Published in final edited form as:

Aging Ment Health. 2018 June ; 22(6): 808–812. doi:10.1080/13607863.2017.1318258.

Pain interference and depressive symptoms in communicative people with Alzheimer's disease: a pilot study

Jinjiao Wang^a, Mary S. Dietrich^{a,b}, Sandra F. Simmons^c, Ronald L. Cowan^{b,d}, and Todd B. Monroe^{a,b,d}

^aVanderbilt University School of Nursing, Nashville, TN, USA

^bVanderbilt University School of Medicine, Nashville, TN, USA

^cCenter for Quality Aging, Vanderbilt University Medical Center, Nashville, TN, USA

^dDepartment of Psychiatry and Behavioral Sciences, Vanderbilt University School of Medicine, Nashville, TN, USA

Abstract

Objectives: To examine pain interference in verbally communicative older adults with mild to moderate Alzheimer's disease (AD) and to examine the association of pain interference with cognitive function and depressive symptoms.

Method: For this pilot study, we used a cross-sectional design to examine pain interference (Brief Pain Inventory-Short Form), cognitive function (Mini-Mental State Exam), and depressive symptoms (15-item Geriatric Depression Scale) in 52 older (≥ 65) communicative adults with AD who reported being free from chronic pain requiring daily analgesics.

Results: Pain was reported to interfere with general activity (13.5%), mood (13.5%), walking ability (13.5%), normal work (11.5%), enjoyment of life (11.5%), relationships with other people (9.6%), and sleep (9.6%). Pain interference was significantly positively correlated with both cognitive function ($r_s = 0.46$, $p = 0.001$) and depressive symptomology ($r_s = 0.45$, $p = 0.001$), indicating that greater reported pain interference was associated with better cognitive function and more depressive symptoms.

Conclusion: Among older people with AD who report being free from chronic pain requiring daily analgesics, 2 in 10 are at risk of pain interference and depressive symptoms. Those with better cognitive function reported more pain interference and depressive symptoms, meaning pain is likely to be under-reported as AD progresses. Clinicians should regularly assess pain interference and depressive symptoms in older persons with AD to identify pain that might be otherwise overlooked.

Keywords

Dementia; pain assessment; end-of-life; community dwelling adults with dementia

CONTACT Jinjiao Wang Jinjiao.wang@vanderbilt.edu.

Disclosure statement

The authors declare no conflicts of interest pertaining to this manuscript.

Introduction

Pain interference is a measure of the disabling impact of pain on one's daily life and well-being, including physical and psychological functioning (White et al., 2014), normal work (Thomas, Peat, Harris, Wilkie, & Croft, 2004), sleep and walking (Scudds & Ostbye, 2001), as well as relationships with others (Stiefel, 1993). Pain interference is a different construct from pain severity, though associations exist between the two (Thomas et al., 2004). Over half of persons with Alzheimer's disease (AD) report regular pain (i.e. any pain not due to malignancies; Leong & Nuo, 2007) that can cause sleep disturbances, loss of appetite, and depressive symptoms (Malara et al., 2016). As such, untreated pain in people with AD presents detrimental unmet need and a serious public health concern (Monroe & Mion, 2012).

Although AD impairs one's cognitive function (Corbett et al., 2014), many with mild and moderate AD retain the ability to reliably report pain (Herr, 2011). Older persons with mild to moderate cognitive impairment in AD are at risk of reporting more intense pain while receiving less opioid pain medication than their counterparts without AD (Monroe, Misra, Habermann, Dietrich, Cowan, & Simmons, 2014). A separate study found that while pain assessment should be a part of routine care, specific physician orders for pain assessment led to an increase in reporting of pain in people with AD (Monroe et al., 2015). Findings from these studies begin to suggest that health care providers may underestimate pain, and people with mild AD seem to be less likely to spontaneously report pain (Monroe et al., 2015). Others have also stressed the importance of assessing self-report pain in verbally communicative people with AD, which may shed light on improving pain assessment in this highly vulnerable population (Corbett et al., 2014).

