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Loneliness and Activities of Daily Living Performance in Older Adults: Exploring the Moderating Role of Cognition

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Abstract

Nearly 43% of individuals aged 60 and older experience loneliness (Perissinotto et al., 2012), which is associated with an increased risk of cognitive impairment (Cacioppo & Hawkley, 2009; Gow et al., 2007) and impairment in performance of activities of daily living (Ferreira-Alves et al., 2014; Holmén et al., 1992; Perissinotto et al., 2012). The present study examined cognition as a moderator of the relationship between loneliness and both *basic* and *instrumental* activities of daily living (ADLs; IADLs) amongst older adults. It was hypothesized that cognitive functioning would moderate the relationship between loneliness and ADLs/IADLs, such that higher cognition would lessen the impact of loneliness on ADL/IADL performance, whereas lower cognition would not afford a buffering effect. Participants ($N = 106$) were community and non-community dwelling adults 65 years and older who completed a series of self-report questionnaires. Hierarchical regression analyses revealed that cognition moderated the relationship between loneliness and *instrumental* ADLs. Follow-up simple slope analyses uncovered that loneliness had a greater impact on IADL performance amongst participants with *lower* cognition, but still exerted significant influence on IADL performance among participants with *higher* cognition. It is conceivable that exposure to chronic stress and loneliness owing to the COVID-19 pandemic has negatively impacted older adults' functioning, over and above the protective effects afforded by their higher cognition. Further study implications, future research and limitations are discussed, including the recruitment of a small, homogeneous sample and the limited generalizability of findings.

Keywords: loneliness, older adults, activities of daily living, cognition, depression

Loneliness and Activities of Daily Living Performance in Older Adults: Exploring the Moderating Role of Cognition

Approximately one in seven individuals in the U.S. is over the age of 65 years (Administration on Aging, 2018). Changes in the number of older adults in the population, added to changes in household composition and levels of geographical mobility, result in a greater number of older adults experiencing social isolation and loneliness (Myers & Palmarini, 2017; Valtorta & Hanratty, 2012). In fact, 40% of older adults, or one in three, report experiencing loneliness (AARP, 2018; Health Resources & Services Administration, 2019; Perissinotto et al., 2012), which has been defined as an incongruity between anticipated and received quality and satisfaction within social relationships (Ciolfi & Jiménez, 2017).

Research demonstrates that individuals with fewer than three friends, those who experience difficult family relationships and/or engage in less than weekly socialization are at increased risk of loneliness (Hawkley et al., 2016, 2017). Feelings of loneliness may also arise after losses in physical, sensory, social, or occupational functioning, and in response to significant life events, such as relocating or becoming a caregiver (AARP, n.d.; Czaja, 2017; Golden et al., 2009; Hacihasanoglu et al., 2012; Myers & Palmarini, 2017; Purtill, 2018; Singh & Misra, 2009; Taylor, 2019).

The strongest and most oft cited sociodemographic predictors of loneliness are age, sex, education, and income. Studies demonstrate that older participants have higher loneliness scores than younger participants (Miri et al., 2017), and that the oldest old have higher loneliness scores than the young old and middle old (Ferreira-Alves et al., 2014). Despite these findings, Theeke (2010) reported that younger age within the older adulthood period was associated with increased loneliness, whereas other research has yielded no significant associations between

participant age and loneliness (Theeke, 2009). Several researchers have found that women report greater feelings of loneliness than men (Berg et al., 1981; de Jong Gierveld & van Tilburg, 1995; Foong et al., 2018; Holmén et al., 1992; Miri et al., 2017; Pinquart & Sorensen, 2001; Shankar et al., 2011; Thurston & Kubzansky, 2009), although others have found higher loneliness scores among men than women (Borys & Perlman, 1985; Cornwell & Waite, 2009; Koc, 2012), and others have reported no significant sex differences (Hacihasanoglu et al., 2012; Richard et al., 2017; Singh & Misra, 2009; Theeke, 2010). Lastly, loneliness scores tend to decrease as educational attainment or income increase (Hacihasanoglu et al., 2012; Hawkley et al., 2017; Theeke, 2009; Thurston & Kubzansky, 2009).

Repercussions of Loneliness

Loneliness contributes to an increased probability of stroke, cardiovascular disease, diabetes, falls, hospital stays, emotional distress, incapacity, high blood pressure, suicidality, hopelessness, depression, dementia, and mortality; and is associated with decreased sleep, quality of life, life satisfaction, and daytime functioning (Cacioppo et al., 2006; Cacioppo et al., 2011; Cacioppo, Hawley, Berntson et al., 2002; Cacioppo, Hawkley, Crawford et al., 2002; Ellwardt et al., 2013; Ferreira-Alves et al., 2014; Golden et al., 2009; Hawkley, Preacher, & Cacioppo, 2011; Hawkley, Thisted, et al., 2010; Heikkinen & Kauppinen, 2004; Holmén et al., 1992; Holt-Lunstad et al., 2010; Holwerda et al., 2012; Kaye, 2017; Kwon et al., 2017; Luo et al., 2012; Musich et al., 2015; Myers & Palmarini, 2017; O'Súilleabháin et al., 2019; Perissinotto et al., 2012; Purtill, 2018; Rafnsson et al., 2017; Richard et al., 2017; Rico-Uribe et al., 2016; Seeman, 2000; Segrin, 1999; Singh & Misra, 2009; Smith & Victor, 2016; Valtorta et al., 2016; Waern et al., 2003; Wei et al., 2005; Wilson et al., 2007).

Mental and physical health disparities have been found amongst individuals experiencing transient versus chronic loneliness (Martín-María et al., 2020), such that individuals experiencing an ongoing inability to form or maintain satisfying relationships have comparatively worse physical and mental/emotional functioning than individuals undergoing acute stressors from which they can quickly recover (Martín-María et al., 2020; Shiovitz-Ezra & Ayalon, 2010). For instance, although both transient and chronic loneliness are associated with poorer global cognition, the adverse effects of ongoing loneliness are stronger (Zhong et al., 2016). Chronic loneliness is also associated with greater health care utilization, mortality risk (Patterson & Veenstra, 2010; Shiovitz-Ezra & Ayalon, 2010), and major depression (Martín-María et al., 2021).

Loneliness and Basic and Instrumental Activities of Daily Living

Through its effects on physical health, loneliness may impact individuals' ability to complete basic and instrumental activities of daily living (ADLs/IADLs), as evidenced by several research findings (de Jong Gierveld & van Tilburg, 1995; Holmén et al., 1992; Perissinotto et al., 2012; Purtill, 2018; Wang et al., 2019). ADLs are the basic self-care tasks essential to preserve independence. These include eating, transferring/mobility, toileting, bathing, dressing, and grooming (Kernisan, n.d.; National Institutes of Health, n.d.; SeniorLiving, n.d.). IADLs are the self-care tasks of increased complexity that rely on greater cognitive resources, decision-making, and organizational abilities (Kernisan, n.d.; Lawton & Brody, 1969; Millán-Calenti et al., 2010; Mlinac & Feng, 2016). IADL deficits are more common and generally develop prior to basic ADL deficits (Asberg & Sonn, 1989; Judge et al., 1996; Spector & Fleishman, 1998; Spector et al., 1987).

Research indicates that individuals with greater independence in IADLs report lower feelings of loneliness (de Jong Gierveld & van Tilburg, 1995; Ferreira-Alves et al., 2014). Specifically, individuals with *full* or *partial* dependency in performing ADLs have higher loneliness scores than individuals with no ADL dependency (Gerst-Emerson & Jayawardhana, 2015; Hacihasanoglu et al., 2012; Miri et al., 2017). Further, feelings of loneliness and respective levels of impairment in ADLs varies based on cognitive health, as evidenced by Holmén et al. (1992).

