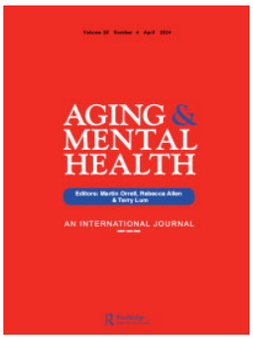

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Procrastination, depressive symptomatology, and loneliness in later life

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ABSTRACT

Objectives: Procrastination is an almost universal behaviour and yet little research to date has focused on procrastination among older adults. The purpose of this study was to explore the potential association between age and procrastination, and the potential mediating roles of depressive symptomatology and loneliness.

Method: Structural equation modelling was applied to data from 1309 participants (aged 29–92) from two waves United States Health and Retirement Study (2016–2020). Within the model, sex, education, marital status, and job status were added as covariates.

Results: There was no statistically significant direct effect between age and procrastination ($\beta = 0.06$, $p = 0.106$). However, an indirect effect was present *via* depressive symptomatology ($\beta = -0.40$, $p < 0.001$). No mediating effect of loneliness was observed ($\beta = -0.01$, $p = 0.371$). Subsequent analysis revealed that the symptoms, fatigue, loneliness, and lack of motivation significantly predicted procrastination.

Conclusion: While age was not directly associated with procrastination, increasing age was associated with a decreased likelihood of depressive symptomatology, which was in turn associated with an increased likelihood of procrastination. Such findings indicates that age demonstrates no association with procrastination because of the suppressing effect of depressive symptomatology.

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Health and retirement study; structural equation modelling; mediation; voluntary delay; mental health

Introduction

Procrastination is an intentional delay of an intended course of action, despite potential negative consequences (Steel, 2007), such as stress, reduced productivity, missed opportunities, and potentially compromised performance. While there is no reason to believe that procrastinatory behaviour disappears with age, to date research has predominantly focused on student and younger adult populations, with little attention given to procrastination behaviours among older adults.

Procrastination and procrastinatory behaviour are influenced by a multitude of factors. Previous studies on younger populations have identified psychological factors such as perfectionism, fear of failure, lack of motivation, individual differences, and maladaptive cognitive thinking as predictors of procrastination (Abbasi & Alghamdi, 2015; Balkis & Duru, 2007; Steel, 2007). Additionally, environmental factors such as task aversiveness, temporal delay, and lack of structure can also predict likelihood of procrastinatory behaviours (Klingsieck et al., 2013; Steel, 2007). Furthermore, studies have linked procrastination to heightened stress and depression levels, noting that the distress it causes can intensify the emotions leading to more procrastination (Fernie & Spada, 2008; Flett et al., 2012, 2016). This self-perpetuating cycle can be particularly detrimental to wellbeing, as it may lead to a decline in self-esteem and a sense of personal efficacy.

However, to gain a more comprehensive and holistic understanding of procrastination, research also needs to take into consideration procrastination in later life and examine its predictors among older adults. Procrastination in older adults can lead to a range of negative outcomes, including poor health management, delayed financial planning, and the exacerbation of social isolation. For instance, procrastination on health-related decisions can result in more severe health consequences for older adults compared to younger individuals due to the cumulative effects of aging and the potential for rapid health deterioration (Diehr et al., 2013; Stolcis & McCown, 2018). Postponing medical appointments or treatment adherence can escalate manageable conditions into critical emergencies. Furthermore, procrastination in financial decision-making related to retirement savings and asset management can lead to economic hardship.

Some studies on procrastination have gathered data from older adults, without focusing specifically on this age group. For instance, in a study of adults aged 18–77, procrastination was found to decrease with age up to the age of 60, whereupon it began to increase again (McCown & Roberts, 1994). This increase was attributed, by others, to retirement or health decline (Ferrari et al., 1995). A similar pattern, with a later inflection point of aged 70, was reported by Beutel et al. (2016) based on a sample of individuals aged 14–95. However, the potential reasons for this increase were not discussed in the study.