Prior studies have examined the severity of regular, non-malignant pain in persons with AD (Horgas, Elliott, & Marsiske, 2009). Yet, it is unknown how regular pain may interfere with daily life in people with AD (i.e. pain interference). Pain in cognitively healthy older adults causes impairment in activities of daily living (Scudds & Ostbye, 2001) and negatively impacts their perceived health status (Reyes-Gibby, Aday, & Cleeland, 2002). Yet, it is unknown how 'pain interference' may negatively impact otherwise healthy older adults with AD.

Factors associated with pain in AD include depressive symptomology (Malara et al., 2016), which is a common comorbidity of pain (Bair, Robinson, Katon, & Kroenke, 2003) due to reasons such as shared networks in the brain (Blazer, 2003). Depressive symptomology is also predictive of future pain interference in older adults (Arola, Nicholls, Mallen, & Thomas, 2010), possibly due to higher attention paid towards pain stimuli among people with depressive symptoms (Dersh, Polatin, & Gatchel, 2002; Williams, Jacka, Pasco, Dodd, & Berk, 2006), or social exclusion induced depressive symptoms due to pain with high impact on daily life (Dersh et al., 2002; Vlaeyen & Linton, 2000). Cognitive function is also related to pain, as people with AD report fewer pain conditions with worsening cognitive function than cognitively intact people, possibly resulting from an impaired ability to recognize (Corbett et al., 2014; Malara et al., 2016) and report pain (Monroe et al., 2016). Though prior research has examined the role of depressive symptoms and cognitive

impairment in the presence of pain among older adults with and without AD, it is unknown how these factors are associated with pain interference in AD.

Given the increase in risk of unrecognized and untreated pain as cognitive impairment worsens, assessing ‘pain interference’ and depressive symptoms in communicative older persons with AD may provide a more thorough assessment of pain and lead to better recognition of pain in this vulnerable population. Thus, the aims of this pilot study were to: (1) determine the frequency of pain interference in communicative physically healthy older adults with AD; and (2) determine the relationship of pain interference with cognitive function and depressive symptoms in people with AD. We posited that (1) communicative older adults with better cognitive function in AD will report more pain interference; and (2) those reporting more pain interference will report higher levels of depressive symptoms.

Methods

Sample and setting

This study was approved by the Vanderbilt University Institutional Review Board. Potential participants were identified via chart review, mailings, flyers, and/or email. If interested, legal guardians or primary caregivers contacted a number of the study team. After passing a preliminary phone screening, consenting and enrollment occurred at the patient’s residence and data were collected at Vanderbilt University Medical Center. Details of study methods and eligibility criteria have been previously described (Monroe et al., 2015, 2016). Briefly, inclusion criteria were: (1) 65 years old; (2) English speaking; (3) having a diagnosis of AD (confirmed by the patient’s primary doctor), (4) able to provide a pain rating; (5) absence of chronic pain requiring daily medications (opioid or non-narcotic); (6) not taking any analgesics within 24 hours of behavioral testing; and (7) having a history of stroke, cancer, peripheral neuropathy, unstable cardiac or respiratory conditions, insulin dependent diabetes, rheumatoid arthritis, and Parkinson’s disease. Participants with chronic pain requiring daily analgesics were excluded because the primary study was focused on experimental pain and the authors sought to minimize the confound of chronic pain on experimental pain measures. Since the focus of this study is on relatively healthy persons with AD, we also excluded participants with severe mental illnesses, such as bipolar disease, schizophrenia, post-traumatic stress, substance use disorders, and major depression requiring daily medications. Subjects with severe AD based on a Mini-Mental State Exam (MMSE; Folstein, Folstein, & McHugh, 1975) total score below 11 were also excluded due to prior evidence that self-report measures for pain (Radbruch et al., 2000), and depressive symptoms (Conradsson et al., 2013) are potentially unreliable for those with severe cognitive impairment. From the eligible sample of 63 AD patients in the primary study, three subjects had incomplete data for the Brief Pain Inventory Short Form (BPI-SF), eight had a MMSE score lower than 11; we obtained a final sample of 52 substantially healthy people with mild to moderate cognitive impairment in AD for this analysis.

Procedure and data collection

After obtaining caregiver consent and subject assent, we collected demographics (age, gender, race/ethnicity, and education) and measured global cognitive function, depressive

symptoms, and overall pain symptomology (severity and interference). All data were self-reported questionnaires, orally administered by trained research assistants in face-to-face interviews.

