). Unstandardized (standardized) parameter estimates provided. Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

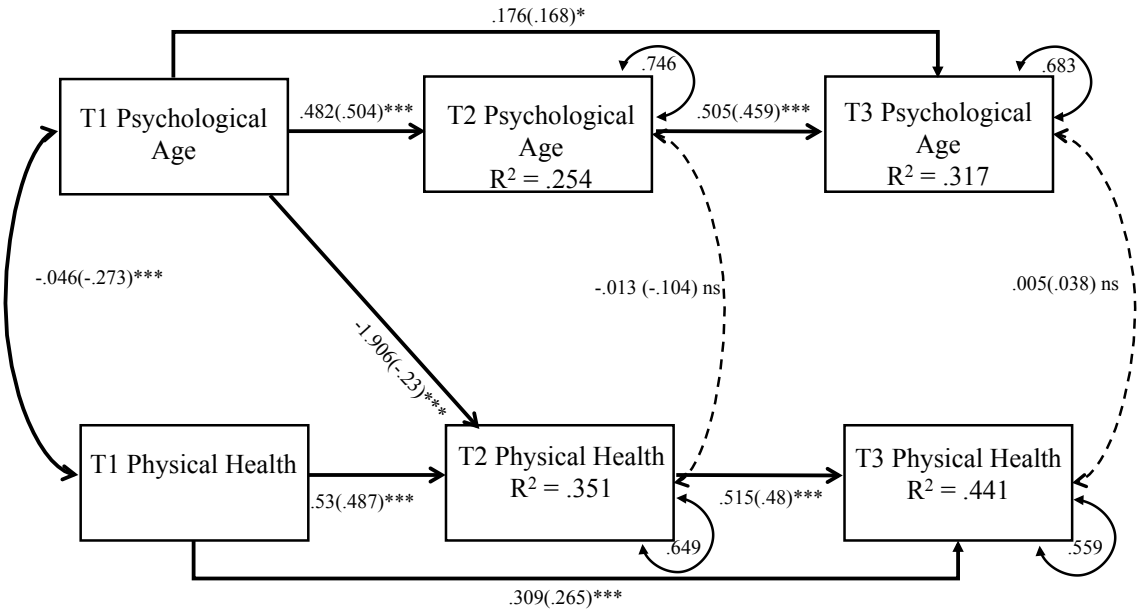
50 and Over General Health M5: Trimmed Reciprocal Relationship



Model fit: $\chi^2(5) = 4.876$; RMSEA = 0.0, 90% CI: [.000, .101]; CFI = 1.00; TFI = 1.001

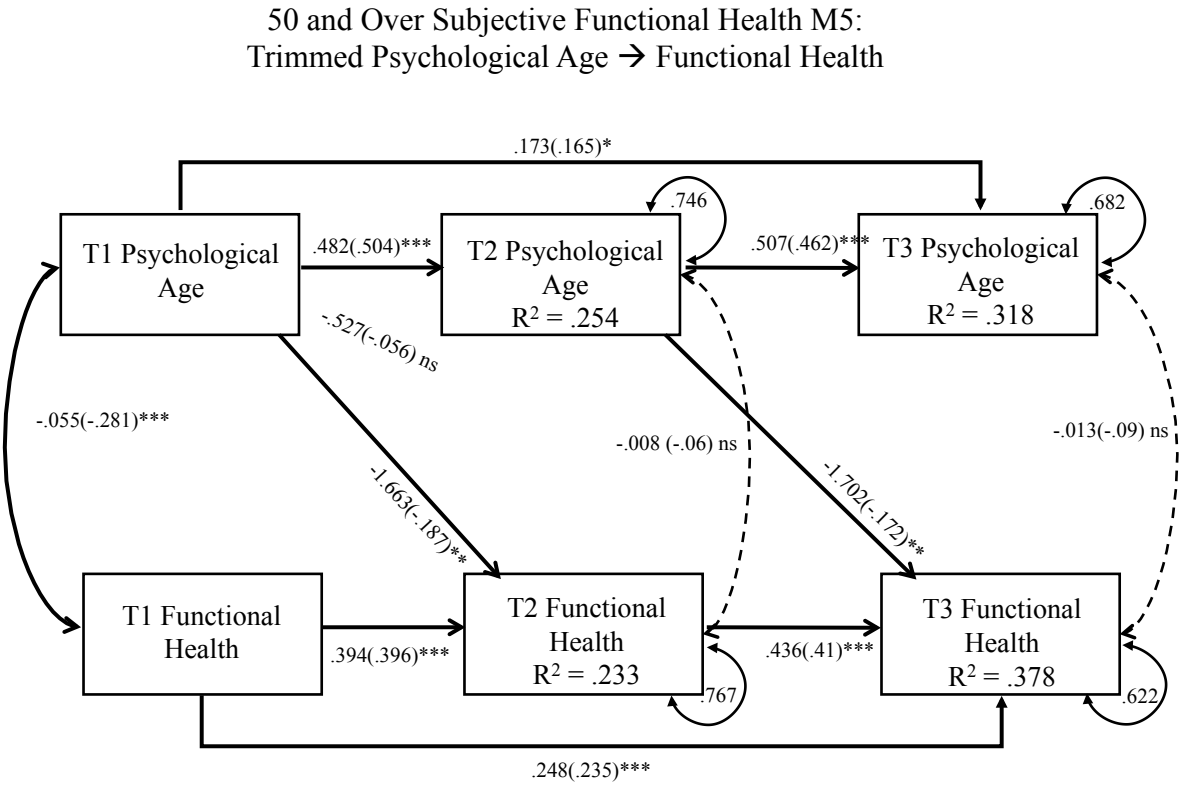
Figure 11. General health final model (M5) for 50 and older age group. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). Unstandardized (standardized) parameter estimates provided. Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

50 and Over Subjective Physical Health M5: Trimmed M3 - Psychological Age → Physical Health



Model fit: $\chi^2(5) = 2.493$; RMSEA = .000, 90% CI: [.000, .068]; CFI = 1.000; TFI = 1.023

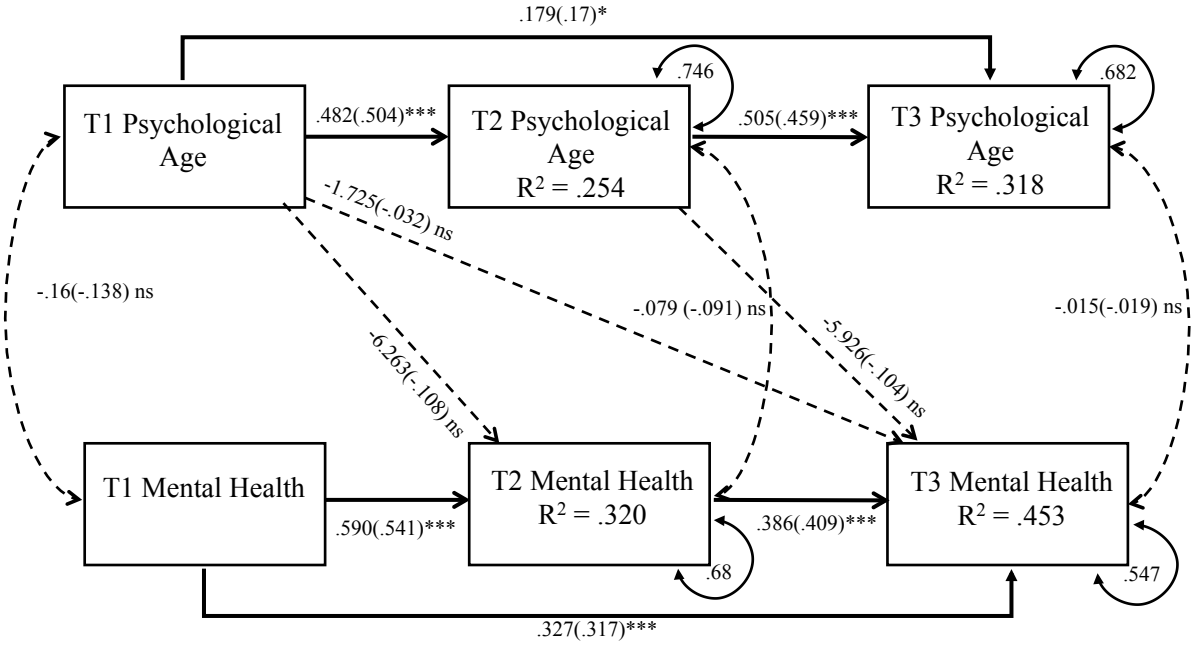
Figure 12. Subjective physical health final model (M5) for 50 and older age group. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). Unstandardized (standardized) parameter estimates provided. Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.



Model fit: $\chi^2(4) = .893$; RMSEA = .000, 90% CI: [.000, .035]; CFI = 1.000; TFI = 1.043

Figure 13. Subjective functional health final model (M5) for 50 and older age group. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). Unstandardized (standardized) parameter estimates provided. Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

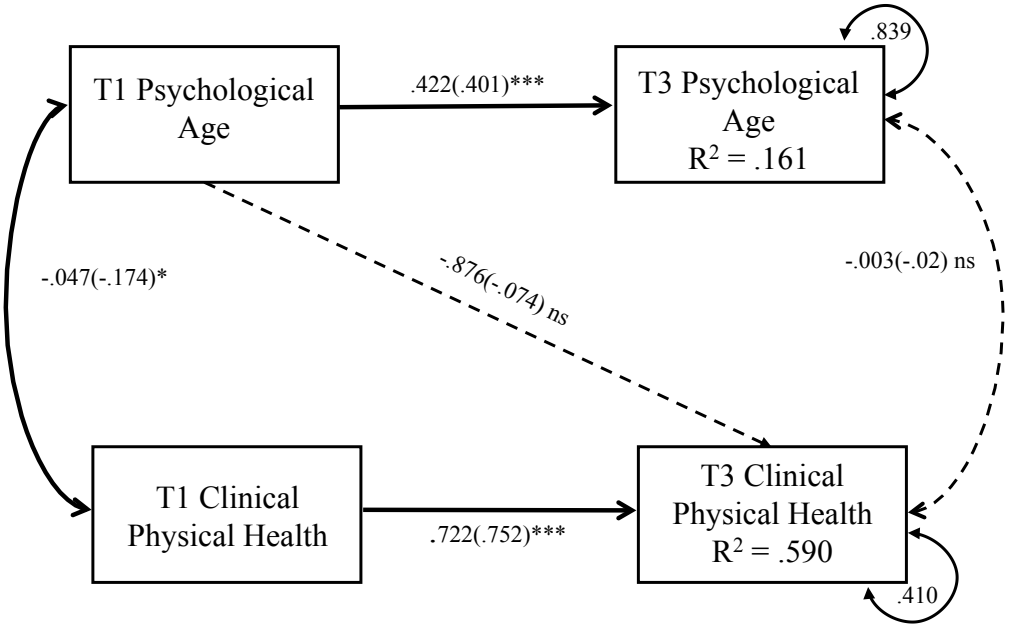
50 and Over Mental Health M3: Psychological Age → Mental Health



Model fit: $\chi^2(3) = 2.785$; RMSEA = .000, 90% CI: [.000, .121]; CFI = 1.000; TFI = 1.003

Figure 14. Mental health final model (M3) for 50 and older age group. Unstandardized (standardized) parameter estimates provided. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

50 and Over Clinical Physical Health M3: PA → Health



Model fit: $\chi^2(1)$ .023; RMSEA = .000, 90% CI: [.000, .098]; CFI = 1.00; TFI = 1.026

Figure 15. Clinical physical health final model (M3) for 50 and older age group. Unstandardized (standardized) parameter estimates provided. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Appendix A

Survey Items

Subjective Health Items

General Health Measures
(Ware, Kosinski, & Keller, 1998).

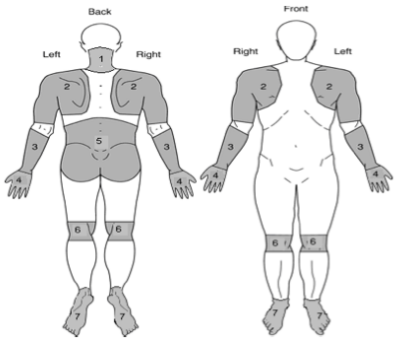
A. In general, would you say your health is… (Poor, Fair, Good, Very Good, Excellent).

Physical Health Measures
Serious Injury (Miranda, Punnett, Gore, & Boyer, 2011)

A. In the past 12 months, have you had any serious injury to any of these body parts? This includes injury from any causes (sports, workplace accidents, assault, etc.). Please choose all that apply (Yes or No).
    a. No injury/NA
    b. Low back
    c. Shoulder
    d. Wrist or forearm
    e. Knee
    f. Foot
    g. Neck
    h. Hands

Pain/Limited Motion (Miranda, Punnett, & Gore, 2014).

A. During the past 3 months, how much pain, aching or stiffness/limited motion have you had in the areas shown on the diagram below? (None, Mild, Moderate, Severe, or Extreme.)
    a. Neck (Area 1)
    b. Shoulder (Area 2)
    c. Wrist or forearm (Area 3)
    d. Hands (Area 4)
    e. Low back (Area 5)
    f. Knee (Area 6)
    g. Foot (Area 7)



Arthritis

A. Has a doctor or other health provider told you that you currently have arthritis or joint pain, and is it currently being treated with medication? (No; Yes, not being treated; or Yes, being treated.)

Vision

A. Do you have trouble seeing, even when wearing glasses or contact lenses (Yes or No)?

Hearing

A. Which statement best describes your hearing (without a hearing aid)? (Good, A little trouble, A lot of trouble, or Deaf.)