While these two studies did not focus specifically on procrastination in later life, the pattern of results they report suggests that there is a shift in procrastination at some point beyond the age of 60. As mentioned, Ferrari et al. (1995) attributed this shift to retirement or health decline. Retirement can be a challenging adjustment for some individuals, leading to uncertainty, loss of identity, and reduced social interaction, which may impact motivation and productivity (Henning et al., 2016; Heybroek et al., 2015; Wang, 2007). Furthermore, Sirois et al. (2003)

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proposed that procrastination is associated with declining health through increased stress and a reduction in health seeking behaviours. However, Johansson et al. (2023) suggests a bi-directional relationship with declining physical and mental health also contributing to increased procrastination due to reduced energy and motivation.

Additionally, neurobiological studies have linked variations in grey matter volume within the brain to procrastination. This association particularly highlights specific regions of the brain such as the dorsolateral prefrontal cortex, orbital frontal cortex, and ventromedial prefrontal cortex (Chen et al., 2020; Hu et al., 2018). These specific areas govern executive functions, such as decision-making, impulse control, and the ability to prioritize tasks. However, these areas of the brain are known to undergo changes overtime due to neurocognitive aging. For example, the dorsolateral prefrontal cortex, which is crucial for working memory and planning shows a decline in neural efficiency overtime (Rajah & D'Esposito, 2005). Similarly, the orbital frontal cortex, involved in the evaluation of risks and rewards, and the ventromedial prefrontal cortex, associated with emotional regulation, also undergo significant changes (Cohen et al., 2019).

Moreover, older adults are more likely to experience a range of uncontrollable life factors which may also contribute to increases in procrastinatory behaviours. Such factors include the above-mentioned declining health and cognition and retirement, along with the loss of loved ones and reduced social connections (Okun & Keith, 1998). Loneliness is commonly associated with these declines and has been linked to higher prevalence rates among older adults (Ekwall et al., 2005; Lim, 2018; Surkalim et al., 2022). Loneliness is described as a perceived discrepancy between one's actual and desired levels of social relationships (Peplau & Perlman, 1982) and can lead to individuals feeling demotivated (Perlman & Peplau, 1981). As noted by Weiss (1975), tasks can lose their purpose and significance for lonely individuals, consequently increasing the likelihood of procrastination. Furthermore, loneliness can negatively affect cognitive functioning and in turn, decision-making processes (Lara et al., 2019), further exacerbating procrastination tendencies.

As well as loneliness, depression may also be a factor in determining procrastination behaviour in later life. Symptoms such as reduced pleasure in activities, low levels of energy, and difficulties concentrating (American Psychiatric Association, 2013) are noted as common reasons for procrastination in student populations (Strongman & Burt, 2000). While depression is less prevalent in older adults (Fiske et al., 2009) and can be understood though frameworks such as selective optimization with compensation (Baltes & Baltes, 1990) and socioemotional selectivity theory (Carstensen et al., 1999) its effects and symptoms can still be profoundly detrimental. Previous research (Beutel et al., 2016; Flett et al., 2016; Van Eerde, 2003) has established a link between depression and procrastination, suggesting that cognitive factors such as ruminative brooding and a lack of mindfulness may exacerbate procrastination (Flett et al., 2016). These cognitive patterns can lead to a vulnerability to depression, characterized by a high frequency of procrastination-related automatic thoughts and a deficit in self-compassion (Flett et al., 2016).

With regard to procrastination in older adults research is limited. However, a recent study by Biella et al. (2020) found that higher levels of depressive symptoms were correlated with two maladaptive decision-making profiles: an 'avoidance profile' where individuals rely on external sources for decision making, and a 'procrastination profile' involved individuals who consistently delay decision-making processes for as long as possible.

Overall, loneliness and depression may, as such, predict procrastination. However, the existing body of research primarily focuses on younger student populations (Anam & Hitipeuw, 2022; Beutel et al., 2016; Flett et al., 2016) with limited research focusing on older adults. As such, the objectives of this study were twofold: (i) investigate the direct effect of age on procrastination and, (ii) investigate the indirect effects of loneliness and depressive symptomology on procrastination tendencies among older adults.

