Leisure engagement and self-perceptions of aging: Longitudinal analysis of concurrent and lagged relationships

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Abstract

Objectives: There is evidence to suggest that leisure engagement may influence self-perceptions of ageing, but disentangling potential bidirectionality in this relationship is challenging. A better understanding of the directionality of this association is essential for designing more effective interventions to promote healthy aging. We therefore tested both lagged and concurrent effects in both directions both for a composite measure of leisure engagement as well as specific domains of community, cognitive, creative, and physical activities.

Method: A total of 17,753 adults aged 50 or above living in the United States from the Health and Retirement Study were included in the analysis. They provided 32,703 observations over three waves between 2008/2010 and 2016/2018. Data were analysed using structural equation modelling with both concurrent and lagged associations between self-perceptions of aging and leisure engagement, controlling for confounders including age, gender, ethnicity, socioeconomic position, and health conditions.

Results: We found consistent evidence for leisure engagement as a predictor of self-perceptions of aging. There was weaker evidence for a reciprocal relationship, although this was found in the domains of creative activities and physical activities, where these two activities were also predicted by older adults' self-perceptions of aging.

Discussion: Our findings provide empirical support for potential benefits of leisure engagement on positive self-perceptions of aging, regardless of the type of activities. As the overall association appears to be stronger between leisure engagement and subsequent self-perceptions of aging, interventions designed to increase leisure engagement may be effective for improving older adults' health.

Introduction

Population aging is a major challenge for many developed countries. In the United States (US), it is projected that adults aged 65 and above will form 23% of the population by 2060 (Vespa et al., 2020). Often, aging is perceived negatively due to its association with cognitive and physical functioning decline, which poses economic and public health challenges at the societal level. However, in the last few decades, there has been a shift toward positive gerontology (Andrews et al., 2017; Michel & Sadana, 2017). This is reflected in the framework of active and healthy aging, which focuses on enabling older people to take an active part in society and to enjoy an independent and good quality of life, rather than a more reductive focus on chronologic age or merely the absence of illness (WHO, 2020). Self-perceptions of aging (also referred to as attitudes toward aging or satisfaction with aging) are of particular importance in this context. They reflect older people's perspectives on themselves and their aging process, which can be viewed as both

an indicator and promoter of healthy aging. Empirical studies have shown that self-perceptions of aging are related to both physical and mental functioning among older adults, including mortality/longevity (Christensen et al., 2009; Kotter-Grühn et al., 2009; Westerhof et al., 2014), functional health (Levy et al., 2002; Moser et al., 2011; Tovel et al., 2019), cognitive function (Robertson et al., 2015), psychological wellbeing (Freeman et al., 2016; Nakamura et al., 2022), health behaviors (Levy & Myers, 2004; Nakamura et al., 2022), and the use of preventive health services (Kim et al., 2014).

There are many factors that can shape self-perceptions of aging, including demographic characteristics, objective health, and environmental factors (e.g. culture, national policy)(Busso et al., 2019; Macia et al., 2009; Pan et al., 2019). Previous studies have suggested that leisure engagement such as physical activity, gardening, volunteering, arts and cultural activities, creative hobbies and other activities that people engage in during their free time may influence how they evaluate their own aging. Leisure engagement often involves components that comprise of sensory, cognitive or creative stimuli and physical bodily motions or actions (Warran et al., 2022), which can trigger positive emotions that influence individuals' thoughts, behaviours and wellbeing (Fancourt & Finn, 2019). This is supported by Fredrickson's broaden-and-build theory (Fredrickson, 2004). The theory suggests that the experience of positive emotions such as joy, contentment and interest may broaden people's novel and creative thoughts and actions, which in turn build their physical, social, psychological and intellectual resources (e.g. physical capabilities, problem-solving skills, social capital). These resources can then be beneficial for wellbeing and self-perceptions for aging (Fredrickson, 2004). For instance, the arts have been shown to elicit positive affect, increase happiness, help regulate emotions and cope with adversity; and group participation facilitates interpersonal connections, builds meaningful relationships, evokes greater empathy, develops trusted resources and encourages prosocial behaviours (Fancourt & Finn, 2019). All of these could help reduce negative aging stereotypes, improve mutual understanding (Ory et al., 2003), and thus lead to positive aging perceptions.