Functional Health Measures

SF-12 Items (Used to generate both the PCS and MCS)

A. In general, would you say your health is (Poor, Fair, Good, Very good, or Excellent).
B. The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much (Not limited at all, Limited a little, or Limited a lot)?
    a. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing gold.
    b. Climbing several flights of stairs.
C. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health (Yes or No)?
    a. Accomplished less than you would like.
    b. Were limited in the kind of work or other activities you could do.
D. During the past 4 weeks, how much did pain interfere with your normal work, including both work outside the home and housework (Not at all, Slightly, Moderately, Quite a bit, or Extremely).
E. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activity as a result of any emotional problems (such as feeling depressed or anxious) (Yes or No)?
    a. Accomplished less than you would like.
    b. Didn't do work or other activities as carefully as usual.
F. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.) (None of the time, A little of the time, Some of the time, Most of the time, or All of the time)?
G. How much time during the past 4 weeks… (All of the time, Most of the time, A good bit of the time, Some of the time, A little of the time, or None of the time)
    a. Have you felt calm and peaceful?
    b. Did you have a lot of energy?
    c. Have you felt downhearted and blue?

Activity Limitation (Ware & Sherbourne, 1992).

A. Does your health now limit you in vigorous activities? If so, how much? (Not at all limited, Limited a little, Limited a lot.)

Work and Sleep Limitation (Miranda, Punnett, & Gore, 2014).

A. During the past week, were you limited in your work or other regular activities as a result of any… (Not limited at all, Slightly limited, Moderately limited, Severely limited, or Unable to work or do regular activities)
    a. Back problem?
    b. Knee problem?
    c. Hand, arm, or shoulder problem?

B. During the past week, have you had difficulty sleeping because of any… (No difficulty, Mild difficulty, Moderate difficulty, Severe difficulty, or So much difficulty that I can't sleep)
    a. Back problem?
    b. Knee problem?
    c. Hand, arm, or shoulder problem?

Seeing and Hearing Limitation (Lerner, Amick, Rogers, Malspeis, Bungay, & Cynn, 2001)

A. In the past 4 weeks, how often did you have difficulty at work with the following (None of the time, Slight bit of the time, Half of the time, Most of the time, or All of the time)?
    a. See your work or read clearly.
    b. Hear clearly what other people are saying.

Mental Health

See the SF-12 items listed under Subjective Functional Health, above.

Demographic and Control Variables

A. Marital Status
    a. What is your current marital status? (Married or live with partner; widowed; divorced or separated; single, never married)
B. Income
    a. Which range best describes your total family income (combination of salaries, wages, investments, and rents)? ($10,000-$24,999; $25,000-$49,999; $50,000-$74,999; $75,000-$99,999; > $100,000)

Appendix B

Clinically Assessed Physical Health Measurement

Blood pressure hypertension indication category ranges (Pickering et al., 2005).

Hypertension Indication	Systolic Blood Pressure	Diastolic Blood Pressure
Normal (no hypertension)	120 or lower	80 or lower
Pre-hypertension	121-139	80-89
Stage 1 hypertension	140-159	90-99
Stage 2 hypertension	160-179	100-109
Hypertensive Crisis	180 or higher	110 or higher

Body Mass Index (BMI) categorization (CDC, 2011).

BMI	Weight Status
Below 18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight
30.0 and Above	Obese

Appendix C

Clinically Assessed Functional Health Measurements

Hand function was determined by measuring handgrip strength using a JAMAR 5030 J1 Hand Dynamometer. With arms positioned so that the elbow was near, but not touching, the waist and forearm extended forward to 90°, participants' were told to squeeze the dynamometer as hard a possible for 3 to 5 seconds. The maximum value to the nearest kilogram was recorded.

Shoulder function included one item each for power (i.e., torque) and fatigue (described below).

Neck function measured flexibility and was determined through a series of tests using a cervical range of motion inclinometer (CROM). The participant was seated in a straight back chair, then range of motion in degrees were recorded for active cervical flexion, extension, left and right lateral flexion, and left and right rotation. Larger values indicate greater range of motion (Youdas, Garrett, Suman, Bogard, Hallman, & Carey, 1992).

Trunk function was ascertained through measures of power and torque (described below) and flexibility. Flexibility of the spine was assessed by having participants stand on a 23 cm high pedestal and then bend forward at the waist while reaching their fingers towards their toes; the vertical distance from the middle finger to the floor was recorded. This process was repeated three times. The height of the pedestal was subtracted from the third trail value; this number represented the distance in centimeters the fingertip was from the ground, with lower numbers indicating greater flexibility. These values were trichotomized, so that a negative number equates to fingers extending beyond the toes, zero meaning the fingers reached the toes, but not beyond, and a positive number indicating that the fingers did not reach the toes.

Leg function included a single item indicating strength. This was measured with a Keiser K400 V3.14 Leg Press Machine according to standard procedures specified by Bean et al. (2002). From a seated position with knees bent at 90° to 95°, participants engaged in a series of leg presses beginning with 50% of the person's body mass, with resistance increased incrementally by 10% intervals until full leg extension was not possible. The maximum value was recorded.

How power and fatigue were measured. Isokinetic strength, which concerns the strength of muscles in motion against resistance (Spencer-Wimpenny, 2011), evaluated using a Cybex 6000 Norm. Each participant was measured for shoulder and trunk. The participant stood on the Trunk Modular Component or sat on the machine's chair and was secured with waist or shoulder belts according the to the test being performed. From the anatomical point of origin, defined by test as standing upright (trunk) or sitting holding the horizontal bar at waist height (shoulder). Participants' were given four practice trials with no resistance to become familiar with each test movement. This was followed by a succession of 15 test for each body area with resistance set at 60° per second. Verbal encouragement (e.g., "You are doing great!") was given throughout the testing. Peak torque and a fatigue index were recorded from each set of test.

Appendis D

Diagnosis of Missingness*

Variable	# (% Missing)	Notes
General Health (also part of SF-12)		
T2_Health1	1 (.2)	
Subjective Physical Health		
T1 Arthritis	3 (.7)	2 replaced – 1 missing more than 1x
T2 Arthritis	2 (.5)	1 replaced – 1 missing more than 1x
T3 Arthritis	2 (.5)	Both missing more than 1x
T1 Hearing	1 (.2)	--
Subjective Functional Health		
SF-12 Items		
T1 Activity 2	5 (1.2)	--
T2 Activity 2	7 (1.7)	--
T3 Activity 2	2 (.5)	--
T1 Activity 3	8 (2)	--
T2 Activity 3	6 (1.5)	--
T3 Activity 3	1 (.2)	--
T2 Physical 1	5 (1.2)	--
T3 Physical 1	1 (.2)	Missing more than 1x
T1 Physical 2	1 (.2)	No replacement – missing more than 1x
T2 Physical 2	7 (1.7)	--
T3 Physical 2	1 (.2)	--
T1 Emotion 1	1 (.2)	--
T2 Emotion 1	5 (1.2)	--
T1 Emotion 2	2 (.5)	--
T2 Emotion 2	8 (2)	--
T3 Emotion 2	1 (.2)	--
T2 Pain	2 (.5)	--
T3 Pain	1 (.2)	--
T1 Feel 1	1 (.2)	--
T2 Feel 1	1 (.2)	--
T1 Feel 2	3 (.7)	--
T2 Feel 2	9 (2.2)	3 replaced – 1 missing more than 1x
T3 Feel 2	2 (.5)	--
T1 Feel 3	3 (.7)	2 replaced – 1 missing more than 1x
T2 Feel 3	4 (1)	--
T3 Feel 3	2 (.5)	--
T1 Social	1 (.2)	--
T2 Social	3 (.7)	--
Sleep Limitation Items		
T1 Sleep 1	1 (.2)	--
T2 Sleep 1	5 (1.2)	--
T1 Sleep 2	2 (.5)	--
T2 Sleep 2	18 (4.4)	--
T1 Sleep 3	1 (.2)	--
T2 Sleep 3	4 (1)	--
T3 Sleep 3	1 (.2)	--
Activity Limitation		
T2 Activity Limit	3 (.7)	--

Sleep Deficit Items		
T1 Sleep Amount	2 (.5)	--
T1 Function Sleep	1 (.2)	--
T2 Function Sleep	2 (.5)	Both missing more than 1x
Work Limitation Items		
T1 Work 1	2 (.5)	--
T2 Work 1	2 (.5)	--
T1 Work 2	1 (.2)	--
T2 Work 2	14 (3.4)	13 replaced – 1 missing more than 1x
T2 Work 3	9 (2.2)	8 replaced – 1 missing more than 1x
T3 Work 3	1 (.2)	Missing more than 1x
Sensory Limitation		
T1 Seeing Limit	5 (1.2)	--
T2 Seeing Limit	4 (1)	--
T3 Seeing Limit	1 (.2)	--
T1 Hearing Limit	4 (1)	--
T2 Hearing Limit	5 (1.2)	--
T3 Hearing Limit	2 (.5)	--
Work Ability		
T1 Work Ability 1	1 (.2)	--
T2 Work Ability 1	2 (.5)	--
T1 Work Ability 2	1 (.2)	--
T2 Work Ability 2	27 (6.6)	--
T2 Work Ability 3	3 (.7)	--
T3 Work Ability 3	1 (.2)	--
T1 Work Ability 4	6 (1.5)	--
T2 Work Ability 4	20 (4.9)	--
T1 Two Years	4 (1)	--
T2 Two Years	6 (1.5)	--
T3 Two Years	3 (.7)	--
Clinical Physical Health (not imputed)		
T3 Hypertension	3 (.7)	--
BMI Categories	2 (.5)	--
T3 BMI Categories	4 (1)	--
Clinical Functional Health (not imputed)		
T1 Hand	1 (.2)	--
T3 Hand	1 (.2)	--
T1 Neck	1 (.2)	--
T3 Neck	2 (.5)	--
T1 Shoulder	50 (12.2)	--
T3 Shoulder	58 (14.2)	--
T1 Trunk	1 (.2)	--
T3 Trunk	2 (.5)	--
T1 Leg	15 (3.7)	--
T3 Leg	64 (15.6)	--

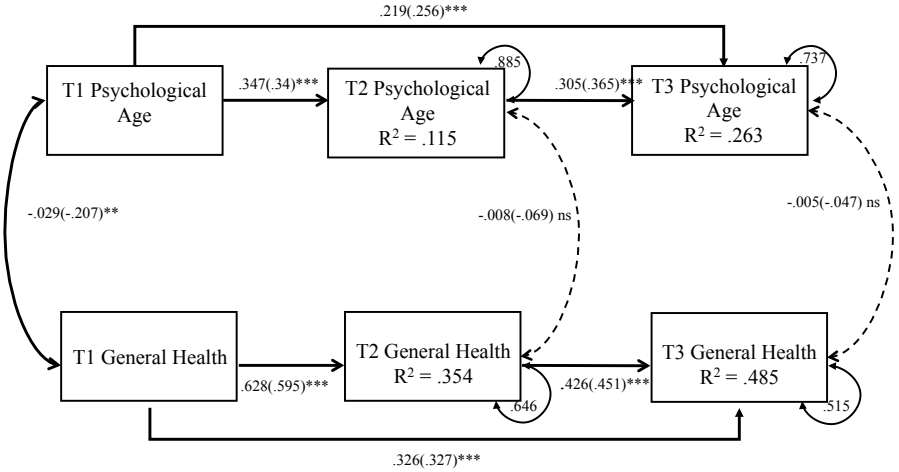
*Only items with missingness listed.

Appendix E

Models Tested for Under 50 Age Group

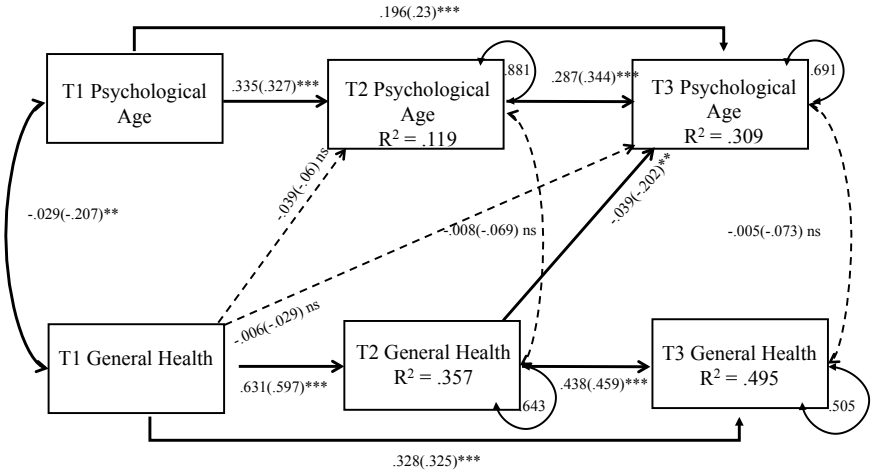
Note: Unstandardized (standardized) parameter estimates provided. Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Under 50 General Health M1: Autoregressive Only



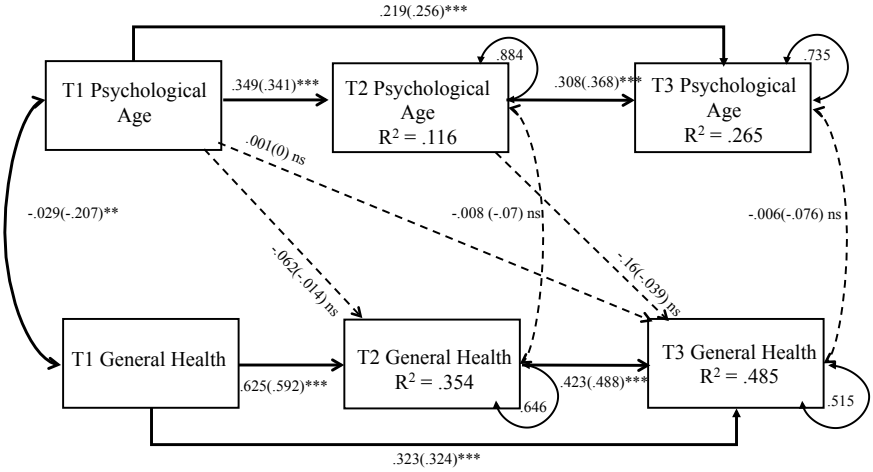
Model fit: $\chi^2(6)$ 16.333; RMSEA = .088, 90% CI: [.038, .140]; CFI = .971; TFI = .932