Basic and Instrumental Activities of Daily Living and Depression

Research demonstrates that depression is a significant predictor of loneliness (Musich et al., 2015) and of functional status impairments (Lawrence et al., 2014; Vest et al., 2011). Lawrence et al. (2014) found that depression significantly predicted ADL functioning in a sample of middle to older aged individuals with Parkinson's disease. Moreover, Vest et al. (2011) found that depression and ADL functioning were negatively correlated in a sample of older adult ICU patients, such that higher depression scores were related to lowered ability to complete ADLs. On the other hand, Bozo et al. (2009) found that lower ADL impairment, coupled with higher perceived social support, predicted lower levels of depression among Turkish older adults.

In addition to evidence demonstrating associations between depression and basic ADLs, Kazama et al. (2011) found that depression significantly predicted impairment in IADLs at 1-year follow-up among Japanese older adults. Xiang et al. (2018) found that depressed older adults reported greater ADL and IADL impairments at higher rates than their non-depressed older adult counterparts. Thus, depression can be conceptualized as either a precursor to or a consequence of feelings of loneliness, as well as of ADL and IADL impairment.

Cognition

Alterations in cognition are bound to occur as a function of age, and these normative changes have been well documented in the literature (Harada et al., 2013). Although research demonstrates variability in the rate of normative cognitive decline (Glisky, 2007), these changes do not generally hinder older adults' ability to perform daily activities (Harada et al., 2013; Wisdom et al., 2012). Therefore, evidence of impaired ADL or IADL performance may signal non-normative cognitive changes (Harada et al., 2013).

The cognitive reserve (CR) model, proposed by Stern (2002), serves to describe why some individuals remain resilient in the face of normative and non-normative changes in cognition (Fleck et al., 2017; Opdebeeck et al., 2016; Stern, 2009). The CR model purports that educational attainment, lifetime occupation, and active cognitive engagement act as safeguards against brain pathology and slow decline of impairment (Opdebeeck et al., 2016; Scarmeas & Stern, 2003**;** Stern, 2009). Owing to their engagement in these protective behaviors, individuals develop a cognitive reserve (i.e., increased neuroplasticity and neural efficiency) that allows them to cope better with underlying deficits (Scarmeas & Stern, 2003). Singh and Misra (2009) noted that individuals with greater "physical, material, and intellectual resources also have more social 'capital,' which allows them to continue to seek out new relationships and forms of social involvement" (p. 53). Therefore, persons with increased cognitive functioning (and, consequently, cognitive reserve) may be more prone to engage socially and form meaningful interpersonal relationships, perhaps reducing the onset of loneliness.

Loneliness and Cognition

There is evidence to suggest that loneliness is associated with increased rates of global and specific impairments in cognition and more progressive decline, as well as with Alzheimer's

disease risk (Cacioppo et al., 2000; Cacioppo & Hawkley, 2009; Gilmour, 2011; Gow et al., 2007; Gow et al., 2013; Hawkley et al., 2009; Holmén et al., 2000; O'Luanaigh et al., 2012; Tilvis et al., 2000, Tilvis et al., 2004; Wilson et al., 2007). Wilson et al. (2007) reported that lonely individuals without cognitive impairment performed worse on cognitive tests than non-lonely individuals without cognitive impairment. Furthermore, Shankar et al. (2013) found that both objective isolation and loneliness were related to poorer cognition over a 4-year time span. O'Luanaigh et al. (2012) found that loneliness was associated with global cognition scores, processing speed and visual memory deficits, while accounting depression and type of social network. Okely and Deary (2019) found that having either superior processing speed, visuospatial capacity, or crystallized intelligence at the age of 73 years was related to lower loneliness scores at a three-year follow-up. However, loneliness scores at the ages of 73 and 76 years were not predictive of alterations in cognition. These findings suggest that impairments in cognition may lead to deficits in social functioning, inadvertently hindering individuals' capacity for proper interpersonal interactions, as well as altering their appraisal of such interactions, therefore increasing the likelihood of loneliness (Okely & Deary, 2019).

Although many researchers have found a significant association between loneliness and cognitive ability (e.g., Cacioppo & Hawkley, 2009; Gow et al., 2007; Shankar et al., 2013; Tilvis et al., 2004; Wilson et al., 2007), not all have found this association (Beller & Wagner, 2018; Kwon et al., 2017) and these conflicting results may be explained by underlying moderators or mediators. For instance, Zhong et al. (2017) assessed the relationship between loneliness and cognition while evaluating the mediating role of physical health among Chinese older adults and found a bidirectional influence between loneliness and cognition, suggesting that loneliness can

lead to cognitive impairment, and that this impairment can lead to or intensify pre-existing loneliness.

Another factor that may underlie the relationship between loneliness and cognition is depression. In their examination of protective factors for cognition, Gow et al. (2013) found that higher loneliness was associated with lower cognitive functioning, but this relationship was no longer statistically significant when factoring out the effect of depression. Furthermore, Donovan et al. (2017) demonstrated that lonely individuals scored higher on a depression measure than did non-lonely individuals, and that depression and baseline loneliness predicted a decline in cognition over time. In fact, cognitive decline was 20% greater among the lonely group compared to the non-lonely group. The researchers also found that deficient cognitive functioning at the onset of data collection was related to an increased risk of loneliness over time, but this relationship was no longer significant when controlling for baseline levels of depression.

Cognition and Activities of Daily Living

Research has demonstrated that cognitive impairment affects individuals' ability to carry out ADLs and IADLs, and decreases independence (Boss et al., 2015; Dodge et al., 2005). Indeed, studies show that participants with cognitive decline have greater ADL and IADL dependence than participants without cognitive impairment (e.g., Alosco et al., 2012; Dodge et al., 2005; Mansbach & Mace, 2018; Nunes et al., 2016), in addition to the fact that IADL impairment is a risk factor for cognitive impairment (Holz et al., 2013).

Mental/Emotional and Physical Health and the COVID-19 Pandemic

Although the onset of the COVID-19 pandemic has had devastating consequences on the overall population's mental/emotional, social, and physical functioning, it has had particularly

pernicious effects on the older adult subset of the population. Social distancing measures require the maintenance of 6 feet of physical distance and reduction of face-to-face social interactions. Although these measures are intended to diminish the spread of COVID-19, they ultimately restrict access to valuable sources of social support. This had led to a new phenomenon coined "lockdown loneliness," defined as loneliness secondary to social disengagement due to social distancing measures amid the pandemic (Shah et al., 2020). Lockdown loneliness has increased in individuals aged 70 and older, such that that 1 in 3 older adults report feeling lonelier amid the pandemic (Newman, 2020). Further, national data examining loneliness experienced by older adults prior to and during the COVID-19 pandemic revealed that 34% percent of older adults surveyed in 2018 reported feeling a lack of companionship, 27% reported feelings of isolation, and 28% reported infrequent social contact (Piette et al., 2020). According to the researchers, these numbers increased to 41%, 56% and 46%, respectively, when reassessed between the months of March through June of 2020 at the height of the pandemic. In addition to heightening feelings of loneliness, stay at home pandemic orders were associated with lessened joy for life, increased grief, anxiety, and depression amongst older adults (Daly et al., 2021). Adams and colleagues (2021) similarly reported that their older adult sample endorsed greater symptoms of anxiety, stress and worry, and less satisfaction with participation in their social roles during the pandemic as compared to prior. Regarding physical health outcomes during the pandemic as compared to pre-pandemic, researchers found that older adults are less apt to seek needed medical attention (Bailey et al., 2021). This finding is likely to be associated with the discovery of decreased mobility, development of new or worsening of pre-existing health conditions, weight gain, and varied pain experiences amongst older individuals (Adams et al., 2021; Daly et al., 2021).