However, self-perceptions of aging might also influence leisure engagement (Hicks & Siedlecki, 2017). The stereotype embodiment theory proposes that stereotypes of aging are embodied within social and cultural settings (Levy, 2009). Such stereotypes can become internalized across the life span and may operate unconsciously through three pathways: psychological, behavioural and physiological (Levy, 2009). Psychologically, age stereotypes may generate expectations for older adults that act as self-fulfilling prophecies, affecting the way they behave in order to 'meet' those expectations. For instance, a negative labelling of aging may lead one to build negative self-perceptions of aging, raise more aging-related concerns, feel less capable of engaging in leisure activities, and thus become less inclined to engage in these activities that could have the potential to protect against adverse health outcomes (Hess & Hinson, 2006; Levy et al., 2014). Through the behavioural pathway, older adults with more positive self-perceptions of aging may be more likely to engage in health-promoting behaviours, compared to those who hold more negative self-perceptions of aging. For example, a study in Germany (n=5194) found that middle-aged and older adults with more positive perceptions of aging engaged in a higher frequency of leisure

activities (e.g. doing sports, going for walks, board games, engaging in arts and cultural activities), which in turn partially explained the association between self-perceptions of aging and physical health (Hicks & Siedlecki, 2017). Finally, physiologically, older adults with more negative views on their own aging process may have poorer functional health (e.g. Levy et al., 2002), which prevents them from accessing and engaging in leisure activities. There are thus a number of potential causal pathways linking self-perceptions of aging to leisure engagement.

Despite theoretical explanations for both directions, the direction of the relationship between leisure engagement and self-perceptions of aging remains unclear due to a lack of empirical evidence. A better understanding of the directionality of this association is essential for designing more effective interventions to promote healthy aging. Therefore, this study aimed to examine the relationship between leisure engagement and self-perceptions of aging among older adults using data from a national representative sample of American adults aged 50 or over from the Health and Retirement Study (HRS; Sonnega et al., 2014). We tested the following hypothesizes: (1) leisure engagement predicts self-perceptions of aging; (2) self-perceptions of aging also predict leisure engagement. Although leisure engagement is treated as a univariate construct in most empirical studies, it consists of a diverse range of activities which could have differential benefits (Fancourt et al., 2021), which may be multivariate or muti-dimensional (VanderWeele, 2022). Therefore, we further hypothesized that (3) different domains of leisure engagement may be differentially associated with self-perceptions of aging.

Methods

Data

Participants were drawn from HRS, a nationally representative study of more than 37,000 individuals over the age of 50 in the US (Sonnega et al., 2014). The initial cohort was first interviewed in 1992 and followed up every two years, and the sample is replenished with younger cohorts every six years (Sonnega et al., 2014).

We used data from HRS waves where engagement in leisure activities was consistently measured (2008-2018). At each wave, a rotating random 50% subsample of participants were invited to an enhanced interview and given a Leave-Behind Psychosocial and Lifestyle Questionnaire (LBQ) to complete and return by mail, which included questions on leisure activities (Smith et al., 2017). Response rates in each year varied from 62% to 85%. The rotating random subsamples form two sub-panels, with one completing the LBQ in 2008, 2012, and 2016, and the other in 2010, 2014 and 2018. To maximize the sample size, we combined the two sub-panels into one panel which was followed up every four years. There were three waves of longitudinal data, with the baseline wave in 2008/2010 (Figure S1 in the Supplement).

In total, 21,569 participants completed at least one wave of the LBQ, and 20,235 (93.8%) had valid leisure engagement measures. Restricting this sample to participants with at least one wave of data on self-perceptions of aging reduced the sample to 19,291 (89.4%). After excluding participants with missing data on any of the covariates (see below), we were left with an

analytical sample of 17,753 participants (82.3%) and 32,703 observations (1.8 repeated measures per person, range 1-3). All participants gave informed consent. This study has approval from the University of Florida (IRB201901792) and University College London Research Ethics Committee (project 18839/001).

Self-perceptions of aging

Self-perceptions of aging were treated as a univariate latent variable. It was measured by five items from the Attitudes Toward Own Aging subscale of the Philadelphia Geriatric Center Morale Scale and another three items from the Berlin Aging Study to increase reliability as univariate measrue (Smith et al., 2017). Examples of the items include: 'things keep getting worse as I get older', 'the order I get, the more useless I feel', and 'the older I get, the more I have to stop doing things that I like' (for the full list see Table S1). Each of these items were measured on a 6-point Likert scale, from strongly disagree to strongly agree. The original response scale was reverse coded, so that a higher value of the latent variable indicated more positive perceptions (Cronbach's alpha=0.81-0.83).