Under 50 General Health M2: General Health → Psychological Age



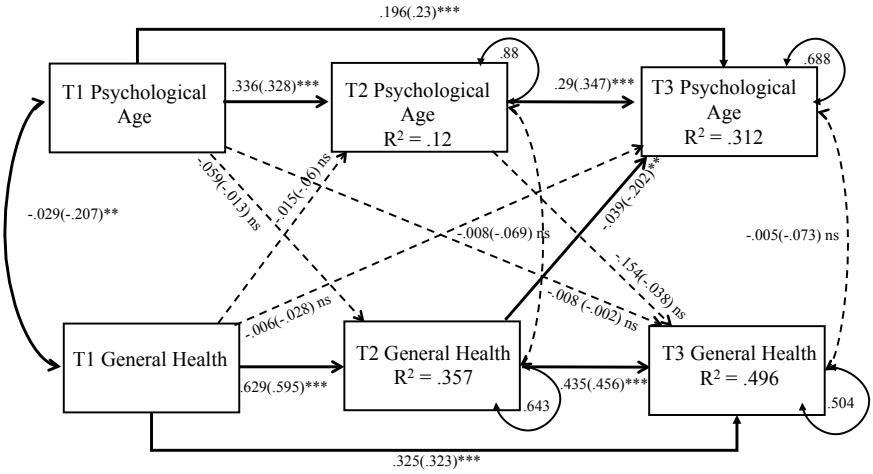
Model fit: $\chi^2(3)$ = .659; RMSEA = .0, 90% CI: [.000, .054]; CFI = 1.00; TFI = 1.031

Under 50 General Health M3: Psychological Age → General Health



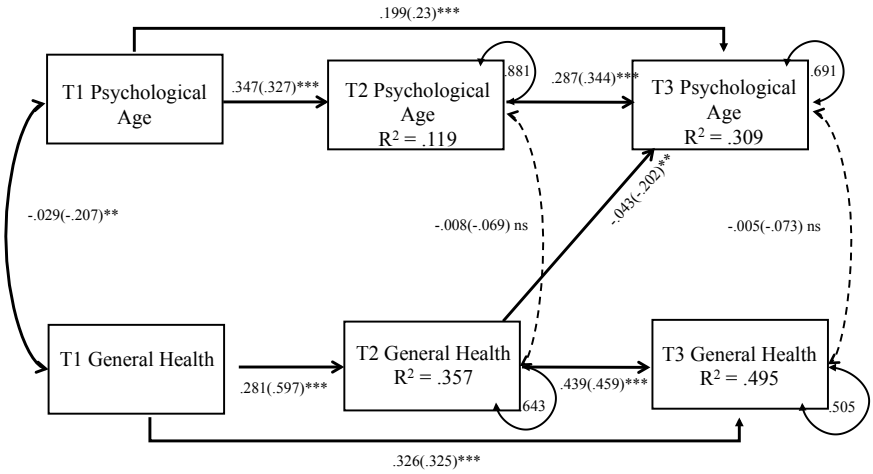
Model fit: $\chi^2(3) = 15.607$; RMSEA = .137, 90% CI: [.075, .207]; CFI = .964; TFI = .833

Under 50 General Health M4: Reciprocal Relationship



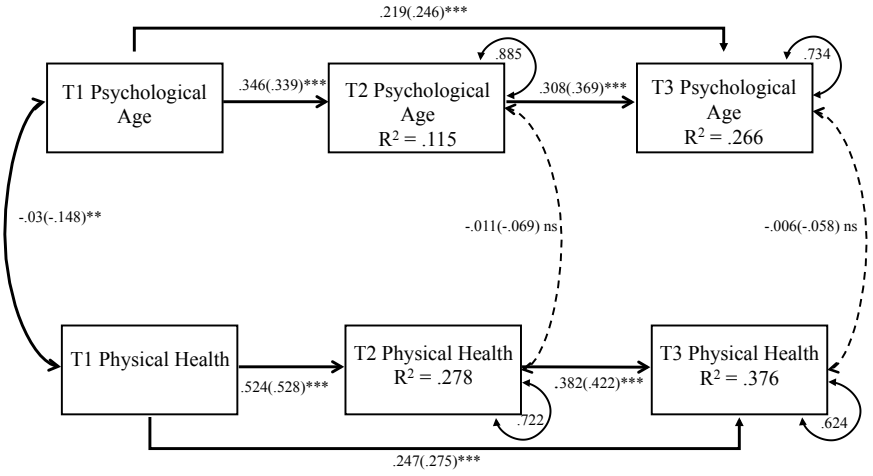
Model fit: Just-Identified; perfect fit

Under 50 General Health M5: Trimmed General Health → Psychological Age



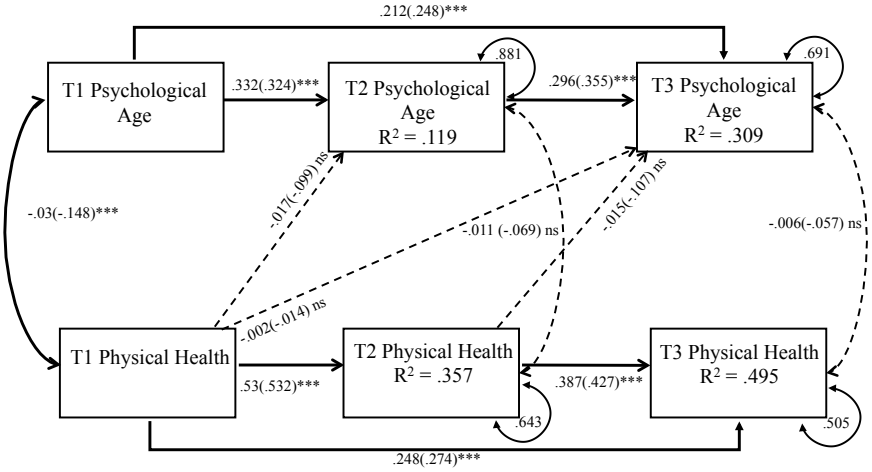
Model fit: $\chi^2(5) = 1.704$; RMSEA = .0, 90% CI: [.000, .043]; CFI = .1; TFI = .1.026

Under 50 Subjective Physical Health M1: Autoregressive Only



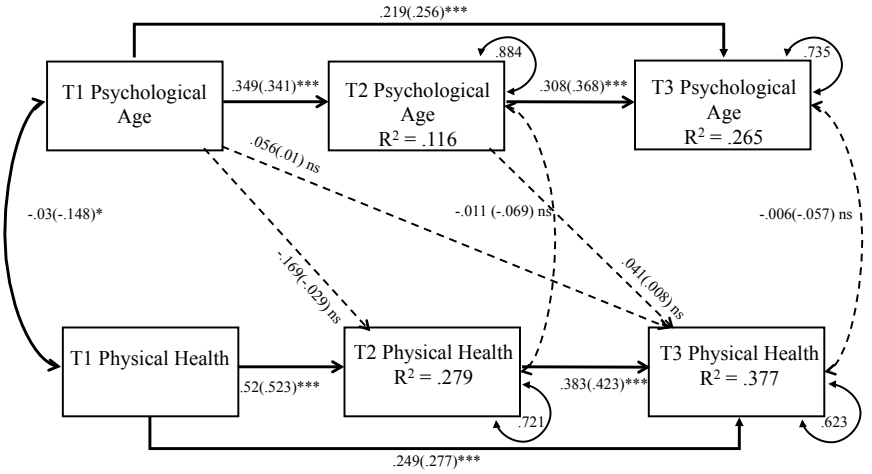
Model fit: $\chi^2(6)$ 6.964; RMSEA = .023, 90% CI: [.000, .092]; CFI = .997; TFI = .994

Under 50 Subjective Physical Health M2: Physical Health → Psychological Age



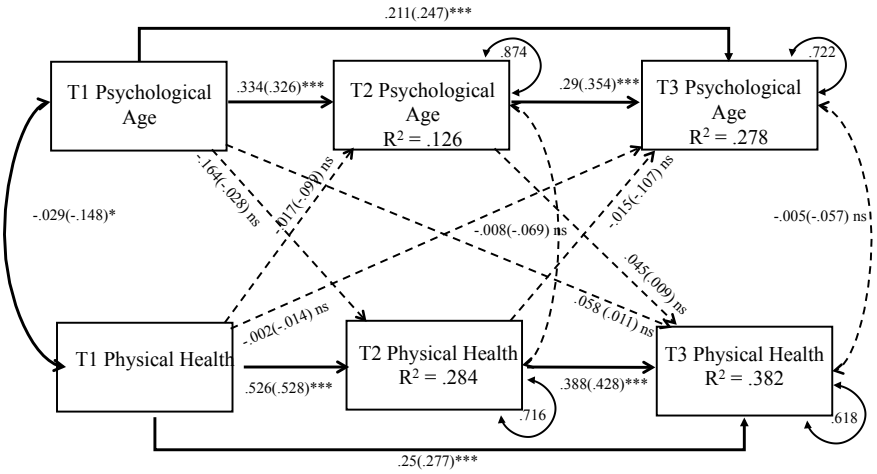
Model fit: $\chi^2(3) = .323$; RMSEA = .0, 90% CI: [.000, .000]; CFI = 1.000; TFI = 1.046

Under 50 Subjective Physical Health M3: Psychological Age → Physical Health



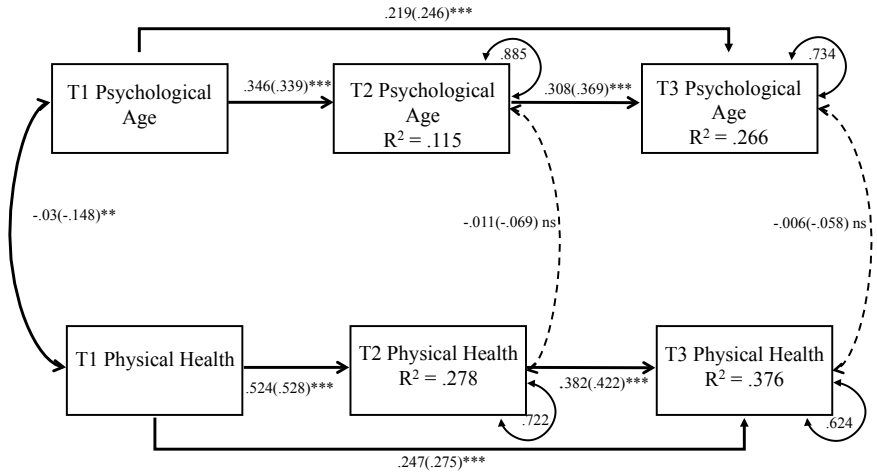
Model fit: $\chi^2(3) = 6.365$; RMSEA = .071, 90% CI: [.000, .148]; CFI = .988; TFI = .943

Under 50 Subjective Physical Health M4: Reciprocal Relationship



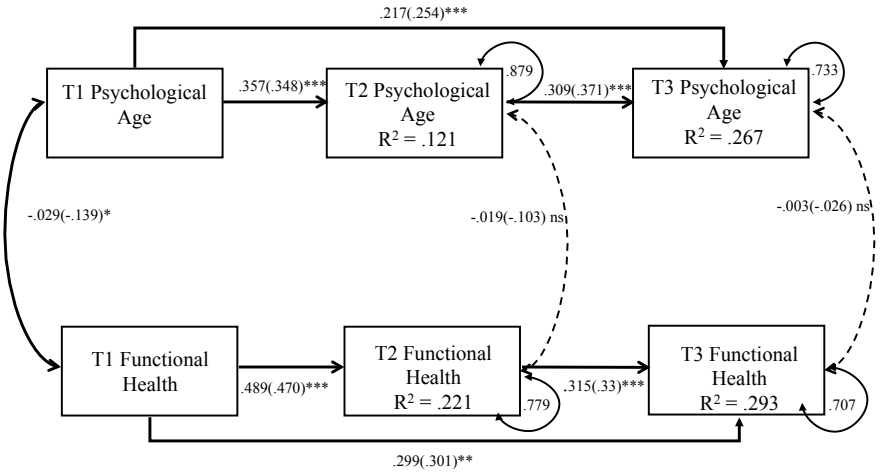
Model fit: Just-Identified; perfect fit

Under 50 Subjective Physical Health M5:
Trimmed M2 (Same as M1 - Autoregressive Only)



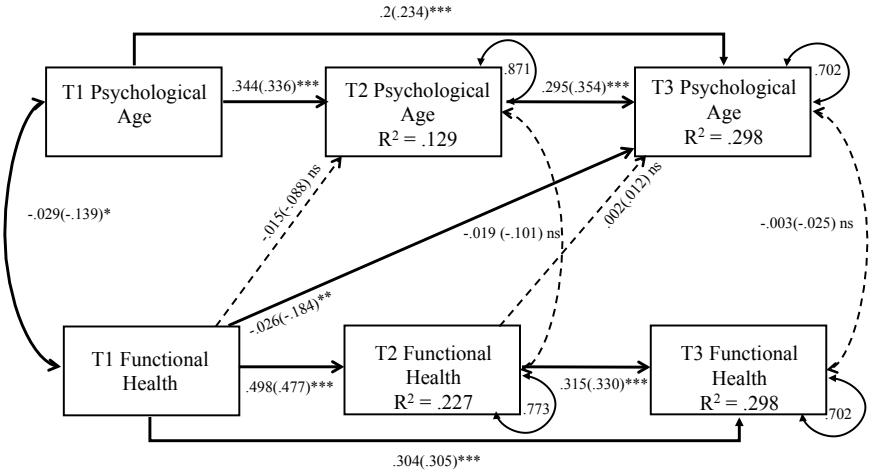
Model fit: $\chi^2(6)$ 6.964; RMSEA = .023, 90% CI: [.000, .092]; CFI = .997; TFI = .994