Purpose

In sum, research suggests that loneliness can have detrimental effects on older adults' well-being, effects of which are compounded by the ongoing global pandemic. Prevailing models of cognition, such as the cognitive reserve model (CR; Stern, 2002), support the contributions of social, cognitive, or physical activities in the maintenance of well-being. Considering the CR model and existing literature, the present study evaluates the buffering effect of cognitive functioning on ADL and IADL performance among older adults. Having better cognitive functioning may provide a protective mechanism against the development of the adverse consequences of loneliness on ADL and IADL functioning. In other words, having better cognitive functioning may help diminish the effects of pre-existing loneliness on ADL or IADL dependence. Having poorer cognitive functioning, however, may exacerbate the adverse effects of pre-existing loneliness on ADL or IADL dependence.

The purpose of the present study is to examine the moderating effect of cognitive functioning in the association between loneliness and ADL and IADL performance. Cognitive functioning will be measured via the Self-Administered Gerocognitive Examination (SAGE; Scharre et al., 2010); loneliness will be assessed using the UCLA Three-Item Loneliness Scale (TILS; Hughes et al., 2004) and impairment in ADLs and IADLs will be assessed using a likert scale adapted from Bravell et al. (2011) and Femia et al. (1997, 2001).

Hypotheses

H_1, H_2, H_3: There will be negative correlations between loneliness and cognitive functioning, ADLs, and IADLs, respectively. Specifically, higher scores on the TILS (Hughes et al., 2004) will be associated with lower scores on the SAGE (Scharre et al., 2010), and lower ADL and IADL scores (Bravell et al., 2011; Femia et al., 1997, 2001).

H_4, H_5: There will be positive correlations between cognitive functioning, ADLs, and IADLs. Specifically, higher SAGE (Scharre et al., 2010) scores will be associated with higher ADL and IADL scores (with higher scores reflecting greater independence and lower impairment; Bravell et al., 2011; Femia et al., 1997, 2001).

H_6, H_7: Cognitive functioning, as examined via the SAGE (Scharre et al., 2010), will moderate the relationship between loneliness and ADL and IADL performance. There will be a main effect for loneliness on ADL and IADL performance.

Method

Participants

Participants (n = 106) were community and non-community dwelling adults aged 65 years and older. The sample was comprised of 22% men and 78% women, with 63% residing in the community and 37% independently residing within a senior living community. Participants' mean age was 76.55, with a range of 65 to 94 years. The sample was primarily Caucasian (96%) with a mean of 17.21 years (SD = 2.51) of education. Participants had an average of 1.98 health conditions and a mean satisfaction with health rating of 5.67 out of 7. (See Table 1 for additional demographic information and Table 2 for satisfaction with health ratings.) Individuals were eligible to participate if they reported being literate and fluent in English. Data from individuals missing two or more of the three orientation items of the SAGE (Scharre et al., 2010) or from individuals who reported a prior diagnosis of Mild Cognitive Impairment or Major Neurocognitive Disorder were excluded from the study.

Design

A moderation model was examined using hierarchical linear regression. Considering the evidence demonstrating the effects of depression on ADL/IADL functioning (e.g., Kazama et al.,

2011; Lawrence et al., 2014; Xiang et al., 2018), depression was controlled for to minimize its potential confounding effects on ADL/IADL functioning. As such, depression was entered as a covariate, loneliness was entered as the independent variable, ADLs and IADLs as the dependent variables, and cognitive functioning as the moderating variable.

Measures

Demographics

Participants completed a demographic survey (Appendix A) assessing participant age, gender identity, employment status, living environment, marital status, identified health conditions, satisfaction with health, and prior diagnosis of dementia or Mild Cognitive Impairment.

Self-Administered Gerocognitive Examination (SAGE)

The SAGE (Scharre et al., 2010; Appendix B) is a self-administered paper-pencil test of cognitive functioning that assesses six domains of cognition, including language, reasoning, visuospatial, executive, memory, and orientation. It yields a maximum score of 22, whereby a score of 17 or above indicates non-impaired/normal cognitive functioning, a score of 15 or 16 indicates mild impairment, and a score of 14 or below indicates a more severe impairment in cognition (Scharre et al., 2010). In addition to the scored items, the SAGE includes several non-scored items that assist providers in identifying potential causes of cognitive impairment. These items solicit additional demographic information, family history of cognitive impairment, and current symptoms (e.g., memory difficulties, dysphoria). For participants with less than or equal to 12 years of education, a point was added to their total score (Scharre et al., 2014). The SAGE has a specificity and sensitivity of 95% and 79%, respectively, for detecting either mild cognitive impairment or dementia using the cut-off score of ≤ 16 (Scharre et al., 2010). Furthermore, the

SAGE has an inter-rater reliability of 0.96, a test-retest reliability of 0.86, and an internal consistency reliability of 0.71 for its six cognitive domains (Scharre et al., 2010, 2014). Scharre et al. (2010) reported that the correlation between the SAGE and a neuropsychological test battery was .84, and a .76 between the SAGE and the Mini Mental State Examination (Folstein et al., 1975).

UCLA Three-Item Loneliness Scale (TILS)

The TILS (Hughes et al., 2004; Appendix C) examines the degree of subjective loneliness using ratings of 1 (*hardly ever or never)*, 2 (*some of the time)*, or 3 (*often)*. The scale measures three dimensions of loneliness, including relational, social, and self-perceived connectedness. These dimensions are assessed using the following items: "How often do you feel that you lack companionship?", "How often do you feel left out?" and "How often do you feel isolated from others?" Higher total scores on the scale are indicative of greater feelings of loneliness. The revised short form has been tested for use with the older adult population and can be completed via self-report or via phone interview (Campaign to End Loneliness, n.d.; Hughes et al., 2004). Hughes et al. reported the correlation between the TILS and the R-UCLA scale to be .82. Hughes et al. also found an alpha coefficient score of .72, suggesting good internal consistency reliability, and reported satisfactory concurrent and discriminant validity for the shortened scale.

Basic and Instrumental Activities of Daily Living

A self-report measure containing 14 items was used to assess impairments in ADLs and IADLs (Bravell et al., 2011; Femia et al., 1997, 2001; Appendix D). Basic ADLs were assessed using seven items (i.e., eating, bathing, dressing, toileting, getting up from bed, transferring from bed to chair, and staying clean), and IADLs were assessed with the remaining seven items (i.e.,

completing housework, cooking, shopping, finances, transportation, making the bed, and using the phone). Each item is rated on a 4-point scale of 0 (*unable to perform*), 1 (*great difficulty to perform*), 2 (*some difficulty to perform*), and 3 (*able to perform independently*). Higher scores on the scale indicate greater independence in ADL and IADL functioning. Femia et al. (1997) reported an internal reliability of .95, whereas Bravell et al. (2011) reported an internal reliability of .91 for the combined scale.

Geriatric Depression Scale-Short (GDS-S)

The GDS-S (Sheikh & Yesavage, 1986; Appendix E) is a 15-item measure that evaluates depressive symptomatology in the elderly using a dichotomous ("yes" or "no") response format. The GDS-S excludes items pertaining to the presence of physical symptoms that are common amongst older adults (Conradsson et al., 2013), making it suitable to assess depressive symptoms in this demographic. Moreover, its length reduces respondents' cognitive burden and fatigue, which allows the scale to be utilized among elderly with significant cognitive impairment (Conradsson et al., 2013). Research demonstrates that the GDS-S is a valid and reliable measure to differentiate older adults with and without depression (American Psychological Association, n.d.; Sheikh & Yesavage, 1986). Weeks et al. (2003) reported the scale's internal consistency reliability to be 0.72.