Leisure engagement

The LBQ included a 20-item Social Participation - Social Engagement scale, which included questions on a wide range of leisure activities (Smith et al., 2017). We excluded two items (childcare and watching television) that were not available in 2008, one item on adult care and another on using a computer as they were not considered leisure activities engaged in for pleasure during spare time. Further, we excluded religious participation (praying privately), focusing on secular participation only. This left us with 15 items which were then grouped into four domains based on exploratory factor analysis (Gao, et al., in preparation). The first domain was community activities including: (1) volunteer work with children or young people, (2) other volunteer or charity work, (3) an educational or training course, (4) sport, social or other club, and (5) meetings of non-religious organizations. The second domain was cognitive activities: (6) reading, (7) word games, (8) play cards or games such as chess, and (9) writing. The third was creative activities: (10) home/car maintenance or gardening, (11) bake or cook something special, (12) make clothes, knit, embroider, etc., and (13) work on a hobby or project. The last domain was physical activities: (14) playing sports or exercising, and (15) walk for 20 minutes or more. These items were coded as: 1=daily, 2=several times a week, 3=once a week, 4=several times a month, 5=at least once a month, 6=not in the last month/never, 7=never/not relevant. All items were reverse coded, so a higher value indicated a higher level of leisure engagement. These items were used to derive a univariate construct of leisure engagement. Further, we derived four domain-specific measures to explore the possibility of muti-dimensionality of leisure engagement(VanderWeele, 2022).

Covariates

We included a range of demographic, socioeconomic, and health-related covariates. Demographic variables were age (50-59, 60-69, 70-79, 80+ years), gender (men, women), partnership status (married/cohabitated, single/separated/widowed), and race/ethnicity (White

[including Caucasian], Black [including African American], Other [including American Indian, Alaskan Native, Asian or Pacific Islander, Hispanic, Other]). In the public HRS data, this variable indicated the race/ethnicity as which participants primarily identified and detailed information was removed to protect participant confidentiality. Socioeconomic covariates were educational attainment (none, high school, college, postgraduate), employment status (employed, not employed), total household income in quartiles (<$19,000, $19,000-$39,999, $40,000-$79,999, ⩾$80,000). Finally, we included two health-related confounders: difficulties with activities of daily living (ADL) and self-reported chronic health conditions (none, one or more), indicating whether participants reported having diabetes, lung disease, cancer, heart conditions, high blood pressure, arthritis, complications from stroke, or other medical conditions. All covariates were measured at baseline.

Statistical Analysis

Data were analysed using the structural equation modelling (SEM) approach. Both self-perceptions of aging and leisure engagement were treated as latent variables and modelled using confirmatory factory analysis (CFA). We tested longitudinal measurement invariance across the three waves by comparing the baseline CFA to metric and scalar invariance CFA models based on model fit indices (see Supplement).

Building on the measurement models, we fitted a path model including autoregressive paths from self-perceptions of aging and leisure engagement in each wave onto the same measure in the subsequent wave (see Figure 1 and Figure S2 for the full SEM). Further, we tested both lagged and concurrent effects of leisure engagement on self-perceptions of aging. We also included a lagged effect of aging perceptions on leisure engagement to examine the possibility of reciprocal relationships. The model controlled for baseline covariates. Missing data on leisure engagement and self-perceptions of aging were handled within the analysis model by using full information maximum likelihood. Analyses were conducted in Mplus version 8.

Results

In our analytical sample (N=17,753), there were 64.6% participants aged between 50 and 69, 58.0% women, 61.8% married or cohabitating, and 16.2% with less than high school education (Table 1). About 23.7% participants self-identified primarily with a racial and/or ethnic background that is minoritized (Table 1). These numbers were largely in line with the US national statistics in 2010 (US Census Bureau, 2010).

[Table 1 here]

Figure 2 shows the estimates of path analysis from the full SEM using leisure engagement as a univariate measure including all 15 items. The model fitted the data reasonably well (RMSEA=0.03, CFI=0.87). Both self-perceptions of aging and leisure engagement significantly and positively predicted the same measures in subsequent waves (β=0.77-0.97), showing stability over time. Concurrently, a higher level of leisure engagement was related to more positive self-

perceptions of aging (β_{w1}=0.66, p_{w1}<0.001; β_{w2}=0.52, p_{w2}<0.001; β_{w3}=0.73, p_{w3}<0.001). The lagged leisure engagement was negatively associated with self-perceptions of aging (β_{w1}=-0.50, p_{w1}<0.001; β_{w2}=-0.73, p_{w2}<0.001). Given the model held the concurrent leisure engagement constant, the negative association should be interpreted as a decrease in leisure engagement since the previous wave (a higher engagement in the previous wave given the same engagement level in the current wave) was associated with less positive self-perceptions of aging. As hypothesized, there was also some evidence of a reverse cross-lagged effect. More positive self-perceptions of aging in the first wave were associated with a higher level of leisure engagement in the second wave (β_{w1}=0.05, p_{w1}<0.001). However, despite being statistically significant, the effect size was very small. And the same lagged relationship was not found between waves two and three (β_{w2}=0.01, p_{w2}=0.092).

[Figure 2 here]

Further, we carried out analyses looking at each domain of leisure engagement separately, namely community activities, cognitive activities, creative activities and physical activities. The results are presented in Figure 3. These models on specific domains fitted the data better than the overall engagement model (model fit indices are shown in Figure 3). This was expected as focusing on specific domains improved the measurement model compared to the composite measure including 15 items across different domains.