Method

Design and participants

This study utilized a longitudinal dataset known as the United States Health and Retirement Study (HRS) (Juster & Suzman, 1995). The HRS, administered by the Institute for Social Research at the University of Michigan, is a longitudinal panel study that predominantly focuses on adults over the age of 50. The study collects, biennially, detailed information pertaining to respondent's physical, cognitive, financial, employment, family, and psychosocial conditions. In each wave of the HRS, methods of data collection vary for each respondent. The core sample is split into two distinct subsamples, distinguished as 'subsample A' and 'subsample B'. In each wave subsample A undergoes an enhanced face-to-face interview, which encompasses the core interview along with physical and biomarker assessments, and administration of a psychosocial and lifestyle questionnaire. In contrast, subsample B undergoes a telephone interview without the administration of the assessments or the psychosocial and lifestyle questionnaire. These two subsamples alternate during each data collection wave. Similarly, in each wave, experimental modules are administered at the end of the core interview. These modules consist of concise questionnaires designed to explore new topics or supplement existing core survey data. However, each respondent only receives one experimental module, and the sample sizes for each module constitute approximately 10% of the core sample.

For our analysis, we utilized data from two waves of the HRS (2016 and 2020), focusing on respondents who were selected to complete an experimental module termed 'long-term care insurance procrastination' during the 2020 wave. This module was split into two parts with the second half incorporating a procrastination measure with the aim of investigating how procrastination influences decision-making in later life.

Measures

Procrastination

Procrastination was measured using the Pure Procrastination Scale (PPS) (Steel, 2010). This scale was developed by combining the 12 highest loading items from 3 other measures of procrastination (Lay, 1986; Mann, 1982; McCown & Johnson, 1989). The items within the PPS specifically measure dysfunctional delay, with each being measured on a five point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Combining the item scores gives rise to a composite score from 12 to 60, with higher scores indicating higher levels of procrastination. The PPS conducted in 2020 (wave 2) was measured by Cronbach's alpha ($\alpha = 0.91$), showing high internal consistency. An example

of a question from the scale includes, 'even after I make a decision I delay acting upon it'.

Depression

Depressive symptoms were measured using a shortened 8-item version of the Centre for Epidemiological Studies—Depression (CESD-8) scale. The shortened scale is increasingly employed in large international studies such as the European Social Survey (Van de Velde et al., 2010) and the HRS (Zivin et al., 2010). Within the HRS, items on the scale are scored as either 1 (yes) or 5 (no), with items 4 and 6 being reversed scored. However, to facilitate consistent scoring with other measures, we modified the scoring system for our analysis. Responses were recoded as 0 (no) and 1 (yes), with items 4 and 6 remaining reversed scored. Combining the item scores gives rise to a composite score from 0 to 8, with higher scores indicating more depressive symptoms. The CESD-8 conducted in 2016 (wave 1) was measured by Cronbach's alpha ($\alpha = 0.81$), showing high internal consistency. An example of a question from the scale includes, 'how much of the time during the past week did you feel everything you did was an effort'.

Loneliness

Within the HRS, loneliness is measured using an 11-item version of the Revised University of California, Los Angeles (R-UCLA) Loneliness Scale (Lee & Cagle, 2017). However, for the purposes of our analysis, we utilized the first 3 items, which form the shortened 3-item version of the scale. Each item on this scale measures 3 dimensions of loneliness: relational connectedness, social connectedness, and self-perceived isolation. Each of the three items are scored on a three-point Likert scale ranging from 1 (often) to 3 (hardly ever or never) with all of them being reversed scored. Combining the item scores gives rise to a composite score from 3 to 9, with higher scores indicating higher levels of loneliness. The 3-item R-UCLA conducted in 2016 (wave 1) was measured by Cronbach's alpha ($\alpha = 0.80$), showing high internal consistency. An example of a question from the scale includes, 'how often do you feel left out'.

Covariates

The potential covariates sex, education, marital status, and job status were chosen based on a priori knowledge of their associations with procrastination (Beutel et al., 2016; Steel & Ferrari, 2013). Education was initially categorised into several levels: no degree (0), general educational development (1), high school diploma (2), college degree (2 years) (3), college degree (4 years) (4), master's degree (5), doctorate (6). However, to facilitate the analysis, this ordinal scale was collapsed into a binary scale based on the presence college degree: does not possess a college degree (0), possesses a college degree (1). Marital status was categorised into several levels: married (1), separated/divorced (2), widowed (3), never married (4). Again, for the purpose of analysis, a binary scale was adopted based on the current marital status of being: not currently married (0), currently married (1). Job status was categorised into several levels: currently working (1), unemployed (2), laid off (3), disabled (4), retired (5), homemaker (6), other (7), on sick leave (8). Once again, for the purpose of analysis, a binary scale was adopted based on retirement status: not retired (0), retired (1).