Procedure

Approval from Xavier University's Institutional Review Board (Appendix F) and from administrators at each facility (Appendix G) was obtained prior to participant recruitment and data collection. The researcher who collected data was certified in Human Subjects Research granted by the Collaborative Institutional Training Initiative (CITI Program).

Data collection

Participants were recruited from a senior living community and from a lifelong learning institute. A flyer with basic study information and researcher contact information was included in each organization's e-newsletters (Appendix H). Interested individuals contacted the researcher via phone or email and were offered a brief description of the study, along with instructions and expectations regarding remote data collection. At that time, the researcher gathered participants' mailing addresses to send each a survey packet containing an instructions page (Appendix I), a consent form (Appendix J), a demographic survey, the SAGE, the UCLA Three-Item Loneliness Scale, the ADL and IADL measure, the GDS-S, and a debriefing page (Appendix K). Participants mailed the completed measures to the researcher using a stamped and addressed envelope provided. Participants were offered the opportunity to enter a drawing to win one of ten $25 Kroger gift cards. Interested participants provided their name, phone number and address on a separate sign-up sheet and mailed it using an additional stamped and addressed envelope provided. The drawing mailing was stored separately from the surveys and then discarded upon its completion. The total study time per participant was approximately 20 to 30 minutes.

Results

The current study examined the moderating role of cognition in the relationship between loneliness and performance of basic and instrumental activities of daily living. To test *Hypotheses 1* through *5*, Pearson's bivariate correlations were conducted to assess for significant relationships between the variables of interest (i.e., cognitive functioning, loneliness, ADLs and IADLs; see Table 3). Contrary to *Hypothesis 1*, loneliness and cognition were not significantly correlated. Loneliness and the combined ADL/IADL score were significantly correlated. However, when parsing out the effects of basic and instrumental ADLs, it was found that loneliness and basic ADLs (H_2) were not significantly associated, whereas loneliness and IADLs

(H_3) were significantly negatively correlated. No significant positive associations were found between cognition, ADLs and IADLs, disconfirming *Hypotheses 4* and *5*.

Exploratory bivariate correlations were conducted utilizing various demographic variables collected (see Table 3). Data revealed significant negative correlations between participant age and education, and between age and scores on the SAGE. Participants' number of health conditions was positively associated with loneliness and depression, and negatively associated with performance of basic ADLs, IADLs, and with the total ADL/IADL score. Satisfaction with health ratings were negatively related to participants' number of health conditions, loneliness, and depression. Conversely, satisfaction with health was positively associated with basic ADLs, IADLs, and the total ADL/IADL score. Loneliness was positively associated with depression, whereas depression was negatively correlated with performance of IADLs, and with the total ADL/IADL score.

To test *Hypotheses 6* and *7* regarding the moderating effect of cognition in the relationship between loneliness and both basic and instrumental ADLs, hierarchical linear regression analyses were performed. ADLs and IADLs were entered as dependent variables, loneliness and cognition as independent variables, and depression as a covariate. All predictors and the moderator included in the model were standardized to reduce multicollinearity, and the interaction variable was calculated by multiplying the standardized variables.

First, a hierarchical linear regression analysis was conducted to examine the effects of loneliness on overall ADL/IADL functioning. Depression scores entered in Block 1 accounted for a statistically significant amount of variance in ADL/IADL combined performance, $\Delta R^2 = .05$, $\Delta F(1, 103), = 5.29$, $p = .02$. The addition of loneliness and cognition in Block 2 did not yield a statistically significant increase in variance, $\Delta R^2 = .03$, $\Delta F(2, 101), = 1.83$, $p = .17$. However,

the inclusion of the interaction term for loneliness and cognition in Block 3 accounted for a statistically significant increase in variance explained in the combined ADL/IADL measure, lending support for a moderating effect of cognition, $\Delta R^2 = .10$, $\Delta F(1, 100) = 12.27, p < .001$, $B = 1.19$, $SE = .34$, $\beta = .38$, $t(100) = 3.50, p < .001$. The standardized regression coefficients for loneliness and cognition were not significant, yet the coefficient for depression was $\beta = -.22$ ($p = .02$), which denotes that depression accounts for a significant amount of unique variance in explaining ADLs/IADLs. To explore the significant interaction, simple slope analyses were conducted, which revealed that both conditional relationships (i.e., high and low cognition) were significant, but the relationship was stronger when cognitive functioning was low, $\beta = -4.68$, $t(101) = -3.41, p < .001$, compared to high, $\beta = -4.28$, $t(101) = -3.43, p < .001$.

A second hierarchical linear regression analysis was conducted to determine whether basic or instrumental ADLs were driving the effect of the prior analysis. Data revealed that depression accounted for a minimal amount of variance in basic ADL scores in Block 1, $\Delta R^2 = .00$, $\Delta F(1, 103), = .07, p = .80$. The addition of loneliness and cognition in Block 2, followed by the inclusion of the interaction term for loneliness and cognition in Block 3, yielded non-statistically significant increases in variance explained in basic ADLs, $\Delta R^2 = .02$, $\Delta F(2, 101) = 1.07, p = .35$ and $\Delta R^2 = .02$, $\Delta F(1, 100), = 2.21, p = .14$, respectively. Therefore, contrary to *Hypothesis 6*, these findings indicate that global cognition, as measured by the SAGE, does not moderate the relationship between loneliness and performance of *basic* ADLs.

A third hierarchical linear regression analysis was conducted to test *Hypothesis 7* (see Table 4). Results revealed that depression (entered in Block 1) accounted for a statistically significant amount of variance in IADLs, $\Delta R^2 = .07$, $\Delta F(1, 103), = 7.39, p = .008$. The addition of loneliness and cognition scores in Block 2 did not yield a statistically significant change in

variance, $\Delta R^2 = .03$, $F(2, 101), = 1.7$, $p = .19$. The inclusion of the interaction term for loneliness and cognitive functioning in Block 3 did, however, account for a statistically significant increase in variance explained in IADLs, which supports the presence of a moderating effect, $\Delta R^2 = .11$, $\Delta F(1, 100) = 14.35$, $p < .001$, $B = 1.04$, $SE = .27$, $\beta = .41$, $t(100) = 3.79$, $p < .001$. To explore the significant interaction, simple slope analyses were conducted to determine the relationships between low and high cognitive scores and loneliness on performance of IADLs. Results demonstrated that both conditional relationships (i.e., high cognition and low cognition) were significant, but the relationship was particularly strong when cognitive functioning was low, $\beta = -4.90$, $t(101) = -3.60$, $p < .001$, as opposed to high, $\beta = -4.48$, $t(101) = -3.62$, $p < .001$.

Discussion

The purpose of the present study was to examine the moderating effect of cognitive functioning in the relationship between loneliness and performance of basic and instrumental activities of daily living amongst older adults. Sample characteristics were similar to those of the older adult U.S. population, although with some exceptions. Consistent with the preponderance of older adult women in the U.S. (56%) as compared to men (Administration on Aging, 2018), analysis of the study's demographic composition revealed that the sample was primarily female (78%). Moreover, 96% of participants were Caucasian, which is in line with reports that three fourths of the older population is Caucasian (Roberts et al., 2018). Approximately 51% of participants reported experiencing either one or two of the most common health conditions (e.g., hypertension, diabetes, arthritis) and the majority (85%) indicated they were moderately to highly satisfied ($M = 5.67$, $SD = 1.09$) with their health. Participants had an average of 17 years of education, with 88% obtaining a bachelor's degree or above, which is higher than the average educational level in the U.S. for individuals aged 65 and older (i.e., 26.7%; Ryan & Bauman,

2016). Regarding the prevalence of loneliness in the present sample, 74.5% of participants obtained a score between 3 and 5 on the TILS, which prior researchers have grouped as "not lonely," whereas 25.5% of participants obtained a score between 6 and 9, considered "lonely" (Steptoe et al., 2013). In their examination of social isolation and loneliness, Steptoe et al. (2013) found that 18.1% of participants scored high on loneliness, whereas 81.9% scored between the low to average ranges. Loneliness ratings in the present study averaged 4.44 (SD = 1.61) which is comparable to Steptoe and colleagues' findings. Moreover, approximately 6% of participants in the present study scored in the mild range of depression, 2.8% scored in the moderate range of depression and 90.6% scored in the none to minimal depression range. These scores are somewhat consistent with depression estimates ranging from 1% to almost 14% (depending upon health status) amongst older adults (Centers for Disease Control and Prevention [CDC], 2021). Updated estimates amid the pandemic reveal that one in four older adults experience either anxiety or depression, as compared to one in 10 older adults when assessed pre-pandemic in 2018 (Koma et al., 2020).