Under 50 Subjective Functional Health M1: Autoregressive Only



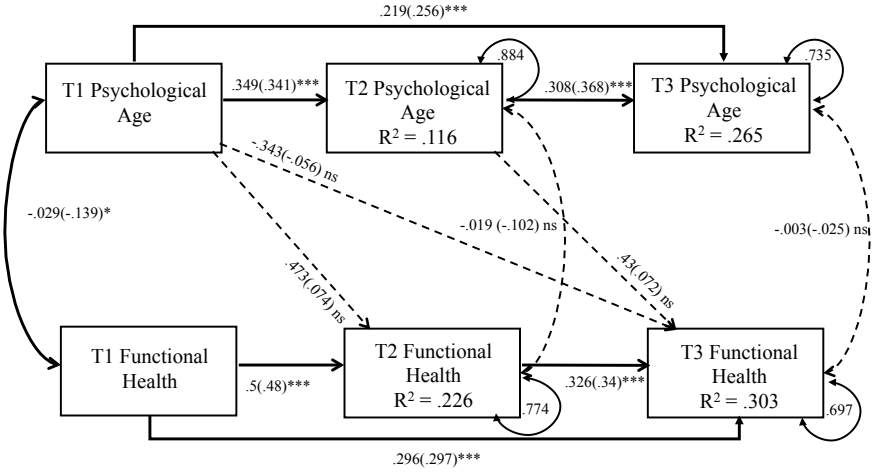
Model fit: $\chi^2(6)$ 14.986; RMSEA = .082, 90% CI: [.03, .135]; CFI = .962; TFI = .912

Under 50 Subjective Functional Health M2: Functional Health → Psychological Age



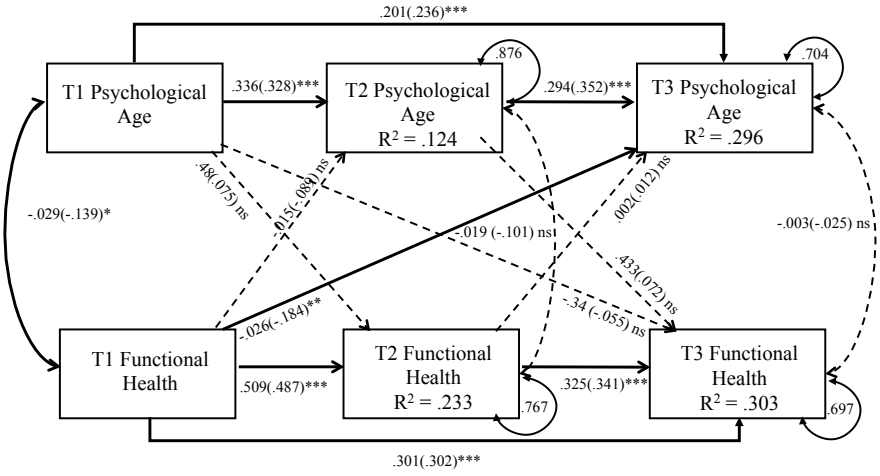
Model fit: $\chi^2(3)$ = 3.347; RMSEA = .023, 90% CI: [.000, .117]; CFI = .999; TFI = .993

Under 50 Subjective Functional Health M3: Psychological Age → Functional Health



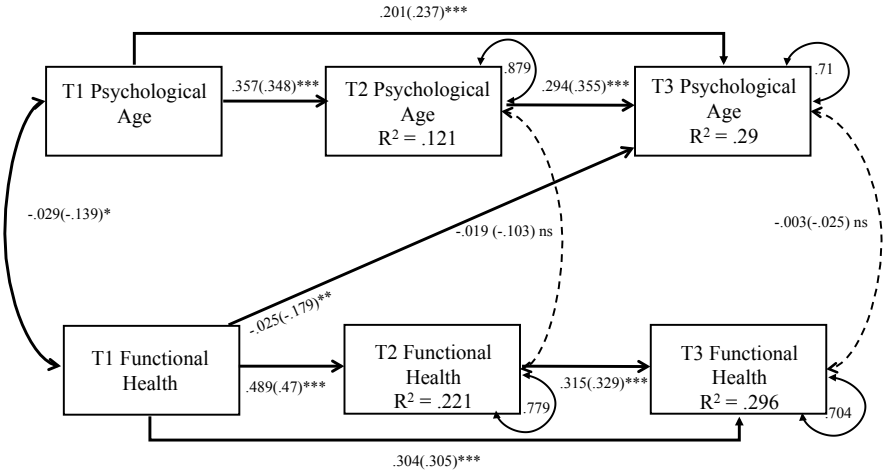
Model fit: $\chi^2(3) = 11.693$; RMSEA = .114, 90% CI: [.05, .186]; CFI = .963; TFI = .829

Under 50 Subjective Functional Health M4: Reciprocal Relationship



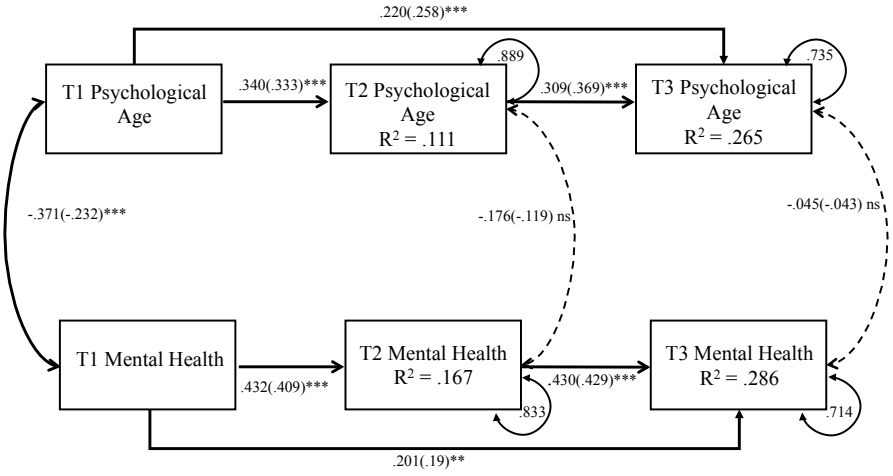
Model fit: Just-Identified; perfect fit

Under 50 Subjective Functional Health M5:
Trimmed Functional Health → Psychological Age



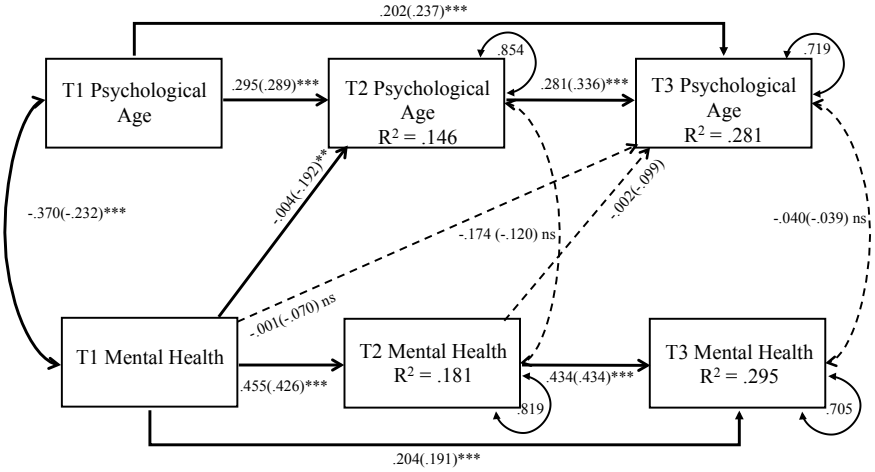
Model fit: $\chi^2(5) = 5.326$; RMSEA = .017, 90% CI: [.000, .096]; CFI = .999; TFI = .996

Under 50 Mental Health M1: Autoregressive Only



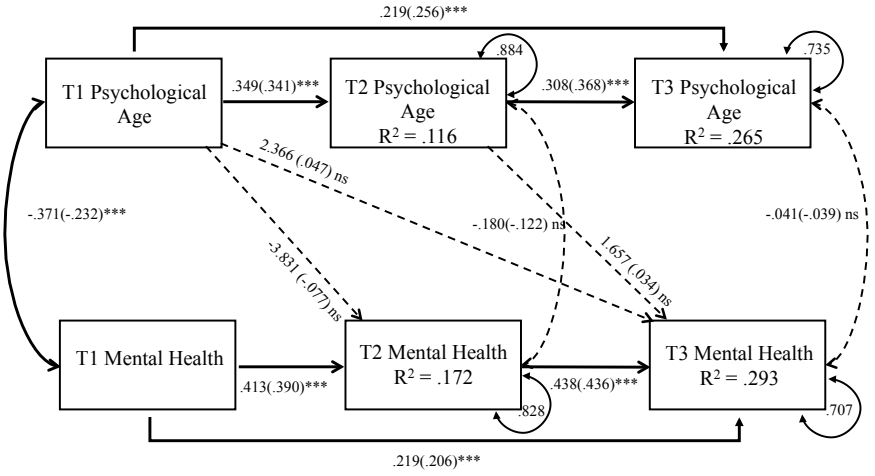
Model fit: $\chi^2(6)$ 17.327; RMSEA = .092, 90% CI: [.043, .144]; CFI = .950; TFI = .883

Under 50 Mental Health M2: Mental Health → Psychological Age



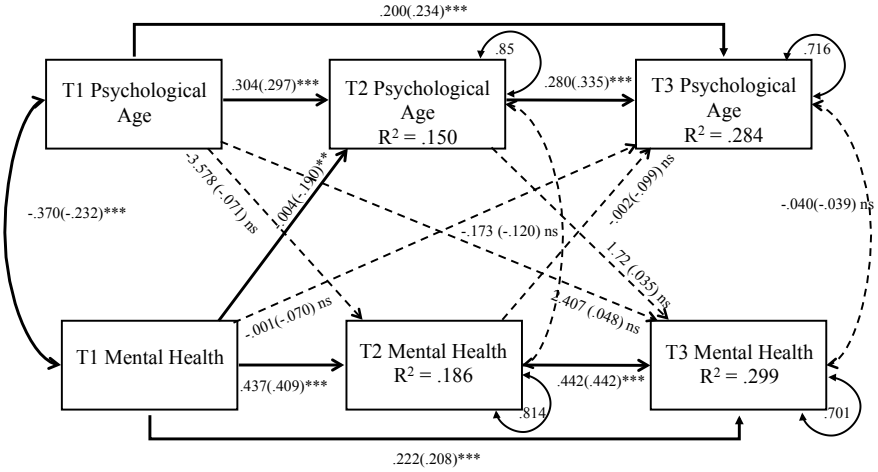
Model fit: $\chi^2(3) = 2.651$; RMSEA = .000, 90% CI: [.000, .108]; CFI = 1.00; TFI = 1.007

Under 50 Mental Health M3: Psychological Age → Mental Health



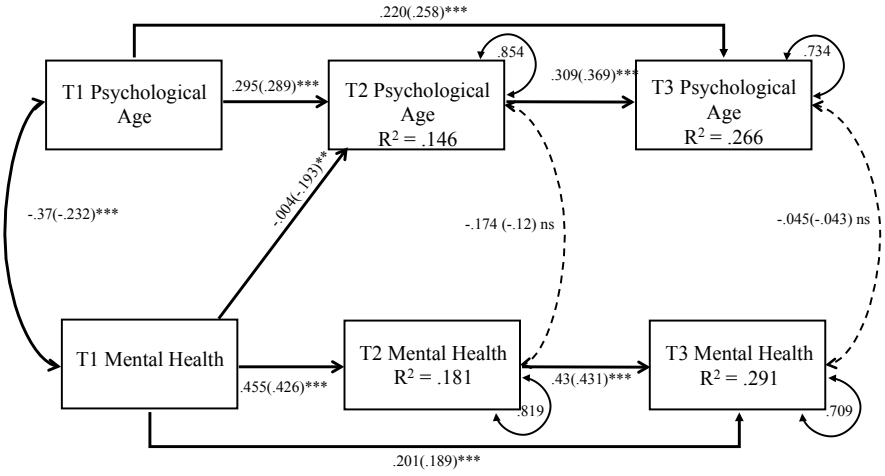
Model fit: $\chi^2(3) = 14.552$; RMSEA = .131, 90% CI: [.069, .202]; CFI = .949; TFI = .762