Data analysis

All data analysis was carried out in R (R Core Team, 2013). Within the final dataset, 7.45% of the data was missing across the entire dataset, though a significant proportion of this missingness was contained within the R-UCLA loneliness items. These missing values were handled using Full Information Maximum Likelihood (FIML) from the R package 'Lavaan' (Rosseel, 2012). FIML is based on the maximum likelihood estimation principle and allows for the estimation of parameter values that are most likely to be true given the available data. Unlike traditional imputation methods, FIML provides better flexibility by allowing for maximal use of existing data relative to other missingness approaches and has been shown to perform equivalently to multiple imputation in handling missing data (Lee & Shi, 2021).

Prior to modelling, preliminary analyses were run to ensure that there was no violation of model assumptions. A structural equation model was applied to the data to assess the direct association between age and procrastination with both depressive symptomatology and loneliness being assessed as potential mediators. Structural equation modelling is a comprehensive statistical technique that utilizes regression models for the analysis of complex relationships between measured (observed) and latent (unobserved) variables. It provides a framework for constructing and testing models that hypothesize the directional influence of certain variables on others, including potential indirect effects through mediators. The proposed model consisted of multiple indicator factors, with the distinct items from each scale serving as indicators of their respective factor.

Model parameters were estimated using the Maximum Likelihood Method, with the null hypothesis being rejected for the hypothesized direct and indirect effects if $p < .05$. To assess model fit absolute fit indices, such as the chi-square test, root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR), along with incremental fit indices such as, the comparative fit index (CFI) and the Tucker-Lewis index (TLI) were used. Due to the chi-square test's sensitivity to large sample size (Bentler & Bonett, 1980) a greater focus was placed on the other fit metrics. Following established literature, a model was considered well fitted when the CFI and TFI values were greater than 0.90, RMSEA below 0.08, and SRMR below 0.05 (Hu & Bentler, 1999; Joreskog & Sorbom, 1993).

Results

The initial analysis included a total of 1320 respondents. However, we excluded respondents who had missing values in key covariates, specifically job status ($n = 8$) and marital status ($n = 3$). As a result, our final analytic sample consisted of 1309 respondents. Of this sample, 63.18% of respondents were female ($n = 827$) and were predominantly aged 50+ years: 20–29 years ($n = 2$), 30–39 years ($n = 5$), 40–49 years ($n = 45$), 50–59 years ($n = 428$), 60–69 years ($n = 437$), 70–79 years ($n = 273$), and 80+ years ($n = 119$). Descriptive statistics for all continuous variables were generated and are presented in Table 1.

Structural equation model

To assess the indirect effects of depressive symptomatology and loneliness on procrastination, a structural equation model was applied to the data (see Figure 1). The model was run for

Table 1. Descriptive statistics of all continuous variables.

Variable	Mean [95% CI]	Std. Error Mean	Median	SD	Range
Age	64.3 [63.70–64.81]	0.28	63	10.29	28–92
Procrastination	28.4 [27.78–29.04]	0.32	27	11.62	4–60
Depressive symptomatology	1.49 [1.39–1.61]	0.06	1	2.03	0–8
Loneliness	4.37 [4.21–4.52]	0.08	4	1.60	1–9

Note. Square brackets are used to enclose the lower and upper limits of a confidence interval.