It was hypothesized that loneliness would be negatively correlated with cognitive functioning, yet no such association was found in the present study. These results are consistent with those of Beller and Wagner (2018) and Kwon et al. (2017) who reported no significant associations between feelings of loneliness and impairments in cognition. Nevertheless, these results are inconsistent with studies reporting that higher loneliness is associated with lower cognitive functioning (Cacioppo & Hawkley, 2009; Gow et al., 2007; Gow et al., 2013; Holmén et al., 1992; Holmén et al., 2000; O'Luanaigh et al., 2012; Tilvis et al., 2004; Wilson et al., 2007). Owing to COVID-19 safety restrictions, self-administered (as opposed to clinician administered) cognitive and loneliness instruments were selected for the present study. Although

self-report measures are invaluable for gathering participants' perceptions of their functioning, these instruments can lend themselves to response bias (e.g., social desirability and recall bias), leading to a potential underestimation of the underlying association between loneliness and cognition (Althubaiti, 2016).

Although cognitive functioning has been demonstrated to relate negatively to performance of both basic and instrumental ADLs (Alosco et al., 2012; Boss et al., 2015; Dodge et al., 2005; Ocampo Chaparro, 2018; Mansbach & Mace, 2018; Nunes et al., 2016), there was no such association identified in the present study. Data revealed the presence of floor effects, suggesting limited variability in participant responses that may have hindered the ability to find significant results. Roughly 96% of participants in the present sample scored in the "normal" range of cognition and participants were in many respects high functioning and generally healthy (e.g., few chronic health conditions, high satisfaction with health) reporting few impairments in daily living activities. Moreover, the ADL and IADL measure utilized relied on self-report (in contrast to clinician or informant report) and thus is prone to responder bias. Responses are contingent upon participants' level of insight and willingness to disclose their functional limitations. It is plausible, too, that underlying stigma regarding functional impairment could have played a role in participants' responses. Indeed, a qualitative study conducted by Martins and colleagues (2018) revealed that older adults endorsed stigma because of physical disability, which translated into social isolation and a fractured sense of identity. Moreover, secondary to the stigma of their physical disability, older adults experience a heightened sense of shame, which is apt to heighten their reluctance to disclose (Holm et al., 2014).

The finding that loneliness was not associated with performance of *basic* ADLs is contrary to the existing literature that highlights significant changes in functional status amongst

lonely compared to non-lonely older individuals (e.g., de Jong Gierveld & van Tilburg, 1995; Gerst-Emerson & Jayawardhana, 2015; Holmén et al., 1992; Miri et al., 2017; Perissinotto et al., 2012; Purtill, 2018; Wang et al., 2019). Conversely, the finding that loneliness was significantly negatively associated with performance of *instrumental* ADLs is consistent with the findings of de Jong Gierveld and van Tilburg (1995) and Holmén et al. (1992). As supported by the literature, deficits in instrumental ADLs precede and are more pervasive than deficits in basic ADLs (Asberg & Sonn, 1989; Judge et al., 1996; Spector & Fleishman, 1998), such that 6.6% of 65- to 74-year-old and 19.4% of 75+ year old adults report IADL impairments, as compared to 3.9% of 65- to 74-year-old and 11.6% of 75+ year old adults who report basic ADL impairment (CDC, 2018).

As per *Hypothesis 6*, cognition was purported to moderate the relationship between loneliness and *basic* ADLs, yet current findings did not substantiate this hypothesis. Cognition did, however, moderate the relationship between feelings of loneliness and performance of *instrumental* ADLs, supporting *Hypothesis 7.* Only 5.66% of participants in the present study reported experiencing one or more impairments in ADLs, compared to 23.58% who endorsed one or more impairments in IADLs. These findings are consistent with evidence showing that basic ADL impairments are less prevalent and occur following IADL impairments amongst samples of similar demographic composition (i.e., independently living and without neurocognitive disorder; Judge et al., 1996). Follow-up simple slope analyses revealed that *high* and *low* cognitive functioning were associated with decreased performance of IADLs amongst participants who experienced loneliness, and this association was stronger when cognition was low versus high. That is, lower cognitive functioning was associated with diminished ability to

maintain independence of the increasingly complex, cognition reliant IADL tasks in the face of perceived social isolation.

The finding that *high* cognitive functioning was associated with decreased IADL performance in the face of loneliness was unexpected, and several hypotheses emerge. It is conceivable that pre-existing decline in performance of IADLs has accelerated or that new impairments have emerged during this time of decreased engagement and increased isolation owing to the global pandemic. There is also the potential for heightened burden of and troublesome adaptation to COVID-19 restrictions amongst individuals who are at baseline higher functioning, given their propensity for greater social and/or cognitive engagement. It is plausible, too, that individuals with higher cognitive functioning have greater insight and awareness into their functional skills and capabilities, such that they would be more attuned to these perceived deficits compared to individuals with lower cognitive ability.

An alternate explanation for these results may be associated with the duration of participants' perceived social isolation. Perhaps prolonged (versus temporary) loneliness is associated with decreased cognitive reserve capacity. Indeed, Dixon et al. (2003) purport that cognitive reserve operates not only at the individual level, but at the social level. In other words, seeking out other individuals for assistance in coping with everyday problems and tasks can promote independence and compensate for any underlying impairments in cognition (National Research Council, 2006). Therefore, although cognition may have acted as a buffer during the initial phases of the pandemic, it may no longer act as a safeguard against impaired performance of daily living activities due to its chronicity and residual social restrictions, which, in turn, exacerbate feelings of loneliness.

Limitations

The present findings should be considered in light of several limitations. First is the generalizability of the results due to the homogeneity of the sample, including race, ethnicity, socioeconomic and educational level. Future research should attempt to recruit a larger, diverse sample, as literature demonstrates that cultural differences (e.g., favoring communal or individual values) can impact levels of social engagement, which ultimately have a bearing upon cognitive maintenance (National Research Council, 2006). Second, applicability of the findings is limited because data were collected amid the COVID-19 pandemic, and participant responses are likely to reflect changes in both real and perceived social isolation endured during this time. Third, participants were self-selected to participate in the study, as recruitment was carried out through flyers and announcements in newsletters. Individuals who elected to participate in the study may have had greater confidence in their cognitive and functional abilities than older adults who chose not to participate. Fourth, the current study was cross sectional, not longitudinal in nature. A longitudinal design would aid in understanding the relationships, fluctuations, and patterns between the variables of interest across a longer period (e.g., the duration of the older adulthood phase). Fifth, data were collected through self-report measures (in contrast to objective, clinician administered measures) in response to COVID-19 safety precautions. Although the assessment measures selected are widely utilized and accepted in the geriatric literature, the combined ADL and IADL measure borrowed from the works of Bravell et al. (2011) and Femia et al. (1997, 2001) is less known and has fewer psychometric evidence. Nevertheless, the authors' preliminary studies demonstrated excellent reliability indices. Moreover, in contrast to more restrictive, dichotomous response formats, the instrument's expanded 1 to 7 rating scale helps capture a broader spectrum of functional impairment. Sixth,

although SAGE scores were adjusted for individuals with less than or equal to 12 years of education, total scores were not adjusted based on participant age. As such, and consistent with Scharre et al.'s (2014) recommendation, future research should aim to adjust total scores for individuals older than 80 years of age.