Under 50 Mental Health M4: Reciprocal Relationship



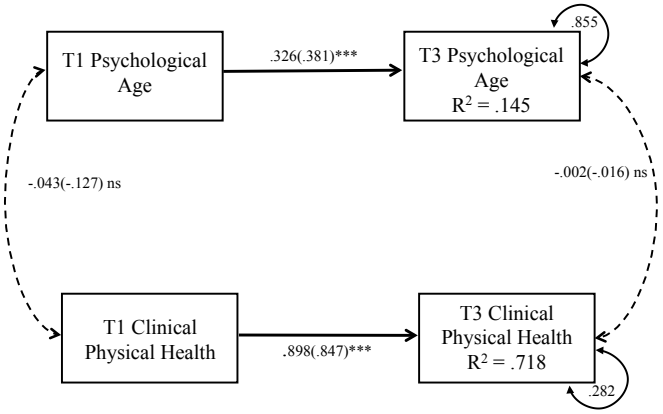
Model fit: Just-Identified; perfect fit

Under 50 Mental Health M5: Mental Health → Psychological Age



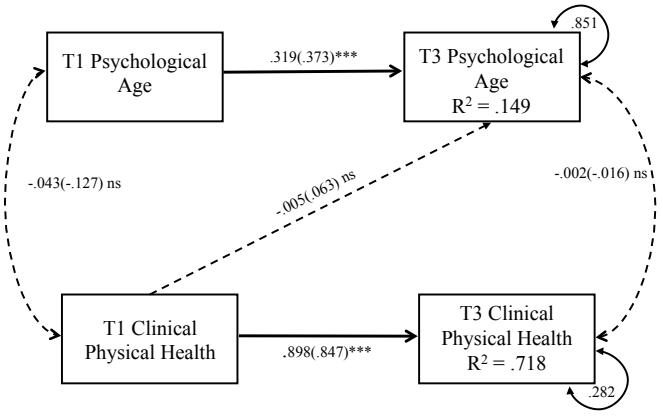
Model fit: $\chi^2(5) = 8.323$; RMSEA = .054, 90% CI: [.000, .117]; CFI = .985; TFI = .959

Under 50 Clinical Physical Health M1: Autoregressive Only



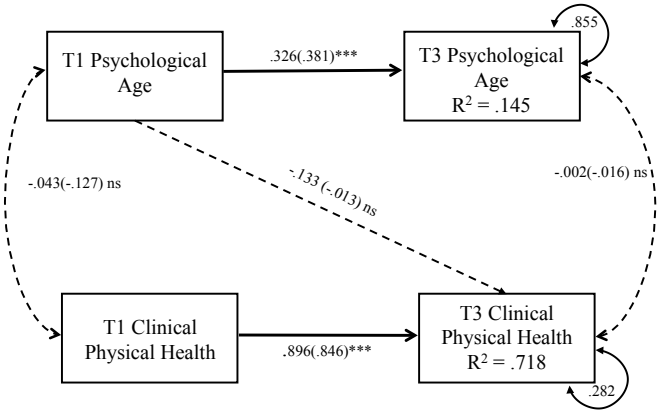
Model fit: $\chi^2(2)$ 1.072; RMSEA = .000, 90% CI: [.000, .110]; CFI = 1.00; TFI = 1.008

Under 50 Clinical Physical Health M2: Health → PA



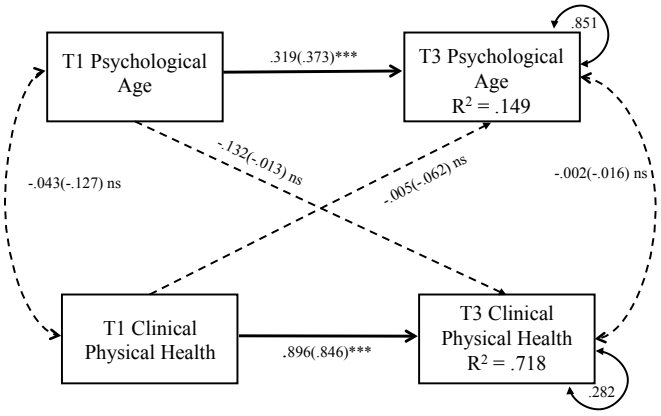
Model fit: $\chi^2(1)$ .121; RMSEA = .000, 90% CI: [.000, .125]; CFI = 1.00; TFI = 1.015

Under 50 Clinical Physical Health M3: PA → Health



Model fit: $\chi^2(1)$ .950; RMSEA = .000, 90% CI: [.000, .175]; CFI = 1.00; TFI = 1.001

Under 50 Clinical Physical Health M4: Reciprocal Relationship



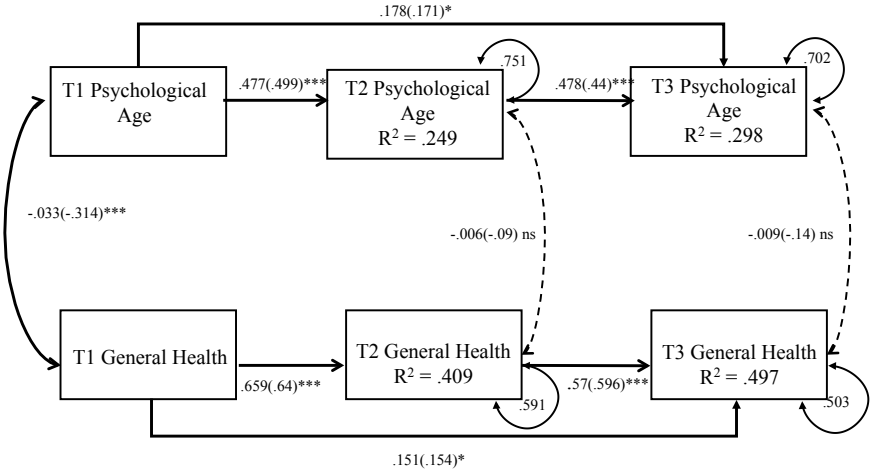
Model fit: $\chi^2(0)$ 0.0; RMSEA = .000, 90% CI: [.000, .000]; CFI = 1.00; TFI = 1.00

Appendix F

Models Tested for 50 and Older Age Group

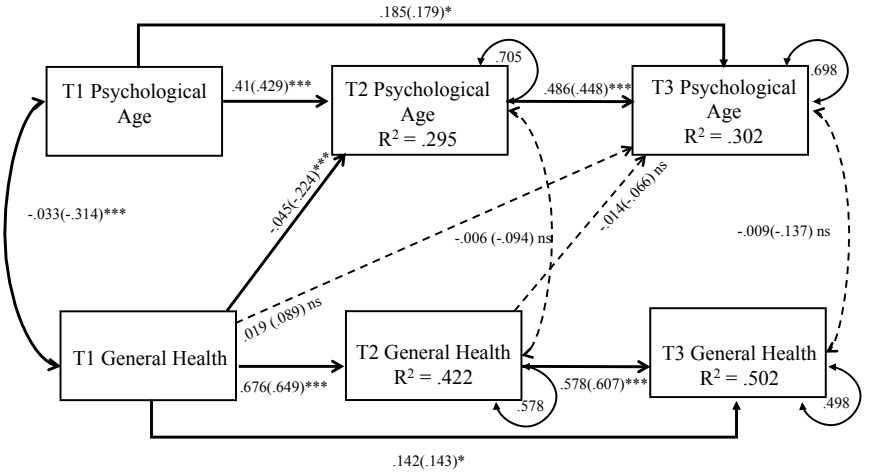
Note: Unstandardized (standardized) parameter estimates provided. Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

50 and Over General Health M1: Autoregressive Only



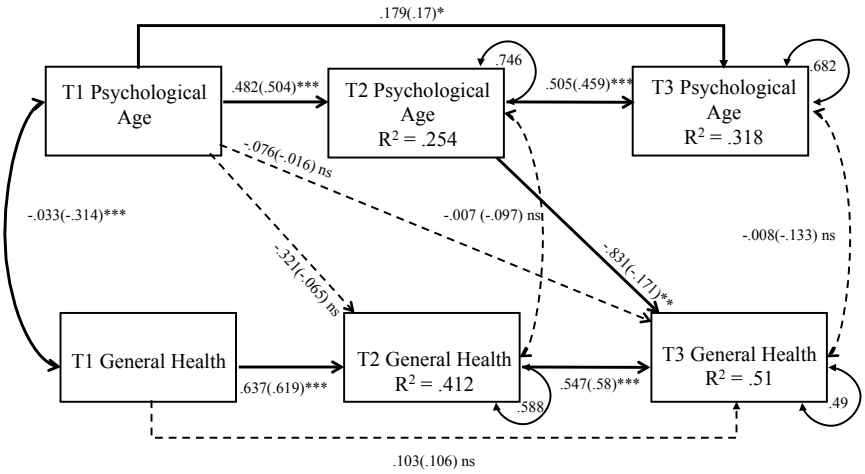
Model fit: $\chi^2(6)$ 24.034; RMSEA = .127, 90% CI: [.077, .183]; CFI = .951; TFI = .886

50 and Over General Health M2: General Health → Psychological Age



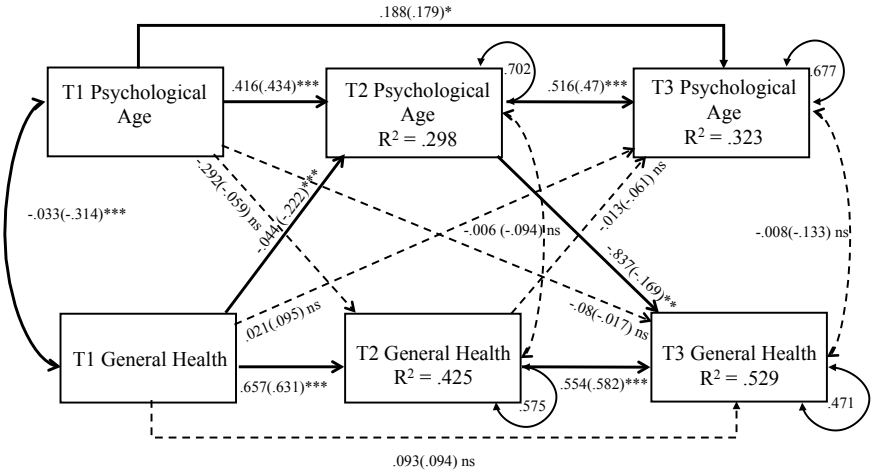
Model fit: $\chi^2(3)$ = 11.317; RMSEA = .122, 90% CI: [.0052, .202]; CFI = .978; TFI = .895

50 and Over General Health M3: Psychological Age → General Health



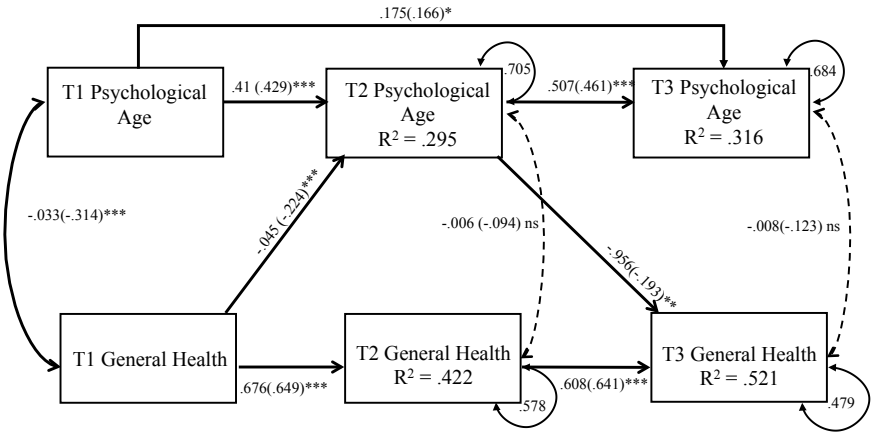
Model fit: $\chi^2(3) = 12.686$; RMSEA = .132, 90% CI: [.063, .211]; CFI = .974; TFI = .878

50 and Over General Health M4: Reciprocal Relationship



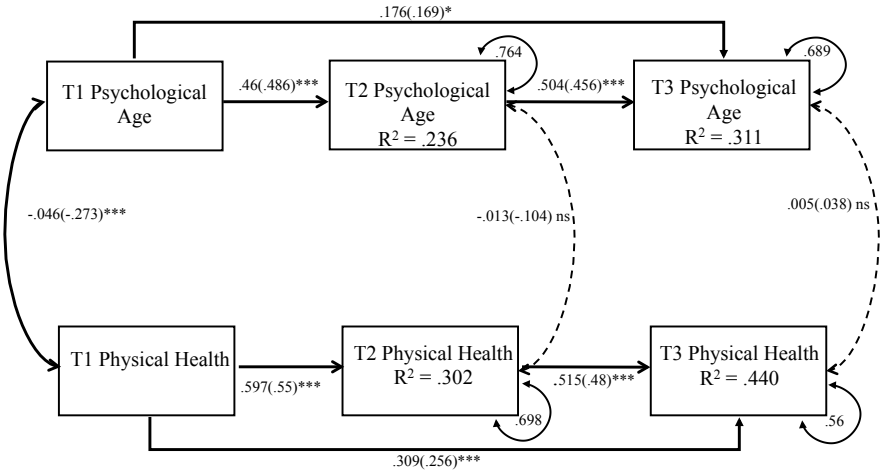
Model fit: Just-Identified; perfect fit

50 and Over General Health M5: Trimmed Reciprocal Relationship



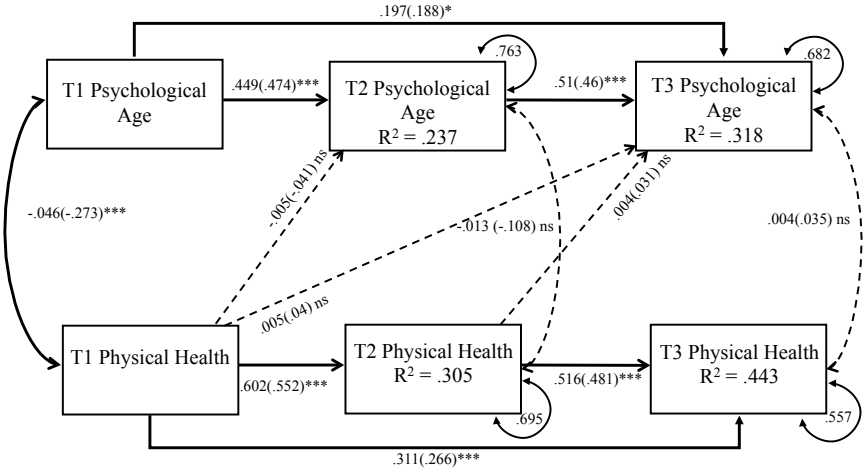
Model fit: $\chi^2(5) = 4.876$; RMSEA = 0.0, 90% CI: [.000, .101]; CFI = 1.00; TFI = 1.001