[Figure 3 here]

As shown in Figure 3a, higher engagement in community activities was concurrently associated with more positive self-perceptions of aging (β_{w1}=0.28, p_{w1}<0.001; β_{w2}=0.15, p_{w2}<0.001; β_{w3}=0.20, p_{w3}<0.001). Decreased engagement in community activities was also associated with less positive aging perceptions subsequently (β_{w1}=-0.15, p_{w1}<0.001; β_{w2}=-0.20, p_{w2}<0.001). Similarly, both concurrent (β_{w1}=0.26, p_{w1}<0.001; β_{w2}=0.12, p_{w2}<0.001; β_{w3}=0.14, p_{w3}<0.001) and lagged (β_{w1}=-0.10, p_{w1}<0.001; β_{w2}=-0.13, p_{w2}<0.001) effects of cognitive activities on self-perceptions of aging were found in the same direction (Figure 3b). There was some evidence supporting reciprocal relationship for both domains, with small magnitudes. These findings were in line with the results from the overall model. Concurrent and lagged relationships with self-perceptions of aging were also found for creative activities (Figure 3c) and physical activities (Figure 3d). However, there was stronger evidence for reciprocal relationships with aging perceptions for these two domains (i.e. an effect of aging perceptions on subsequent activity engagement). This was particularly the case for physical activities. More positive self-perceptions of aging were associated with a higher level of engagement in physical activities in a subsequent wave (β_{w1}=0.16, p_{w1}<0.001; β_{w2}=0.15, p_{w2}<0.001) where the estimated effects were even larger than those of reversed direction (β_{w1}=0-.10, p_{w1}<0.001; β_{w2}=-0.13, p_{w2}<0.001).

Discussion

This study found consistent empirical evidence supporting our first hypothesis that leisure engagement predicts self-perceptions of aging. There was some limited evidence that aging perceptions also predicted leisure engagement (hypothesis two). Further, all specific domains of leisure engagement were found to predict self-perceptions of aging (hypothesis three). However, there was stronger evidence for a reciprocal relationship of self-perceptions of aging with subsequent engagement in creative activities and physical activities, but less evidence for community activities and cognitive activities.

We found consistent evidence for leisure engagement as a predictor of self-perceptions of aging, both concurrently and longitudinally, when using a univariate measure of leisure engagement and looking at specific domains (community, cognitive, creative and physical activities). More specifically, a higher level of leisure engagement, regardless of the type of activities, was associated with more positive self-perceptions of aging among older adults. This is in line with the broaden-and-build theory (Fredrickson, 2004) and echoes previous literature on the benefits of leisure engagement among older adults (Adams et al., 2011; Noice et al., 2014). Experiences of positive emotions induced through engagement in leisure activities may enrich the quality of older adults' thoughts and actions, stimulate curiosity and encourage experiments and exploration, and give opportunities to gain physical, psychological, social and intellectual resources such as physical capabilities, social bonding, and knowledge/skills (Fredrickson, 2004). The positive affect, more open-minded and flexible cognitive processes and action plans, and accumulated personal resources can all support more positive self-perceptions of aging. The fact that all specific domains of leisure engagement were related to self-perceptions of aging suggests that there may not be any one unique 'ingredient' of specific leisure activities that is responsible for effects, but instead the ability of leisure activities to activate multiple mechanisms of action related to aging perceptions may be key (Fancourt et al., 2021; Warran et al., 2022). This implies that older adults could choose any leisure activity based on their own interests and functional status, which would have similar benefits at least for their self-perceptions of aging. These findings provide empirical support for leisure as a resource for countering negative aging perceptions or stereotypes. Moreover, they shed light on the possibility of self-perception of aging as a mediator of the relationship between leisure engagement and health outcomes shown in existing literature (e.g. Christensen et al., 2009; Levy et al., 2002).

Although there is stronger evidence for leisure engagement as a predictor of self-perceptions of aging, we found some evidence for a reciprocal relationship, especially in the domains of creative activities and physical activities, where these two activities also predict older adults' self-perceptions of aging. This provides empirical evidence for the stereotype embodiment theory, in which older adults with a positive evaluation of their aging tend to have a more optimistic and resilient mindset, have a higher level of self-confidence, and are more likely to engage in health-promoting behaviours (Levy, 2009). However, self-perceptions of aging may not influence all types of leisure engagement. Our study shows that while creative and physical activities are

reciprocally associated with self-perceptions of aging, engagement in community and cognitive activities are less likely to be predicted by self-perceptions of aging. In other words, there is little difference in engagement levels in community or cognitive activities between older adults with different self-perceptions of aging. However, the engagement level in creative and physical activities varies in accordance with self-perceptions of aging. A possible explanation is that engagement in creative and physical activities may require more positive self-perceptions to overcome relatively higher levels of perceived difficulties, barriers or stereotypes compared to other activities that are more commonly engaged among older adults. It is also possible that community and cognitive activities are more closely related to other factors (e.g. social relationships and cognitive function) other than self-perceptions of aging.