Implications

Findings of the current study highlight the need for interventions to enhance the quantity and quality of social relationships (through increased perceived social support and decreased social isolation), and the maintenance of cognition and ADL/IADL performance. Social engagement is one avenue to delay the onset of impairment, as it promotes overall wellbeing, longevity, and improved mental, emotional and physical health (Donovan & Blazer, 2020). Older adults should be encouraged to participate in activities that provide the creation of new or enhancement of existing relationships, such as religious service attendance, mentoring, and volunteering (Larkin et al., 2005; Mendes de León & Rajan, 2014; Mlinac & Feng, 2016). During the pandemic, however, face-to-face interaction has been limited and as a society we have been compelled to identify alternate ways of engagement, such as through social media, letters, phone calls, video chats, online gaming, lifelong learning programs, or clubs (Conroy et al., 2020; Ibarra et al., 2020; Millard, 2020; Nguyen et al., 2017). In their systematic review of technology-based interventions to reduce loneliness in older adults, Khosravi et al. (2016) concluded that overall, "some technologies used to alleviate social isolation and loneliness among seniors have a positive impact on seniors' lives and wellbeing" (p. 601). Specifically, the authors noted the effectiveness of video games, personal reminder information and social management system, Tele-Care, general information and communication technologies, and robotics interventions in decreasing loneliness and improving health. In his review, Chopik

(2016) found that higher technology use (i.e., e-mail, social networking, Internet-based video or phone calls, online chatting, instant messaging, and smartphone use) predicted lower loneliness, which was associated with improved mental and physical health (i.e., fewer chronic illness and decreased depression).

Conclusions

Results demonstrated that cognition moderated the relationship between loneliness and instrumental ADLs, and this relationship was stronger when cognitive functioning was low versus high. The present study sheds light on the social, emotional, and physical disruptions the COVID-19 pandemic and its ensuing restrictions have caused in the lives of older adults. It highlights the need for the identification of continued avenues for engagement in social, physical, and cognitive enhancing activities, particularly amid this enduring public health crisis to uphold functional independence in the community.

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Table 1

Frequencies of Demographic Variables

Demographics	*N*	%
Gender		
Male	23	21.70
Female	83	78.30
Education (in yrs)		
12 (High School)	7	6.60
14 (Associate's Degree)	5	4.72
15	1	0.94
16 (Bachelor's Degree)	37	34.91
17	1	0.94
18 (Master's Degree)	39	36.79
19	3	2.83
20	4	3.77
23 (Doctorate Degree)	9	8.49
Race		
African American	2	1.89
Caucasian	102	96.23
Asian	1	0.94
Prefer Not to Respond	1	0.94
Marital Status		
Married or Living with Partner	47	44.34
Divorced	19	17.92
Widowed	31	29.25
Single	9	8.49
Living Environment		
Community	67	63.21
Retirement Community: Independent Living	39	36.79
Employment Status		
Retired	101	95.28
Part Time	3	2.83
Full Time	2	1.89

Note. $N = 106$.

Table 2

Frequencies of Satisfaction with Health Ratings (N = 105)

Item	Very Dissatisfied						Very Satisfied
	1	2	3	4	5	6	7
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Physical Health Satisfaction	0 (0)	2 (1.90)	1 (0.95)	13 (12.38)	20 (19.05)	46 (43.81)	23 (21.90)

Table 3

Pearson's Correlations

Variable	*N*	1	2	3	4	5	6	7	8	9	10
1. Age	104	--									
2. Education	106	-.25*	--								
3. Health Conditions	106	.06	-.02	--							
4. Satisfaction with Health	105	-.01	-.07	-.39**	--						
5. Loneliness	106	-.02	-.13	.21*	-.26**	--					
6. Cognition	106	-.22*	.15	.02	.02	.18	--				
7. Basic ADLs	106	-.13	.09	-.20*	.30**	-.10	.08	--			
8. IADLS	106	-.18	.01	-.19*	.32**	-.20*	.13	.55**	--		
9. Total ADL/IADL Score	106	-.18	.03	-.21*	.34**	-.19*	.13	.73**	.97**	--	
10. Depression	106	-.05	-.05	.27**	-.36**	.57**	.02	-.02	-.23*	-.20*	--

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

Table 4

Hierarchical Linear Regression Results for IADLs

Variable	*B*	*SE B*	β	R^2	ΔR^2
Step 1					
Constant	20.19	.22		.07	.07
Depression (GDS-S)	-.59	.22	-.26**		
Step 2					
Constant	20.19	.22		.10	.03
Depression (GDS-S)	-.43	.26	-.19		
Loneliness (TILS)	-.32	.27	-.14		
Cognition (SAGE)	.36	.22	.16		
Step 3					
Constant	19.99	.21		.21	.11
Depression (GDS-S)	-.56	.25	-.25		
Loneliness (TILS)	-.51	.25	-.22		
Cognition (SAGE)	.82	.24	.36		
Interaction Term	1.04	.27	.41***		

Note. $N = 106$.

$^{**}p < .01$. $^{***}p < .001$.

Appendix A

Demographic Questionnaire

Gender Identity (Circle):

Male Female Non-binary

Prefer not to respond Write in: _____

Age (in years): _____

Marital Status (Circle):

Single Married or living with partner

Separated Divorced Widowed

Living Environment (Circle):

Living in the Community

Living in a Retirement Community (please specify below):

Independent Living Assisted Living Nursing Care

Other (please describe): _____

Employment Status (Circle):

Employed full time (≥ 40 hours per week)

Employed part time (≤ 39 hours per week)

Unable to work/Disabled Unemployed Retired

Identified Health Conditions (Circle):

High blood pressure Diabetes Arthritis

High cholesterol Asthma Cancer

Cardiac failure None of the above

Other (Please specify: _____)

Satisfaction with Health (Circle the number on the scale that best indicates how you feel about your physical health):

Very Dissatisfied **Very Satisfied**

1 2 3 4 5 6 7

Have you ever been told you have mild cognitive impairment, a major neurocognitive disorder, Alzheimer's disease, or dementia? (Circle)

Yes No

Appendix B

Self-Administered Gerocognitive Examination (SAGE)

The SAGE (Scharre et al., 2010) can be used for research purposes **with** permission from The Ohio State University. *The test may be accessed through The Ohio State University: Wexner Medical Center website, https://wexnermedical.osu.edu/brain-spine-neuro/memory-disorders/sage.*

Appendix C

UCLA Three-Item Loneliness Scale

Instructions: The next questions are about how you feel about different aspects of your life. For each one, tell me how often you feel that way by circling the appropriate response.

1. How often do you feel that you lack companionship?

Hardly ever or never *Some of the time* *Often*

2. How often do you feel left out?

Hardly ever or never *Some of the time* *Often*

3. How often do you feel isolated from others?

Hardly ever or never *Some of the time* *Often*

Appendix D

Basic and Instrumental Activities of Daily Living Questionnaire

Please place a checkmark indicating your ability to complete each of the following day-to-day activities without assistance.