50 and Over Subjective Physical Health M1: Autoregressive Only



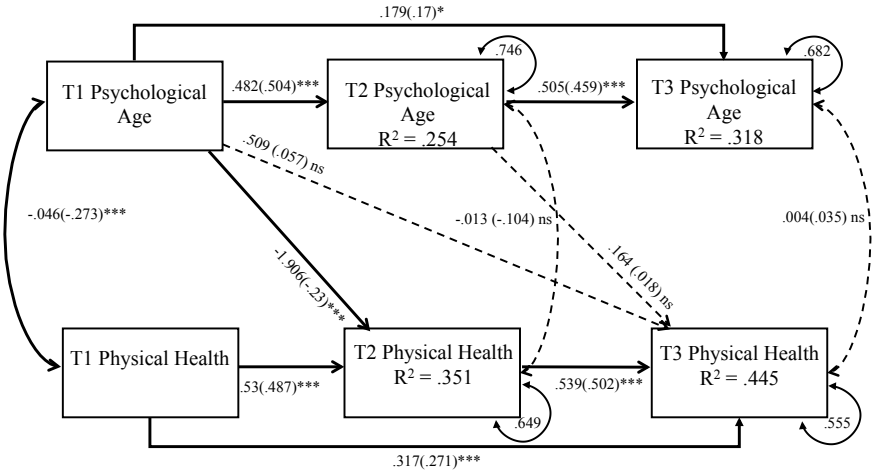
Model fit: $\chi^2(6)$ 15.914; RMSEA = .095, 90% CI: [.039, .152]; CFI = .967; TFI = .924

50 and Over Subjective Physical Health M2: Physical Health → Psychological Age



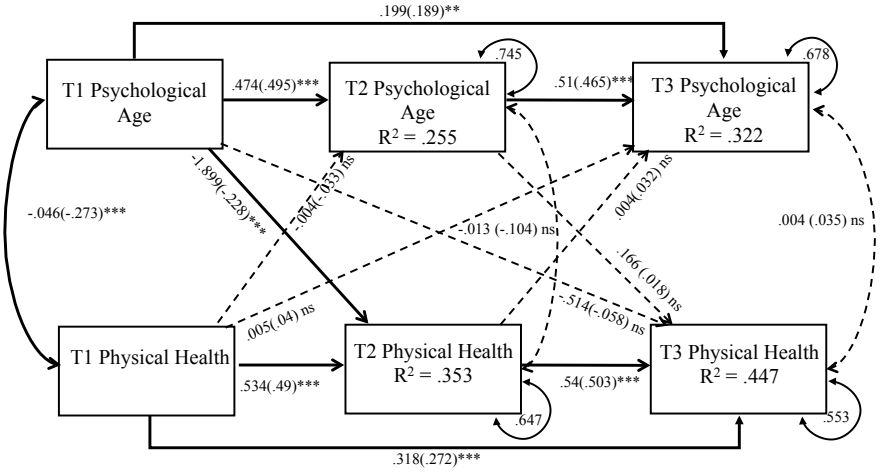
Model fit: $\chi^2(3) = 14.63$; RMSEA = .145, 90% CI: [.076, .223]; CFI = .962; TFI = .822

50 and Over Subjective Physical Health M3: Psychological Age → Physical Health



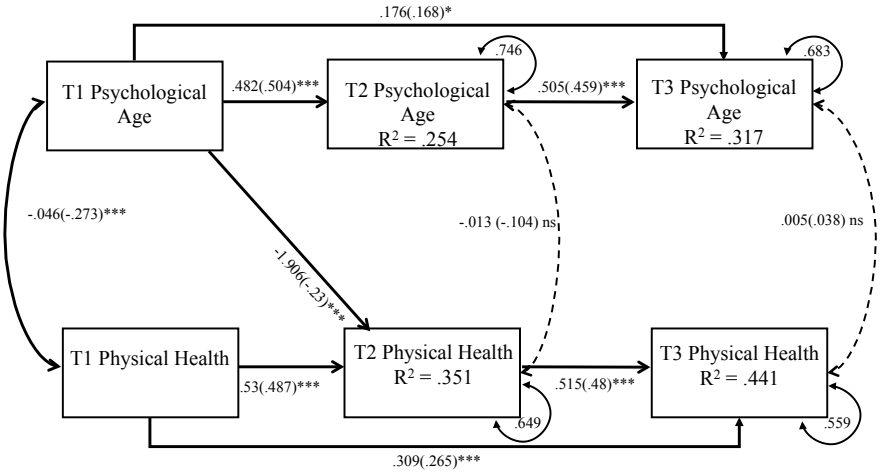
Model fit: $\chi^2(3) = 1.197$; RMSEA = .000, 90% CI: [.000, .085]; CFI = 1.000; TFI = 1.028

50 and Over Subjective Physical Health M4: Reciprocal Relationship



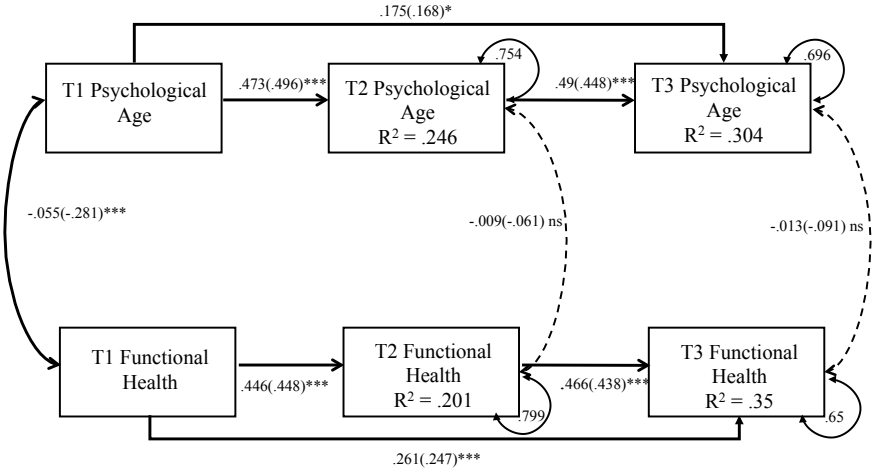
Model fit: Just-Identified; perfect fit

50 and Over Subjective Physical Health M5: Trimmed M3 - Psychological Age → Physical Health



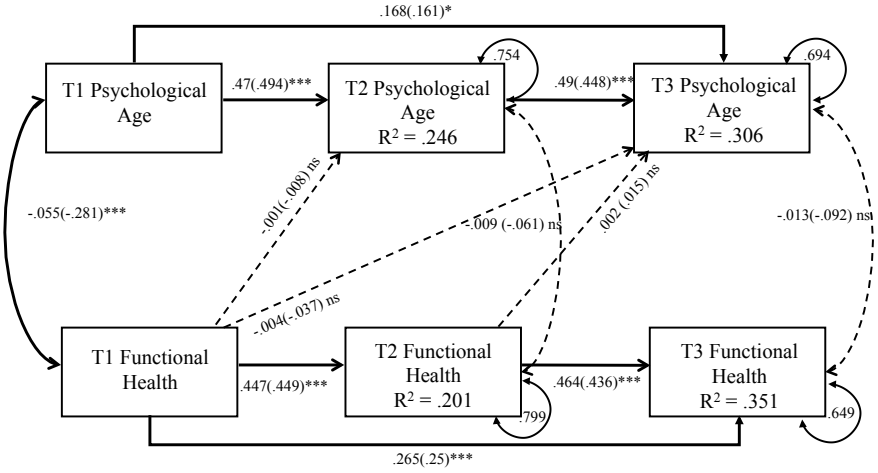
Model fit: $\chi^2(5) = 2.493$; RMSEA = .000, 90% CI: [.000, .068]; CFI = 1.000; TFI = 1.023

50 and Over Subjective Functional Health M1: Autoregressive Only



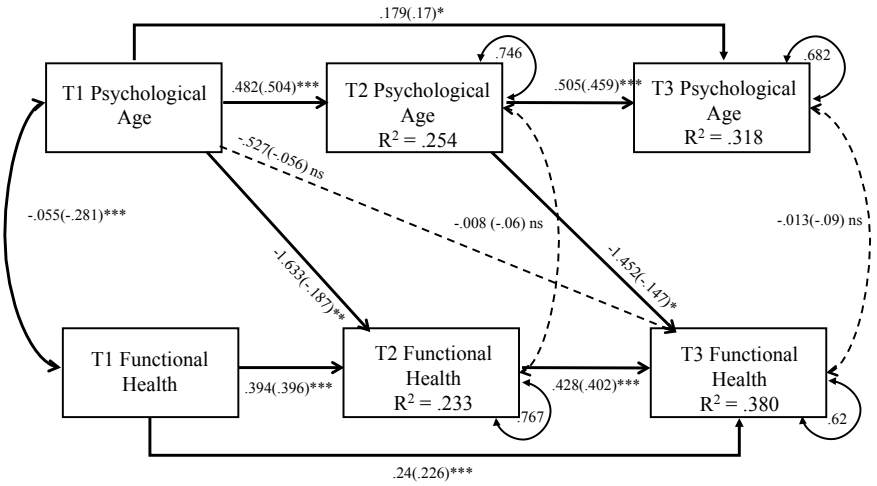
Model fit: $\chi^2(6)$ 16.747; RMSEA = .098, 90% CI: [.044, .156]; CFI = .957; TFI = .900

50 and Over Subjective Functional Health M2:
Functional Health → Psychological Age



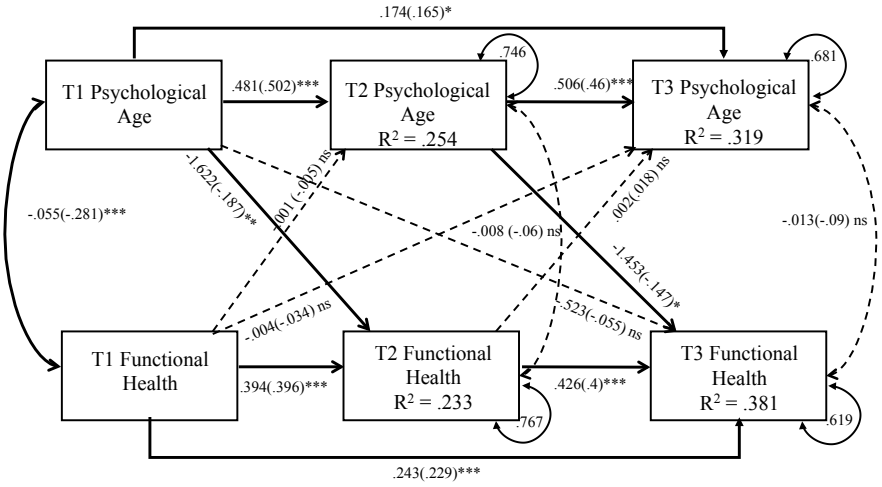
Model fit: $\chi^2(3)$ = 16.455; RMSEA = .156, 90% CI: [.088, .233]; CFI = .946; TFI = .75

50 and Over Subjective Functional Health M3:
Psychological Age → Functional Health



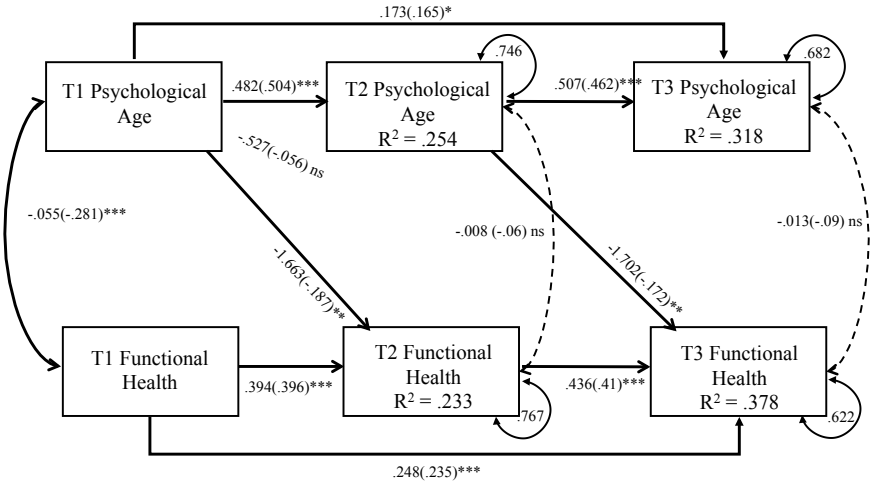
Model fit: $\chi^2(3) = .258$; RMSEA = .000, 90% CI: [.000, .000]; CFI = 1.000; TFI = 1.051