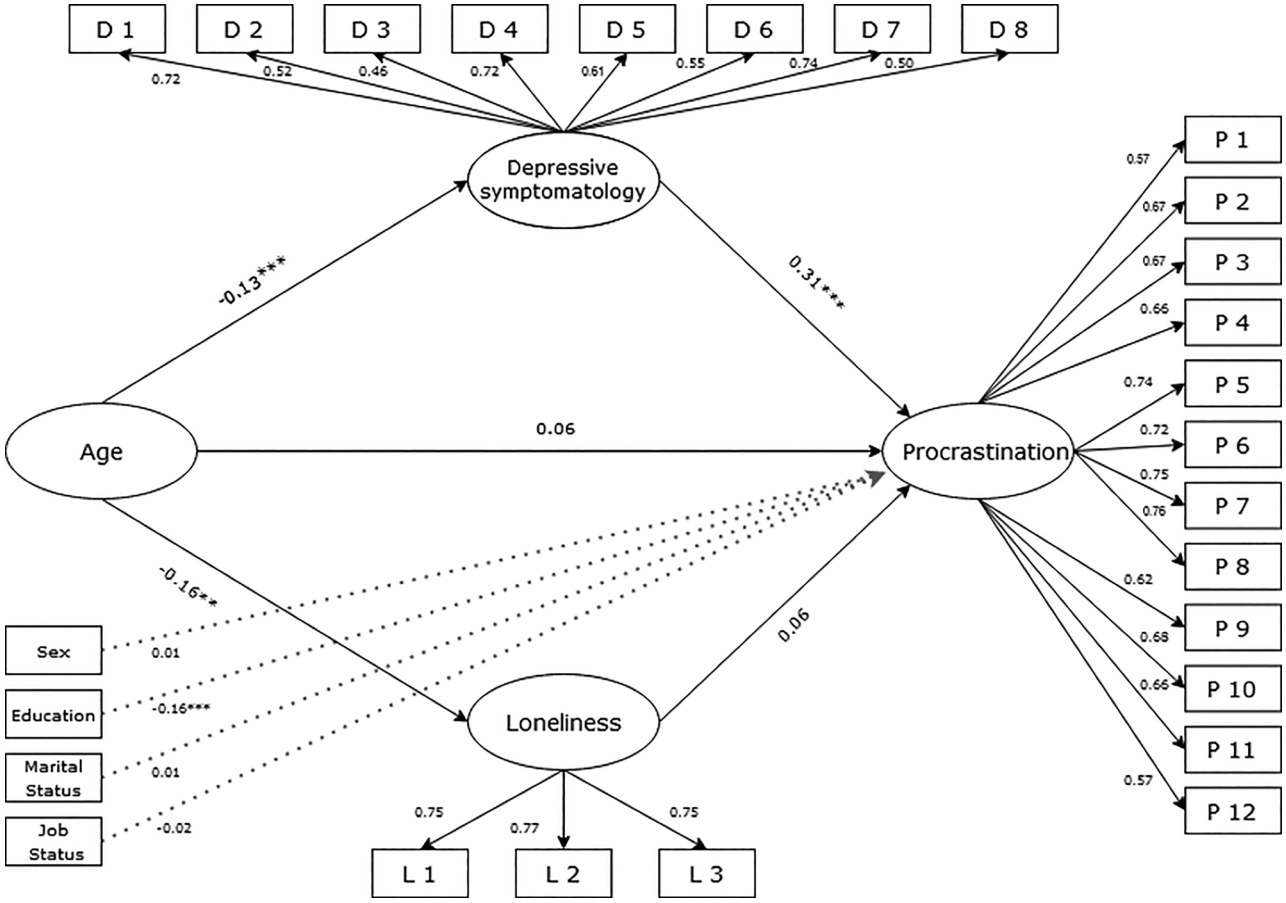

Figure 1. Structural equation model with depressive symptomology and loneliness as mediators.
Note. In the following structural equation model, we have employed a set of measured constructs (D1–D8, P1–P12, and L1–L3) each of which corresponds to specific survey questions designed to gauge the underlying latent construct (depressive symptomatology (D), procrastination (P), and loneliness (L)). The numerical values (beta values) represent the strength and direction of the relationship between the variables. Statistically significant pathways are represented as ** p < .01; *** p < .001. The total effect of age on procrastination is (β = 0.010, p = 0.782).

138 iterations and converged normally. Model fit was acceptable (CFI = 0.931, TLI = 0.923, X^2_{330} = 11520, RMSEA = 0.042, SRMR = 0.047). Latent variable loadings were all above 0.56 for procrastination, 0.46 for depressive symptomatology, and 0.74 for loneliness.

The results show that age did not have a significant direct (β = 0.06, p = 0.106) or total (β = 0.01, p = 0.782) effect on procrastination. However, an indirect effect was present for depressive symptomatology (β = −0.04, p < 0.001). While age was not directly associated with procrastination, age was associated with a decreased likelihood of depressive symptomatology (β = −0.13, p < 0.001). The presence of depressive symptomatology was in turn associated with an increased likelihood of procrastination (β = 0.31, p < 0.001). Age was similarly associated with a decreased likelihood of loneliness (β = −0.16, p = 0.003) however this decrease was not associated with procrastination (β = 0.06, p = 0.343). As such, no mediating effect of loneliness was observed (β = − 0.01, p = 0.371).