In a recent paper, VanderWeele (2022) emphasized the importance of appropriate measurement for psychosocial constructs, in particular the dimensionality of the exposure. Although we found all specific domains of leisure engagement predicted self-perceptions of aging, these findings should not be taken as suggesting leisure engagement as a univariate construct or all leisure activities being equally beneficial. First, leisure is an umbrella term for a wide range of non-work activities that people engage in during free time. Despite having data for 15 activities, there were other leisure activities (e.g. watching television, listening to music, shopping) that were not included in our analyses. Additionally, we only considered one type of classification for leisure activities (Gao, et al., in preparation). It is possible that a more exhaustive list of leisure activities may lead to a different classification and multi-dimensionality of leisure engagement potentially. Second, these findings should be interpreted with respect to the study population and outcome measure. To better understand the dimensionality of leisure engagement and underlying causal mechanisms, empirical evidence is needed for other outcomes, age groups and cultures. Third, although we examined the association of self-perceptions of aging with specific domains measured by conceptually related item sets, it is possible that these domains are not univariate themselves. Future research is encouraged to examine associations item-by-item (VanderWeele, 2022). In addition to the conventional reflective and formative measurement models, another possibility is that leisure activities all share different ingredients, overlapping to different degrees (Warran et al., 2022). Some activities may cluster together as sharing more ingredients than others, but that does not necessarily mean they are a fully defined category or dimension. Future studies could explore alternative conceptualisation and measurement of leisure taking the ingredients perspective.

Our study has several strengths. HRS is a large nationally representative panel study which allowed us to investigate both concurrent and longitudinal associations and to examine the possibility of reciprocal relationships whilst controlling for a wide range of potential confounders. Due to the comprehensive measures of various leisure activities, we were able to look at different domains of leisure engagement. However, this study is not without limitations. First, there were only three waves of data wherein participants were followed up every 4 years. On the one hand, this prevented us from examining longitudinal associations within shorter follow-ups, which could influence the strength of the association. On the other hand, future research is needed to

examine longitudinal trajectories of leisure engagement and self-perceptions of aging over a longer period when more waves of data become available. Second, because HRS uses a binary construct for gender and one 'other' category to collect a range of races/ethnicities, we were not able to investigate nuances of gender or racial/ethnic identities, and associated racism and cultural caste systems. This limitation underscores challenges in controlling for demographics and the need for improving methods for measuring and accounting for structural racism in statistical research (Hardeman et al., 2022).

The self-perception of aging is an important indicator and promoter of healthy aging. Our study has provided strong evidence for potential benefits of leisure engagement on positive self-perceptions of aging, regardless of the type of activities. Moreover, we have shown that positive self-perceptions of aging could also increase the level of specific types of leisure engagement, namely creative activities and physical activities. Self-perceptions of aging are therefore not only a product of these types of leisure engagement, but also contribute to future engagement, potentially in a positive bidirectional cycle. Given the existing evidence for the associations of both leisure engagement (e.g. Fancourt & Finn, 2019) and self-perceptions of aging (e.g. Levy et al., 2002) with health in older adults, they both have potential to support healthy aging. As the overall association appears to be stronger between leisure engagement and subsequent self-perceptions of aging, targeting leisure engagement may be most effective for improving the health of older adults, as it is also likely to improve self-perceptions and potentially enhance amenability to change, which comes with a wide range of other health benefits. For some leisure domains, such as community and cognitive activities, self-perceptions of aging may not be particularly important in determining levels of engagement. However, for creative and physical activities in particular, we may need to consider how self-perceptions of aging may prevent older adults from engaging in these activities. Overall, our findings provide evidence for interventions and general guidelines for promoting leisure engagement among older adults.

Declarations:

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Author Contributions

FB and DF designed the study. FB conducted the analysis. FB DF and JB interpreted the findings. FB HWM and JB drafted the manuscript. DF QG and JKS contributed to the interpretation of the findings and made critical revisions to the manuscript. All authors read and approved the final manuscript.

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Conflict of Interest

The authors declare no competing interests.

Ethical Approval

This is an observational study which has Institutional Review Board approval from the University of Florida (IRB201901792) and ethical approval from University College London Research Ethics Committee (project 18839/001).

Data availability statement

The raw HRS data are available from the RAND Center for the Study of Aging (https://hrsdata.isr.umich.edu/data-products/rand).