50 and Over Subjective Functional Health M4: Reciprocal Relationship



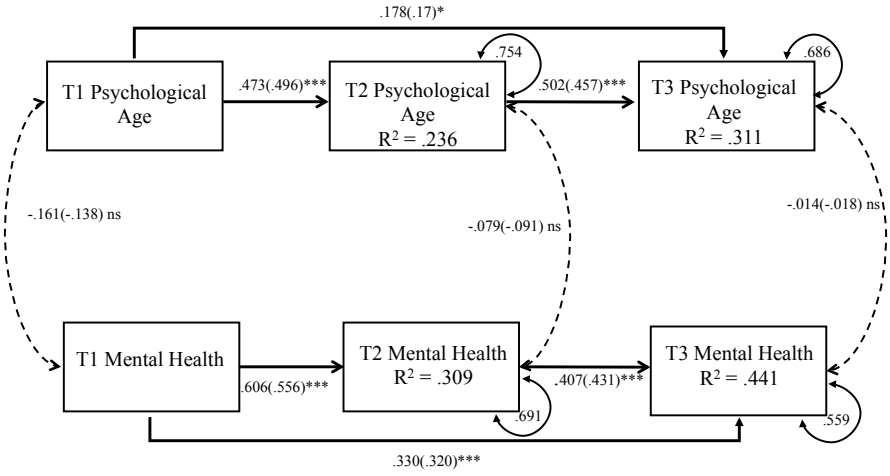
Model fit: Just-Identified; perfect fit

50 and Over Subjective Functional Health M5:
Trimmed Psychological Age → Functional Health



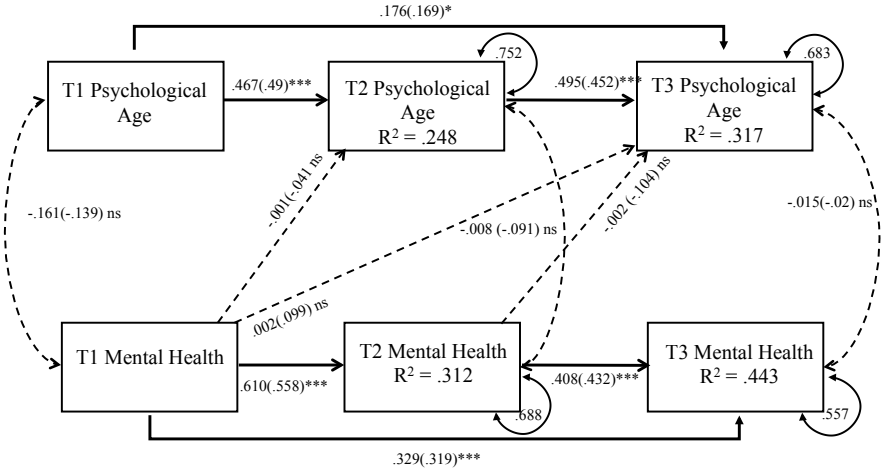
Model fit: $\chi^2(4) = .893$; RMSEA = .000, 90% CI: [.000, .035]; CFI = 1.000; TFI = 1.043

50 and Over Mental Health M1: Autoregressive Only



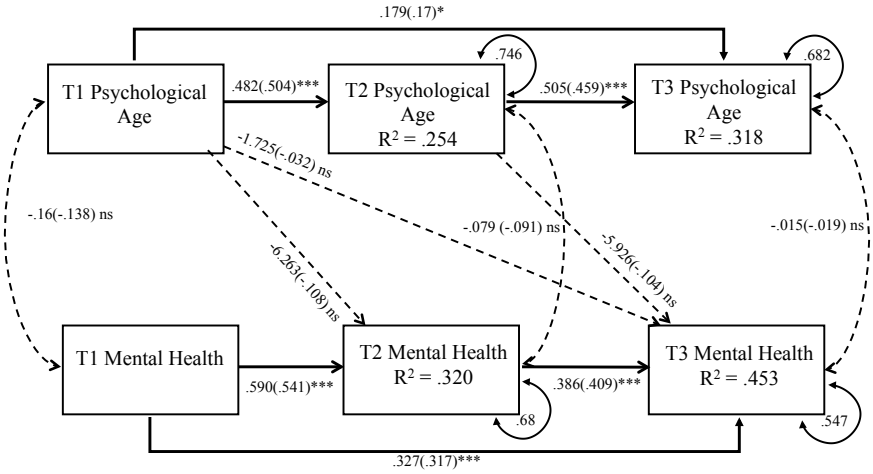
Model fit: $\chi^2(6)$ 10.672; RMSEA = .065, 90% CI: [.00, .127]; CFI = .984; TFI = .963

50 and Over Mental Health M2: Mental Health → Psychological Age



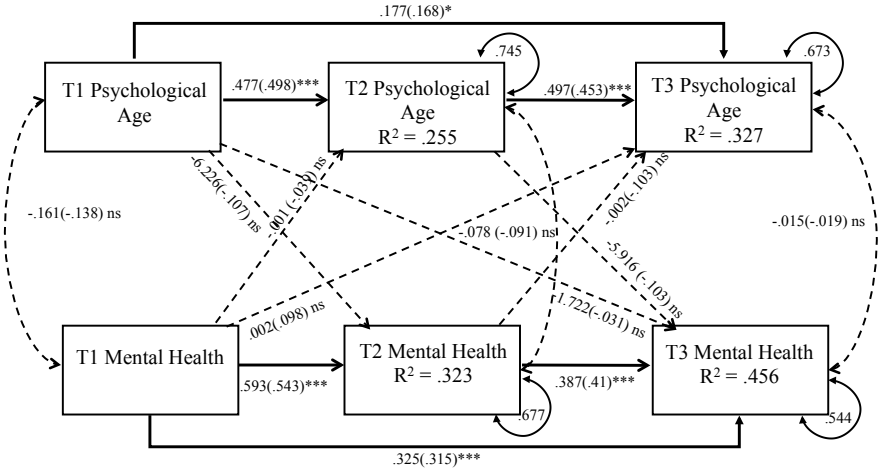
Model fit: $\chi^2(3) = 7.836$; RMSEA = .093, 90% CI: [.004, .176]; CFI = .984; TFI = .924

50 and Over Mental Health M3: Psychological Age → Mental Health



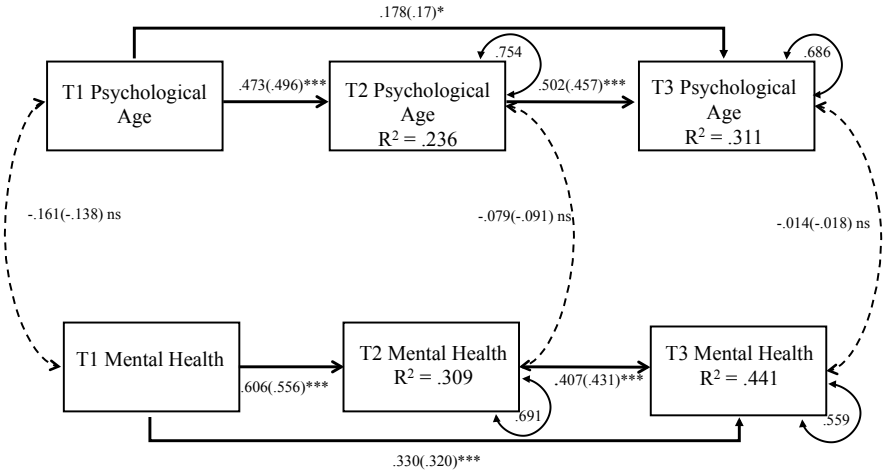
Model fit: $\chi^2(3) = 2.785$; RMSEA = .000, 90% CI: [.000, .121]; CFI = 1.000; TFI = 1.003

50 and Over Mental Health M4: Reciprocal Relationship



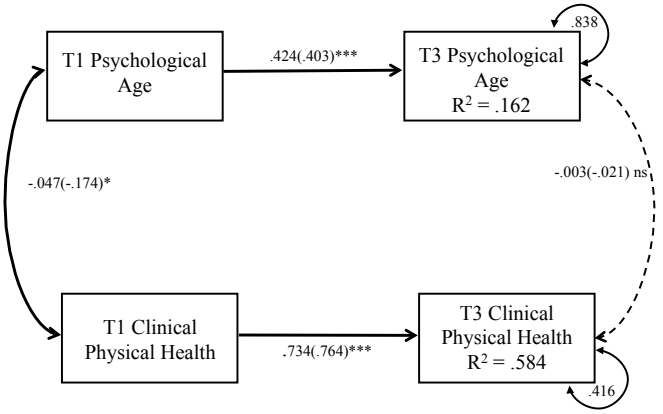
Model fit: Just-Identified; perfect fit

50 and Over Mental Health M5: Trimmed M2 (Same as M1 - Autoregressive Only)



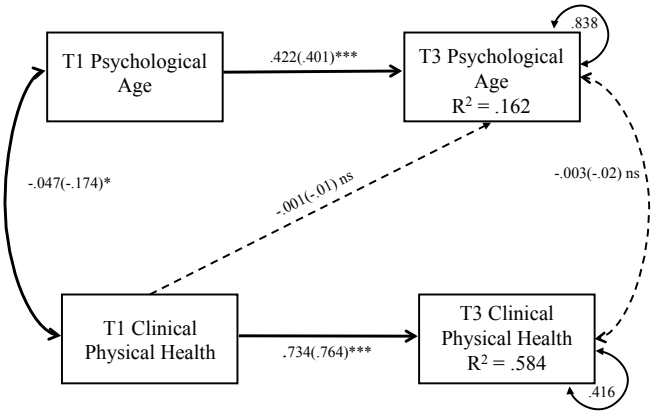
Model fit: $\chi^2(6)$ 10.672; RMSEA = .065, 90% CI: [.00, .127]; CFI = .984; TFI = .963

50 and Over Clinical Physical Health M1: Autoregressive Only



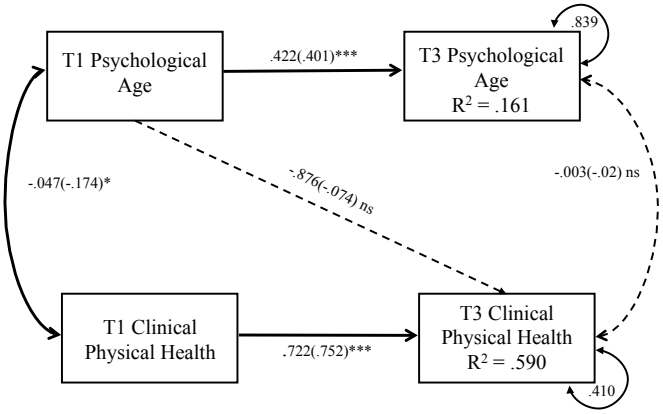
Model fit: $\chi^2(2)$ 2.328; RMSEA = .030, 90% CI: [.000, .152]; CFI = .998; TFI = .996

50 and over Clinical Physical Health M2: Health → PA



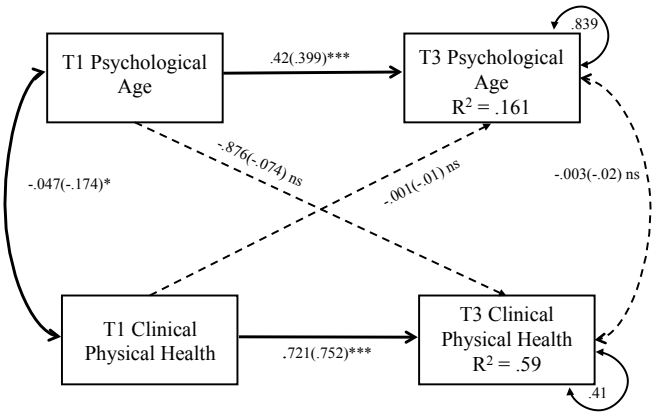
Model fit: $\chi^2(1)$ 2.307; RMSEA = .084, 90% CI: [.000, .233]; CFI = .993; TFI = .965

50 and Over Clinical Physical Health M3: PA → Health



Model fit: $\chi^2(1)$ .023; RMSEA = .000, 90% CI: [.000, .098]; CFI = 1.00; TFI = 1.026

50 and Over Clinical Physical Health M4: Reciprocal Relationship



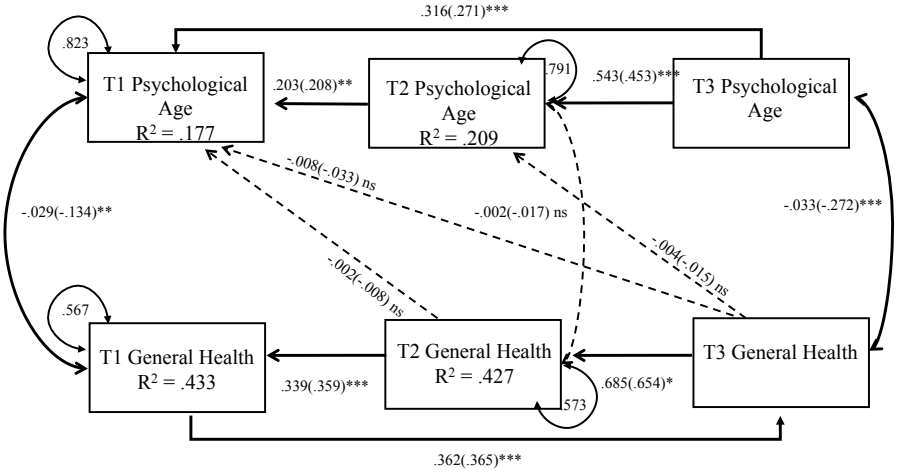
Model fit: $\chi^2(0)$ 0.0; RMSEA = .000, 90% CI: [.000, .000]; CFI = 1.00; TFI = 1.00