Furthermore, the results of the model showed that education was significant associated with procrastination (β = − 0.16, p < 0.001). The additional model covariates, sex (β = 0.01, p = 0.864), marital status (β = 0.01, p = 0.805), and job status (β = − 0.02, p = 0.609) did not show significant associations with procrastination.

Multiple regression symptom analysis

To gain a deeper insight into the relationship between depressive symptomatology and procrastination additional supplementary analyses were carried out. Based off their CESD-8 scores respondents were categorized into two groups: having no depressive symptoms (n = 596) and having depressive symptoms (n = 713). Initially, an independent samples t-test was conducted to compare mean procrastination scores between each group. There was a statistically significant difference in scores (t(1302) = −9.30, p < 0.001) with respondents who had depressive symptoms (M = 31.06, SD = 11.80) scoring higher than respondents with no depressive symptoms (M = 25.25, SD = 10.60). The magnitude of difference in the means was medium (Cohen's d = 0.52).

Following this, a standard multiple regression analysis was performed to determine how well mean procrastination could

Table 2. Multiple regression model of items from the CESD-8 scale predicting procrastination.

	R^2	β [95% CI]	B [95% CI]	sr^2	r
Model	.108***				
Depression		.00 [– .07–.07]	– .01 [– .22–.20]	.00	.19 ***
Fatigue		.13 *** [.07–.19]	.30 [.16–.43]	.01	.25 ***
Restlessness		.06 [.00–.11]	.12 [.00–.24]	.00	.18 ***
Lack of happiness		.03 [– .05–.10]	.07 [– .13–.28]	.00	.19 ***
Loneliness		.07 * [.01–.13]	.18 [.01–.34]	.00	.21 ***
Lack of enjoyment		.00 [– .06–.07]	.01 [– .20–.22]	.00	.15 ***
Sadness		.07 [.00–.14]	.16 [– .01–.34]	.00	.22 ***
Lack of motivation		.13 *** [.07–.19]	.33 [.18–.47]	.01	.24 ***

Note. R^2 = R-squared; β = standardized beta value; B = unstandardized beta value; sr^2 = semi-partial correlation squared; r = zero-order correlation. A significant β indicates the unstandardized beta value and semi-partial correlation are also significant. Square brackets are used to enclose the lower and upper limits of a confidence interval. Statistical significance is represented as: * $p < 0.05$; *** $p < 0.001$.

be explained by each measure on the CESD-8. The model as a whole explained 10.9% of variance in procrastinatory behaviour ($F(8, 1276) = 19.32$, $p < 0.001$). It was found that fatigue ($\beta = 0.13$, $p < 0.001$) significantly predicted procrastination, along with loneliness ($\beta = 0.07$, $p = 0.033$) and lack of motivation ($\beta = 0.13$, $p < 0.001$). The remaining measures, depression ($\beta < 0.001$, $p = 0.928$), restlessness ($\beta = 0.06$, $p = 0.058$), lack of happiness ($\beta = 0.03$, $p = 0.482$), lack of enjoyment ($\beta < 0.001$, $p = 0.912$), and sadness (0.07, $p = 0.063$) did not significantly predict procrastination. See Table 2 for full details.

Discussion

The objective of this study was to investigate the potential association between age and procrastination, with a particular focus on the potential mediating roles of loneliness and depressive symptomatology. It was hypothesised that (i) age would have a direct effect on procrastination and (ii) loneliness and depressive symptomatology would act as mediating variables between age and procrastination. The findings of the study did not support the initial hypothesis, with age having no direct effect on procrastination. However, the subsequent hypothesis received partial support, revealing that depressive symptomatology serves as a partial supressing mediator between age and procrastination.

The results imply that while age may not directly influence procrastination, the presence of depressive symptoms among older adults can contribute to variations in procrastinatory behaviours. In other words, being older is associated with a decreased risk of depressive symptoms, which in turn are associated with procrastination. As such, older adults are indirectly less likely to procrastinate because they are less likely to experience the depressive symptoms typically associated with procrastination. These results are in line with theoretical frameworks and may be linked to protective factors such as their ability to adapt and compensate for age-related challenges, as well as focusing on emotional well-being and meaningful experiences (Baltes & Baltes, 1990; Carstensen et al., 1999). At the same time, the link between depressive symptoms and procrastination coincides with previous research findings (Beutel et al., 2016; Biella et al., 2020; Fiske et al., 2009; Rozental et al., 2015; Steel, 2007) and can be understood through the lens of how depression affects both an individual's motivation and cognitive functioning.