ACTIVITY	**RATING**			
	Unable to perform independently	*Great difficulty to perform independently*	*Some difficulty to perform independently*	*Able to perform independently*
Eating				
Bathing				
Dressing				
Using the toilet				
Transferring from a bed to a chair (or vice versa)				
Getting up from bed				
Staying clean				
Completing housework				
Cooking				
Shopping				
Managing finances				
Driving				
Making the bed				
Using the phone				

Appendix E

Geriatric Depression Scale-Short Form (GDS-S)

Instructions: Circle the best answer for how you felt over the past week.

No.	Question	Answer
1.	Are you basically satisfied with your life?	YES / NO
2.	Have you dropped many of your activities and interests?	YES / NO
3.	Do you feel that your life is empty?	YES / NO
4.	Do you often get bored?	YES / NO
5.	Are you in good spirits most of the time?	YES / NO
6.	Are you afraid that something bad is going to happen to you?	YES / NO
7.	Do you feel happy most of the time?	YES / NO
8.	Do you often feel helpless?	YES / NO
9.	Do you prefer to stay at home, rather than going out and doing new things?	YES / NO
10.	Do you feel you have more problems with memory than most people?	YES / NO
11.	Do you think it is wonderful to be alive?	YES / NO
12.	Do you feel pretty worthless the way you are now?	YES / NO
13.	Do you feel full of energy?	YES / NO
14.	Do you feel that your situation is hopeless?	YES / NO
15.	Do you think that most people are better off than you are?	YES / NO

(Sheikh & Yesavage, 1986)

Appendix F

Institutional Review Board Approval Letter

November 16, 2020

Bianca Velez
[redacted]

Re: Protocol #20-007, *Loneliness and Activities of Daily Living Performance in Older Adults: Exploring the Moderating Role of Cognition*

Dear Ms. Velez:

The IRB has reviewed the request to modify your study, referenced above. We understand that you will be recruiting participants from [redacted] We are able to continue to approve your study based on the information you provided. Therefore, your above-referenced study, as modified, continues to be approved in the Expedited category under Federal Guidelines 45CFR46. Your approval expires on September 28, 2021 and a Progress Report is due by that date. The form can be found online at www.xavier.edu/irb/forms

Please note that if you wish to further modify your study, it will be necessary to obtain IRB approval prior to implementing the modification. If any adverse events occur, please notify the IRB immediately.

We truly appreciate your efforts and attention to compliance within the spirit of human subject's protection. We wish you great success with your research.

Sincerely,

[redacted]
Chair, Institutional Review Board
Xavier University

TLS/sb

Enclosure: stamped informed consent

Appendix G

Letters of Support from Organizations

[redacted]

28 July 2020

Bianca Vélez
Clinical Psychology Doctoral Program
Xavier University

Dear Bianca Vélez,

I have reviewed your research proposal and grant permission for you to recruit students from the [redacted] for the purpose of your research, Loneliness and Activities of Daily Living Performance in Older Adults: Exploring the Moderating Role of Cognition, pending IRB approval.

Sincerely,

[redacted]

[redacted]

November 13, 2020

Bianca Vélez
Clinical Psychology Doctoral Program
Xavier University

Dear Bianca Vélez,

I have reviewed your research proposal and grant permission for you to recruit residents from [redacted] for the purpose of your research, *Loneliness and Activities of Daily Living Performance in Older Adults: Exploring the Moderating Role of Cognition*, pending IRB approval.

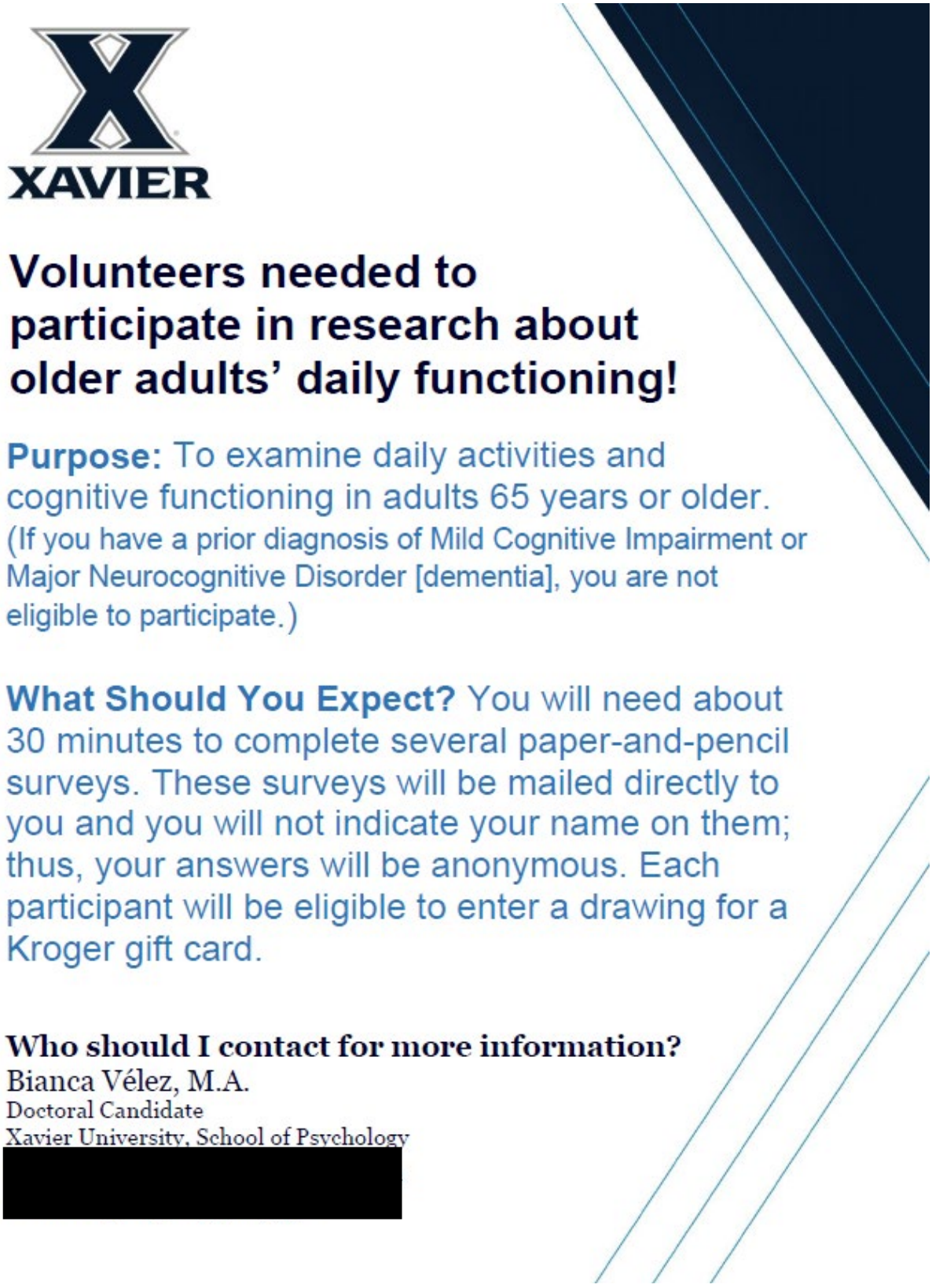
Sincerely,

[redacted]

[redacted]

Appendix H

Recruitment Flyer



Appendix I

Survey Packet Instructions

Hello! Thank you so much for agreeing to participate in this study. Below you will find instructions to complete this survey packet and information regarding steps to take after its completion.