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Tables and Figures

Table 1 Sample characteristics of the analytical sample (N=17,753)

Variable		Percentage %
Age	50-59	38.8%
	60-69	25.8%
	70-79	24.3%
	≥80	11.1%
Gender	Women	58.0%
	Men	42.0%
Partnership status	In partnership	61.8%
	Not in partnership	38.2%
Ethnicity	White	76.3%
	Black	16.1%
	Other	7.5%
Education	None	16.2%
	High school	53.0%
	College	20.7%
	Postgraduate	10.1%
Employment	Employed	37.9%
	Not employed	62.1%
Household income	<$19,000	20.8%
	$19,000-$39,999	25.3%
	$40,000-$79,999	26.9%
	≥$80,000	27.0%
Chronic health conditions	None	14.5%
	One or more	85.5%
ADL	None	84.6%
	One or more	15.4%

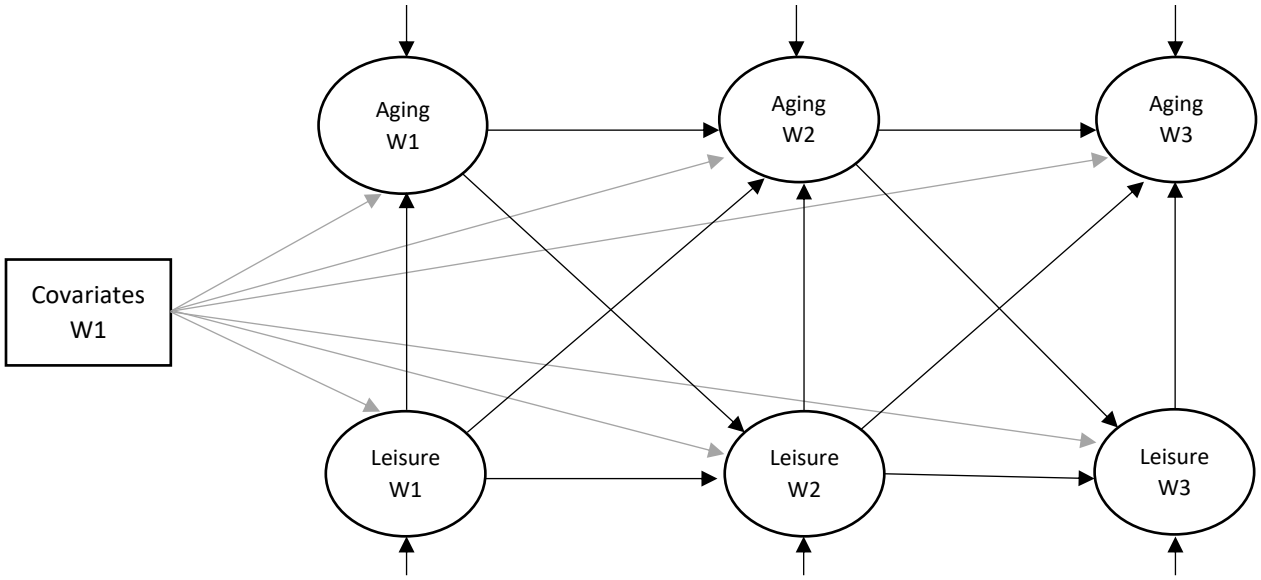


Figure 1 Model specification path diagram (omitting measurement models for simplicity)