The results of the model showed that the presence of depressive symptoms was associated with an increased likelihood of procrastination. Supplementary analysis revealed that respondents who had one or more depressive symptoms had higher levels of procrastination. For those older adults the symptoms of depression may manifest differently compared to their younger counterparts. As highlighted by Fiske et al. (2009), older adults are less likely to experience cognitive-affective symptoms and more likely to experience fatigue, sleep disturbances, reduced interest in activities and concentration, and cognitive decline. This is in line with the results of the regression analysis which showed that fatigue and lack of motivation significantly predicted procrastination. These depressive symptoms can inadvertently hinder one's ability to initiate and complete tasks (Rozental et al., 2015). The interplay between depression and procrastination is evident in the way depressive symptoms can lead to a cycle of delayed actions and increased stress (Flett et al., 2012, 2016). The lack of motivation and diminished interests can contribute to a sense of apathy and a reduced enthusiasm to engage in productive behaviours. Similarly, low levels of energy and difficulties concentrating can further impede effective task management and hinder progress toward completing necessary activities.

As mentioned, advancing age brings with it a range of uncontrollable life factors, ranging from declining health, cognitive impairment, and retirement, along with the potential repeated deaths of friends and loved ones. Moreover, older adults face unique societal and cultural challenges, most notably ageism. In the absence of protective factors, the cumulative effect of these stressors can significantly contribute to the development of depressive symptoms among older adults and potentially cumulate into late-life depression (Husain-Krautter & Ellison, 2021). The development of these symptoms and depression itself could potentially shed light on the increase in later-life procrastination scores noted in both McCown & Roberts (1994) and Beutel et al. (2016) studies. Both studies revealed an increase in procrastination scores beyond the approximate age threshold of 60, which coincides with the onset of late-life depression (Aziz & Steffens, 2013; Fiske et al., 2009).

To effectively support older adults, interventions must be tailored to their unique experiences and challenges, such as coping with ageism, health decline, and bereavement. Support groups and therapy that focus on these life factors can provide the necessary tools to manage depressive symptoms more effectively (Eimontas et al., 2021; Krishna et al., 2011). Moreover, by tackling the underlying causes of depression, such interventions can help reduce procrastination, as they regain a sense of self control (Sirois & Pychyl, 2013). Furthermore, incorporating physical activity programs can combat fatigue and improve cognitive function, thereby reducing the tendency to procrastinate (Paterniti et al., 2002).

This tendency to procrastinate can have detrimental consequences for older adults, particularly in relation to their physical and mental well-being. Procrastination is frequently linked to heightened levels of stress and a decline in self-care behaviours

(Sirois et al., 2003; Steel, 2007). Such decline can have profound ramifications for the lives of older adults. For instance, when older adults postpone medical appointments and checkups, the effects can be far more catastrophic compared to their younger counterparts. Age-related health conditions tend to progress more rapidly and can have more severe implications for older individuals (Diehr et al., 2013). Similarly, with age the body's ability to recover and respond to medical treatments may decrease. As such, delaying appointments and checkups can potentially lead to the exacerbation of health conditions, missed opportunities for early intervention, and increased risks to overall well-being. Additionally, the consequences of procrastination can also extend to critical financial decision-making processes. By procrastinating important financial tasks such as managing retirement disbursements or planning for healthcare and other expenses older adults risk facing financial difficulties and may struggle to maintain a stable and secure lifestyle in their later stages of life.

No mediating association was found between loneliness and procrastination. These results are not in line with previous research on loneliness and procrastination (Anam & Hitipeuw, 2022; Beutel et al., 2016). However, such research has focused predominately on younger populations and in some cases, has operationalised procrastination differently, often centering around academic procrastination. Interestingly, the results of the regression analysis showed that loneliness when measured as a symptom of depression did significantly predict procrastination. Again, this discrepancy may be a result of a difference in operationalisation with the CESD-8 measuring a general feeling of loneliness within the past week and the R-UCLA scale measuring specific aspects of loneliness in general. Overall, the results of this study provide a deeper insight into the relationship between loneliness and procrastination, specifically within the context of older adults. It suggests that the experience of loneliness in older adults may differ from that of younger adults and, consequently, may not exert the same influence on procrastination tendencies.