Contained in this packet are several paper-and-pencil surveys for you to complete. The first form is an informed consent document that briefly describes the study. Please read this document carefully before completing the rest of this packet. It is not necessary to sign this document. If you complete all the surveys and return them, that will be the indication that you consent to participate. After you read the informed consent, you will complete some short surveys that ask for demographic information, assess how you feel and your ability to think and carry out daily activities. There are no right or wrong answers to any of the items, just answer as truthfully as you can. If you feel uncomfortable responding to any of the statements or questions, you may choose not to respond to that particular statement, or you may stop participating altogether. Your name will not appear on any of the surveys you complete. After you complete the surveys, you will return them in a stamped, addressed envelope that I will provide you.

If you choose to enter a drawing to win one of several $25 gift cards, you will need to provide your name, phone number, and address. You will submit this information in the separate stamped and addressed envelope provided. Thus, the information you provide on the surveys will not be linked to your personal information for the gift card drawing.

To reiterate, you will need to mail the provided envelope labeled “Surveys”. This envelope should only contain:

a) Surveys #1 through #5 (numbers located in the top right-hand corner)

b) Do not return the Informed Consent document or the Debriefing document. You may keep these documents for your records or for future reference.

c) Please do NOT include the sign-up sheet for the drawing with the surveys. If you wish to enter the gift card drawing, you must mail the sign-up sheet using the separate (smaller) envelope provided.

If you encounter problems, have questions, or need assistance answering the items, you may contact the primary researcher, Bianca Vélez, via email at [redacted].

Appendix J

Informed Consent

My name is Bianca Vélez and you are being given the opportunity to volunteer to participate in a project conducted through Xavier University. The purpose of this study is to assess your ability to think and perform daily activities. Participants in this study will be asked to complete surveys that assess cognitive abilities, social connectedness, and the ability to carry out daily activities. If you are interested in learning more about this study, please continue to read below.

Nature and Purpose of the Project

The purpose of this study is to assess your ability to think and to perform your day-to-day activities, and how connected you feel to others.

Why You Were Invited to Take Part

You were invited to take part in this study because you are 65 years of age or older. Your input is important to expand the existing literature on the lives of older adults.

Study Requirements

To participate in this study, you must be 65 years of age or older and fluent in English. You are not eligible to participate if you have a prior diagnosis of Mild Cognitive Impairment or Major Neurocognitive Disorder (dementia). You will be required to complete the surveys and mail them to the researcher. The total study time will be approximately 30 minutes.

Anticipated Discomforts/Risks

There may be some psychological discomfort related to participating in a study that measures one's ability to think. Moreover, you may feel mentally fatigued after completing the measures.

Confidentiality/Anonymity

Your name will not appear on any of the surveys you complete. Information provided for the gift card drawing will be mailed separately and will not be linked to your survey responses. The study data will be reported for the entire group of participants. No individual answers will be reported in the dissertation or to the organization through which you were recruited to participate.

Compensation

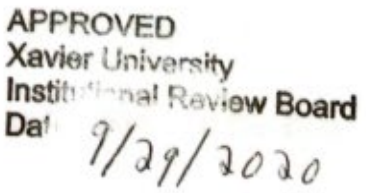
You will be provided the opportunity to enter a drawing to win one of ten $25 gift cards for participating in this study. To be entered in the drawing, you will need to provide your name, phone number, and address on a separate sign-up form that only the researcher will have access to. You are not required to enter the drawing and your personal information will not be linked to your survey responses or used for any other purposes. After the drawing and mailing of the gift cards, your personal contact information will be destroyed.

Refusal to participate in this study will have *no effect* on any future services you may be entitled to from Xavier University or the organization through which you are participating in this study. You are *free to withdraw* from the study at any time without penalty. Only participants who complete the study in its entirety may enter the drawing.

If you have any questions, you may contact the primary researcher, Bianca Vélez, at [redacted] or her dissertation chair, Dr. Cynthia Dulaney, at [redacted]

Questions about your rights as a research participant should be directed to Xavier University's Institutional Review Board at (513) 745-2870, or irb@xavier.edu.

I have been given information about this research study and its risks and benefits. By completing the elements of the study as previously described to me, I understand that I am giving my informed consent to participate in this research study.



The date approval stamp on this consent form indicates that this project has been reviewed and approved by Xavier University's Institutional Review Board.

Appendix K

Debriefing

Thank you for your participation! The purpose of this study was to examine the impact of loneliness and cognitive ability on performance of daily living activities. Loneliness refers to experiencing a mismatch between expected and received satisfaction within social relationships. Activities of daily living are either basic tasks required for self-care, or more difficult tasks needed to maintain personal independence.

Everyone experiences forgetfulness or difficulty completing tasks sometimes. You may feel as if you do this more than you used to, and indeed, we all have more of these moments as we get older. However, there are ways to remain cognitively fit, including:

- Keeping your mind active (e.g., playing crossword puzzles or card games, reading, learning a new skill)
- Exercising regularly (e.g., tai chi)
- Following a healthy diet
- Socializing regularly (e.g., forming new social connections, joining interest groups, volunteering)

If you want more information about staying socially connected or about volunteering opportunities, visit the following websites: National Council on Aging (NCOA.org), the AARP Foundation's Connect2Affect (connect2affect.org), and the Senior Corps Programs (seniorcorps.gov).

Please do not disclose information about this research to other potential participants so that they will not know what the study is about. If completing this survey has revealed concerns or you feel distressed at any point during or after the study, counseling services are available on a

sliding fee scale at Xavier University for community members. If you are interested in these services, contact the Psychological Services Center at (513) 745-3531. If you are concerned about cognitive decline, please consult your doctor. If you have any questions or concerns about this study, or if you wish to inquire about the results, you may contact the primary researcher, Bianca Vélez, at [redacted], or her dissertation chair, Dr. Cynthia Dulaney, at [redacted]

Thank you for your participation!

Summary

Title. Loneliness and Activities of Daily Living Performance in Older Adults: Exploring the Moderating Role of Cognition

Problem. Due to changes in the sociodemographic landscape, the number of older adults who experience loneliness and social isolation has risen (Myers & Palmarini, 2017). Loneliness is associated with an increased risk of cognitive impairment (Cacioppo & Hawkley, 2009; Gow et al., 2007; Tilvis et al., 2004; Wilson et al., 2007) and impairment in performance of ADLs (de Jong Gierveld & van Tilburg, 1995; Holmén, et al., 1992; Perissinotto et al., 2012; Wang et al., 2019) and IADLs (de Jong Gierveld & van Tilburg, 1995; Ferreira-Alves et al., 2014; Holmén et al., 1992). Although cognition has been studied as either a predictor or outcome of loneliness, it has yet to be determined if this variable could act as a buffer between loneliness and impairments in basic or instrumental ADLs.

Method. Participants ($N = 106$) were community and non-community dwelling adults aged 65 years and older. The sample was comprised of 22% men and 78% women, with 63% residing in the community and 37% independently residing within a senior living community. Participants' mean age was 76.55, with a range of 65 to 94 years. The sample was primarily Caucasian (96%) with a mean of 17.21 years ($SD = 2.51$) of education. Remote data collection consisted of the completion of self-report measures (SAGE, GDS, TILS, and ADL/IADL measure). A moderation model was examined using hierarchical linear regression, where depression was entered as a covariate, loneliness as the independent variable, ADLs and IADLs as the dependent variables, and cognitive functioning as the moderating variable.

Findings. Cognition moderated the relationship between loneliness and performance of instrumental ADLs, but not of basic ADLs. Follow-up simple slope analyses revealed that *high*

and *low* cognitive functioning were associated with decreased performance of IADLs amongst participants who experienced loneliness, and this association was stronger when cognition was low versus high.

Implications. As data were collected amid the pandemic, the study sheds light on the social, emotional, and physical disruptions the COVID-19 pandemic and its ensuing restrictions have caused in the lives of older adults. Findings highlight the need for interventions to enhance the quantity and quality of social relationships, as well as older adults' involvement in physical and cognitive activities to uphold functional independence in later life.