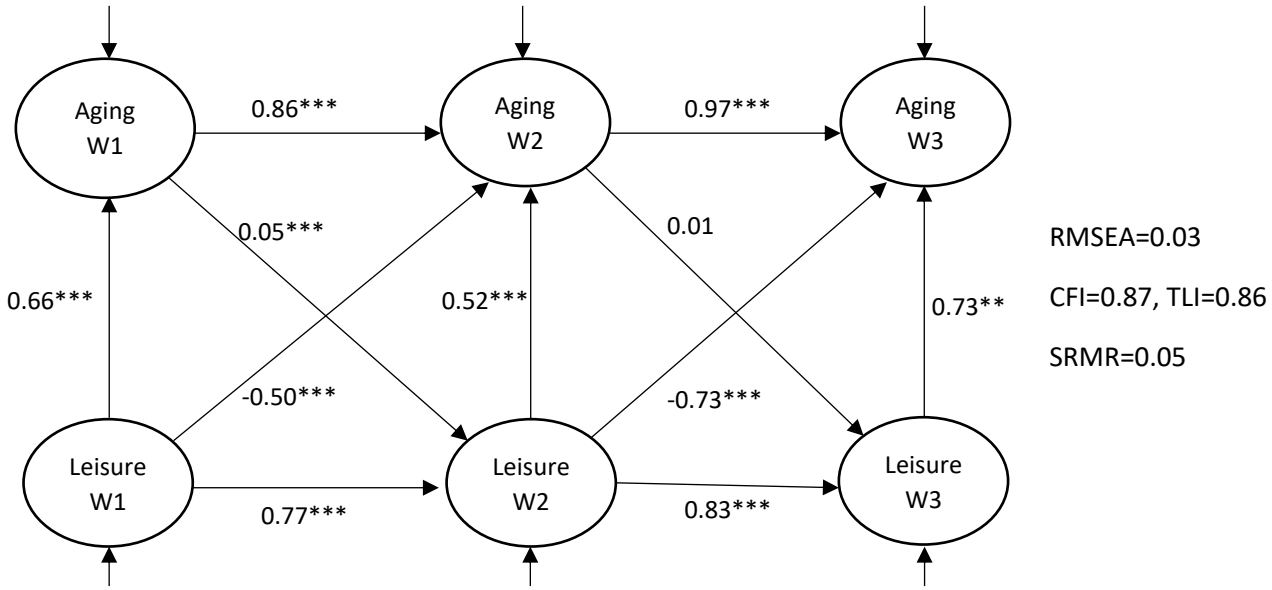
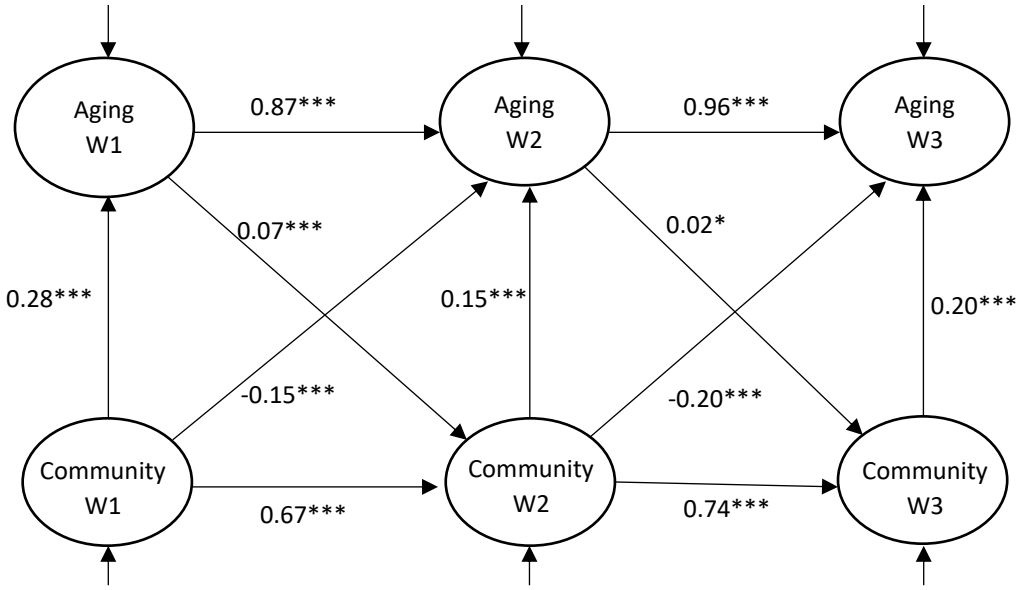


Figure 2 Results from the full structural equation model using leisure engagement as a composite measure. Higher values of the latent variables indicate a more positive perception of aging or a higher level of leisure engagement (*** p<0.001 ** p<0.01 * p<0.05)



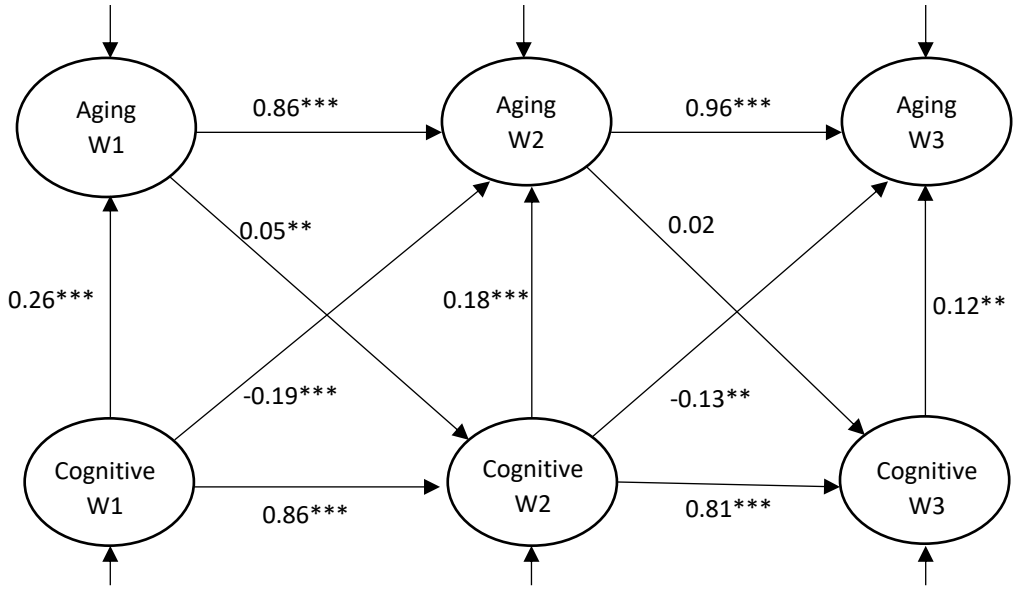


Figure 3 Results from the full structural equation model on each domain of leisure engagement (a higher value of latent variable indicating a more positive perception of aging or a higher level of engagement, *** p<0.001 ** p<0.01 * p<0.05)