Furthermore, the results of the model also showed that education had a negative impact on procrastination. This association is consistent with previous studies that have found a similar relationship (Fiske et al., 2009; Steel & Ferrari, 2013) and suggests that older adults with higher levels of education tended to procrastinate less than those with lower levels of education. One possible explanation for this link is that higher education may, in later life, enhance cognitive functioning and mental health in older adults, which in turn may reduce the tendency to delay tasks. For instance, higher education has been shown to be associated with better cognitive functioning (Wilson et al., 2009) and lower levels of depressive symptoms (Koster et al., 2006) in later life. Therefore, higher education may act as a protective factor against procrastination in older adults by improving their cognitive and emotional well-being.

Finally, while this study does suggest that depressive symptomatology serves as a partial mediator between age and procrastination, procrastination is a complex behaviour with multiple influential factors (see Steel, 2007). These potential mediators could serve as a plausible explanation for the absence of a direct association between age and procrastination in the study's findings. For instance, while depressive symptomatology indirectly influences age and procrastination, increasing age may also be associated with risk factors such as, physical and cognitive decline (Einstein et al., 2000), along with increased sleep disturbances and bereavement (Cole & Dendukuri, 2003). The gradual development and occurrence of these events may be linked to increased fluctuations in procrastinatory behaviours. By not accounting for these potential factors, the original model may have overlooked potentially significant roles in the overall relationship between age and procrastination. As such, further investigation is warranted to comprehensively understand how age truly impacts procrastination tendencies.

Limitations

As previously mentioned, a significant proportion of missing data was contained within the R-UCLA loneliness items. This missingness can be attributed to the nature of the HRS 'psychosocial and lifestyle questionnaire', the questionnaire the R-UCLA loneliness items are contained in. As mentioned, the HRS core sample is divided into two distinct subsamples, referred to as 'subsample A' and 'subsample B.' In alternating waves of data collection, subsample A undergoes an enhanced face-to-face interview, which includes the psychosocial and lifestyle questionnaire, while subsample B undergoes a telephone interview without these assessments. This subsample rotation is a key feature of the HRS methodology. However, the 10% of respondents that were selected to complete the procrastination module consisted of respondents from both subsamples. Consequently, it is plausible that the majority of these respondents belonged to the opposing subsample of that year and as such did not complete the R-UCLA loneliness questionnaire. While this missingness was handled using FIML, future research should take into account this unique subsample distribution in their methodology and when analysing and interpreting results.

Additionally, the measures employed in this study may have failed to capture the complexity of both loneliness and depression. For example, loneliness can be experienced in a variety of different forms, such as social, emotional, or existential loneliness (Ward et al., 2019). Likewise, the symptoms of depression can oftentimes have different causes and manifestations. These complexities may influence how individuals manage such negative emotional states and in turn how they initiate and complete tasks. Future research should explore how specific nuances may moderate or mediate the effects of loneliness and depression on procrastination.

Finally, this study was based on a sample from the US, which may limit the generalizability of the findings to other populations and cultures. For instance, cultural differences in time orientation, individualism-collectivism, or uncertainty avoidance may affect how people perceive and deal with procrastination (Lu et al., 2022). Therefore, it is important to replicate this study in other parts of the world to determine how robust and universal these findings are.

Conclusion

Procrastination is a complex behaviour that can have detrimental effects for older adults. However, the existing body of literature on procrastination in older adults remains relatively limited. The present findings suggest that the presence of depressive symptoms mediates the relationship between age and procrastination, absent of a direct effect. In other words, while age alone may not directly impact procrastination, the development of depressive symptoms among older adults acts as a pathway through which age influences procrastination

behaviours. Consequently, older adults who experience depression may be particularly susceptible to procrastination. Conversely, loneliness did not play a significant mediating role. However, when considered in synergy with depression, did significantly predicted procrastination. This suggests that the experience of loneliness in older adults may exert a more multifaceted influence over procrastination tendencies. By addressing underlying emotional factors and managing procrastination older adults may be able to retain greater control over their lives. Similarly, future research should consider the importance of exploring procrastination in later life and addressing the current knowledge gap within the literature.

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The authors report there are no competing interests to declare.

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