Appendix G

Alternative Models Tested for Under 50 Age Group

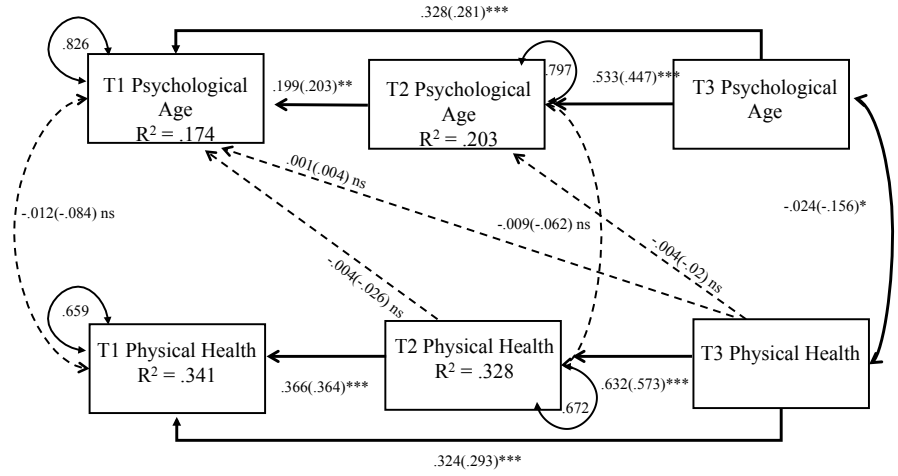
Note: Unstandardized (standardized) parameter estimates provided. Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Under 50 General Health Alternative M2: General Health → Psychological Age, Reverse Paths



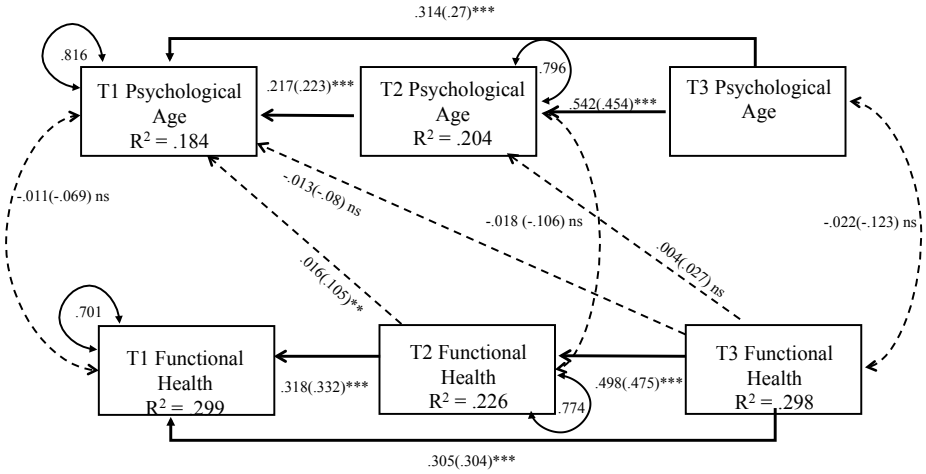
Model fit: $\chi^2(3) = .659$; RMSEA = .0, 90% CI: [.000, .054]; CFI = .1; TFI = .1.031

Under 50 Subjective Physical Health Alternative M2: Physical Health → Psychological Age, Reverse Paths



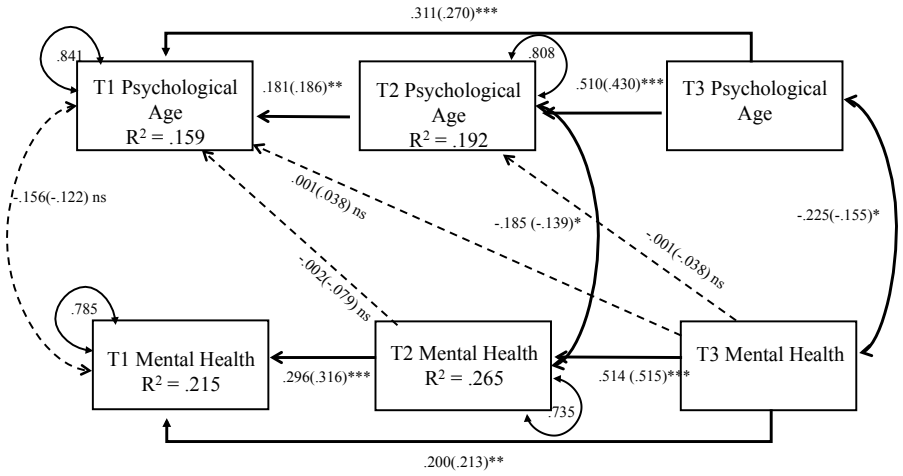
Model fit: $\chi^2(3) = .659$; RMSEA = .0, 90% CI: [.000, .054]; CFI = .1; TFI = .1.031

Under 50 Subjective Functional Health Alt M2:
Functional Health → Psychological Age, Reverse Paths



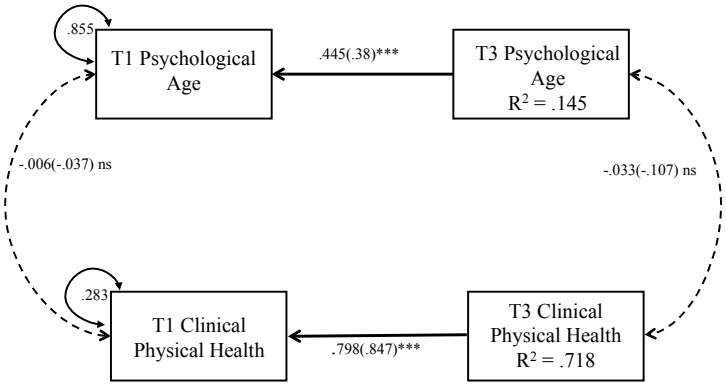
Model fit: $\chi^2(3) = 3.347$; RMSEA = .023, 90% CI: [.000, .117]; CFI = .999; TFI = .993

Under 50 Mental Health Alt M2: Mental Health → Psychological Age, Reverse Paths



Model fit: $\chi^2(3) = 19.059$; RMSEA = .155, 90% CI: [.093, .224]; CFI = .931; TFI = .679

Under 50 Clinical Physical Health Alt M1: Reversed Autoregressive Only



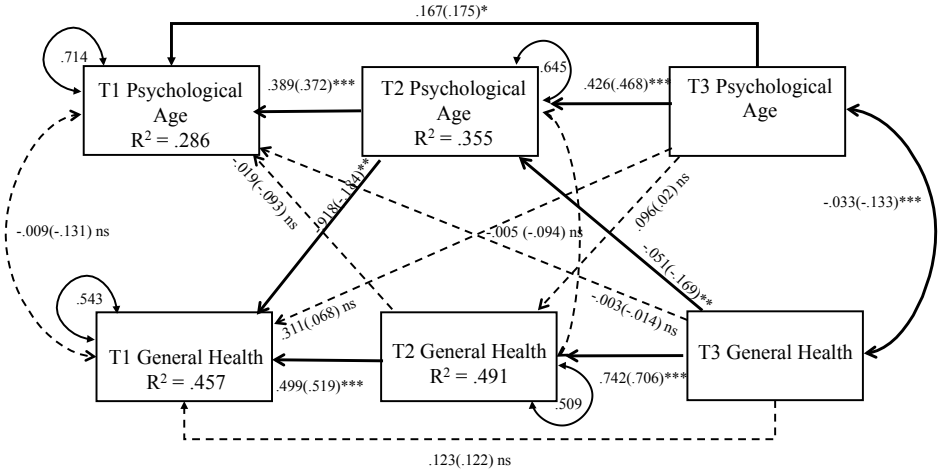
Model fit: $\chi^2(2)$ 1.976; RMSEA = .000, 90% CI: [.000, .132]; CFI = 1.00; TFI = 1.00

Appendix H

Alternative Models Tested for 50 and Older Age Group

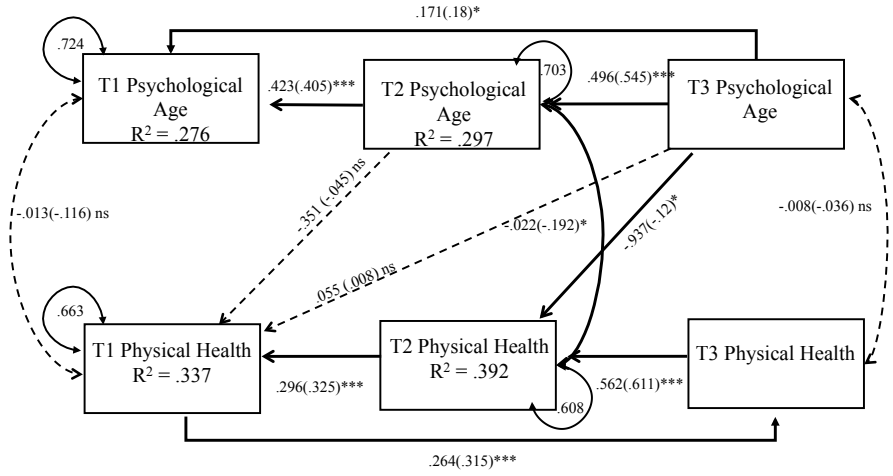
Note: Unstandardized (standardized) parameter estimates provided. Solid lines indicate statistically significant paths; dashed lines indicate non-significant paths. Psychological age represents the proportional discrepancy of felt age and chronological age (i.e., [FA-CA]/CA). * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

50 and Over General Health Alternative M4: Reciprocal Relationship



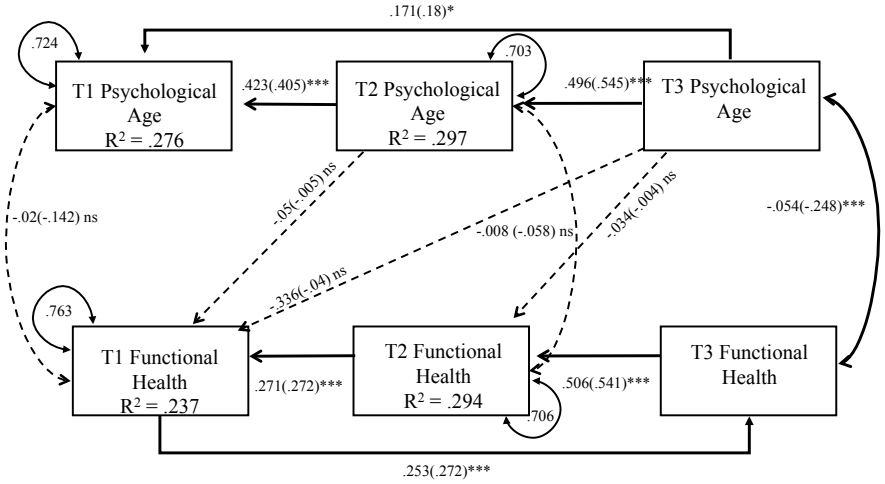
Model fit: Just identified; perfect fit

50 and Over Physical Health Alternative M3: Psychological Age → Physical Health , Reverse Paths



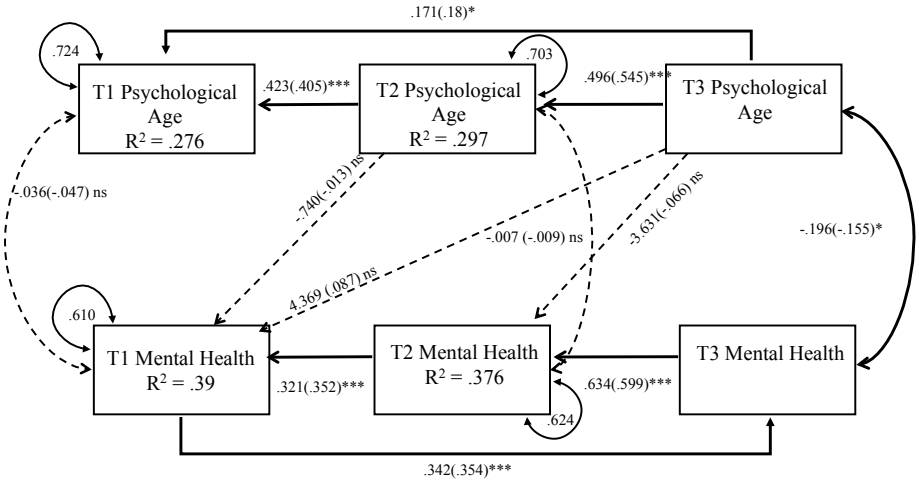
Model fit: $\chi^2(3) = 18.503$; RMSEA = .167, 90% CI: [.099, .244]; CFI = .1; TFI = .1.031

50 and Over Subjective Functional Health Alt M3: Psychological Age → Functional Health, Reverse Paths



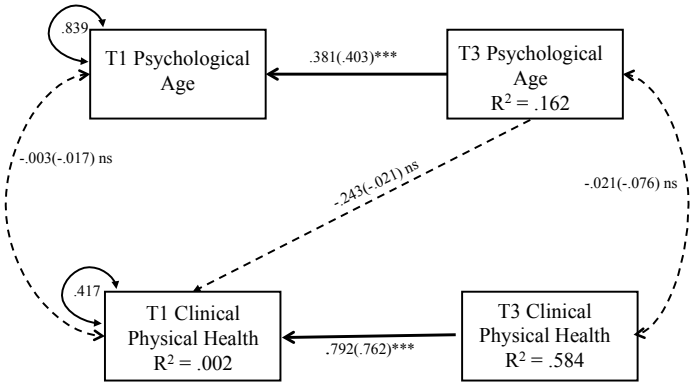
Model fit: $\chi^2(3) = .258$; RMSEA = .000, 90% CI: [.000, .000]; CFI = 1.000; TFI = 1.051

50 and Over Mental Health Alt M3: Psychological Age → Mental Health, Reverse Paths



Model fit: $\chi^2(3) = 7.703$; RMSEA = .092, 90% CI: [.000, .175]; CFI = .984; TFI = .926

50 and Over Clinical Physical Health Alt M3:
Psychological Age → Physical Health



Model fit: $\chi^2(1)$ 6.644; RMSEA = .175, 90% CI: [.068, .310]; CFI = .97; TFI = .852