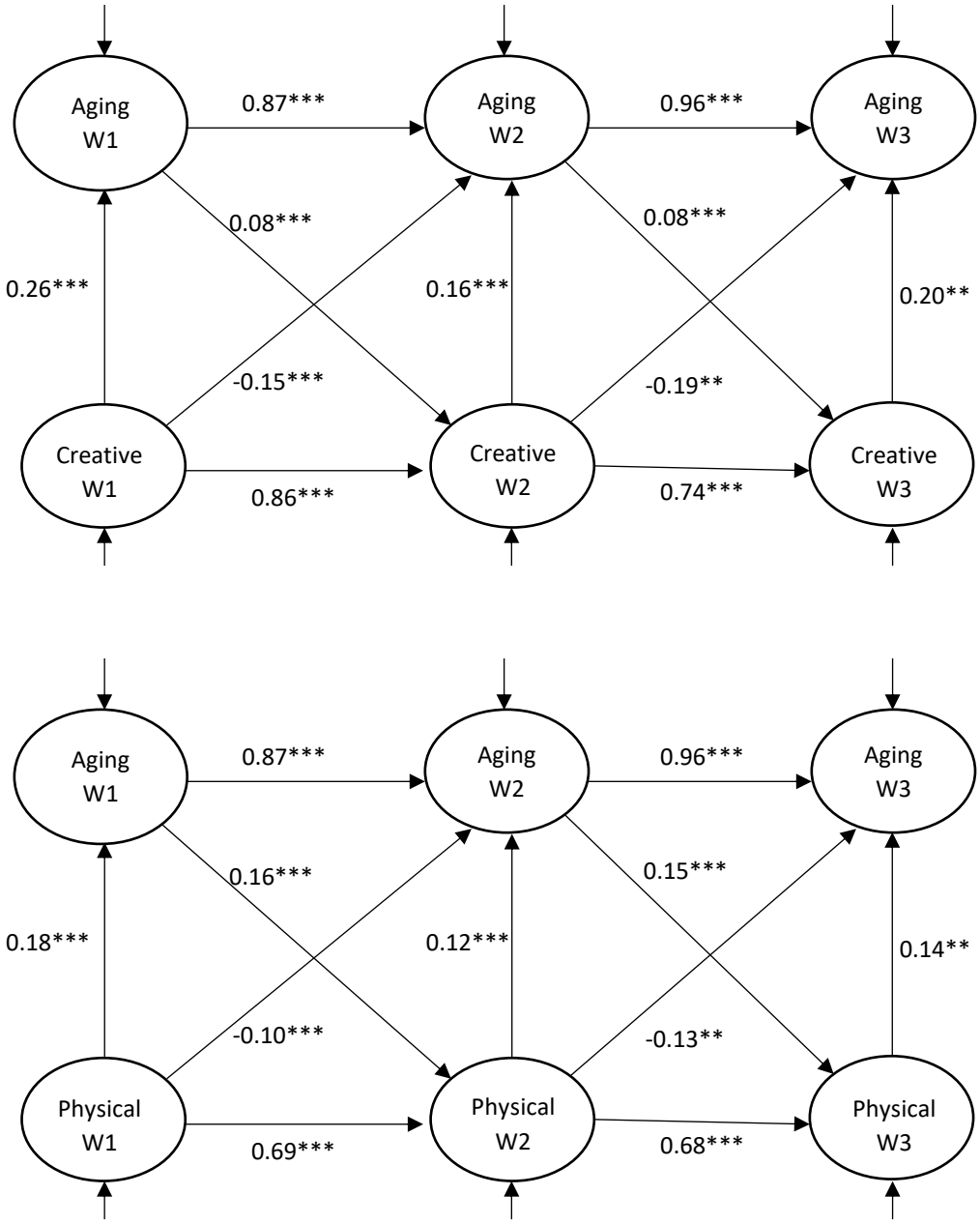


Figure 3 Results from the full structural equation model on each domain of leisure engagement (a higher value of latent variable indicating a more positive perception of aging or a higher level of engagement, *** p<0.001 ** p<0.01 * p<0.05)