Variables and measurements

Overall pain and pain interference was measured using the BPI-SF (Cleeland, 1991), a nine-item self-report instrument that assesses the severity and interference of pain with daily activities and well-being. The pain severity component is comprised of five questions regarding the typical and current levels of pain on a scale of '0' (none) to '10' (high), such as 'what is your pain today' and 'what is your average pain.' The pain interference component is comprised of seven activities on a scale of '0' (no interference) to '10' (high interference). Those activities include general activity, mood, walking ability, normal work (both housework and work outside the home), relations with other people, sleep, and enjoyment of life. An overall score of pain interference was computed by averaging responses to the seven individual activities. The BPI-SF has been tested in patients with mild-to-moderate cognitive impairment (Herr, 2011) with strong validity (correlation with disability measure, $r = 0.57$; Tan, Jensen, Thornby, & Shanti, 2004). The internal consistency of the scores for the sample in this study was 0.94 (Cronbach's alpha).

Global cognitive function was assessed by the MMSE (Folstein et al., 1975), a valid performance-based assessment of cognitive functioning (Tombaugh & McIntyre, 1992). The total score ranges from '0' (severely cognitively impaired) to '30' (cognitively intact). The reliability of the scores for the sample in this study was 0.57 (Cronbach's alpha), consistent with the broad range of reliabilities for MMSE scores from previous psychometric reports (Cronbach's alpha: 0.54–0.96; Tombaugh & McIntyre, 1992).

Depressive symptomology was measured using the 15-item version of the Geriatric Depression Scale (GDS-15; Shiekh & Yesavage, 1986). Items in the GDS-15 assess depressed mood and diminished interest or loss of pleasure in activities. For example, 'Are you basically satisfied with your life?' and 'Have you dropped many of your activities and interests?' The tool has established validity (sensitivity: 0.92, specificity: 0.95) in self-report screening for depressive symptoms among older adults (Fountoulakis et al., 1999). The total score ranges from '0' to '15,' with a score ≥ 6 indicating probable depression (Shiekh & Yesavage, 1986). The reliability of the scores for the sample in this study was 0.90 (Cronbach's alpha), again consistent with previous reports of reliability (Cronbach's alpha: 0.80–0.94; Fountoulakis et al., 1999).

Data analysis

Data analyses were conducted using SPSS (v. 23). Frequency distributions were used to summarize the nominal and ordinal data. Fisher test of skewness was used to determine the normality of continuous data distributions. If normally distributed, mean and standard deviation were used to summarize those distributions. Because means and standard deviations are no longer meaningful if a distribution is not normally distributed, the Fisher test of skewness was used to evaluate all continuous variables for normality. If the distribution did not meet the criteria ($z \pm 1.58$, $p < 0.01$; Ghasemi & Zahediasl, 2012),

median and inter-quartile range, which always represent the middle value and middle 50% of the distribution were used. Pearson correlation coefficients were used to assess the univariate associations among the study measures. Partial correlation was used to assess the strength of the association of pain interference with depressive symptoms after controlling for cognitive function. Because normal distributions of continuous variables are required for proper interpretations of Pearson and partial correlations, the skewed distributions were transformed to normal. Several types of transformations were attempted; however, the rank transformation was the only method that sufficed. An alpha of 0.05 ($p < 0.05$) was used for determining statistical significance.

Results

Sample characteristics

Demographics—Demographic and behavioral measures are summarized in Table 1. The primarily Caucasian (82.7%) sample had a mean age of 78.2 years ($SD = 7.9$) and was 57.7% female. The average MMSE score was 18.5 ($SD = 5.1$) indicating a moderate level of cognitive impairment. Approximately 23% of the sample had a GDS-15 total score ≥ 6 indicating probable depression (Table 1).

Pain interference—The median severity level of both current and average pain and for pain interference was 0 (max = 8, see Table 2). Pain interference with one or more items on daily activities and well-being was reported for 21.2% of the sample. Interference with specific activities in descending order included general activity (13.5%), mood (13.5%), walking (13.5%), normal work (11.5%), enjoyment of life (11.5%), relations with others (9.6%), and sleep (9.6%).

Associations among pain interference, depressive symptomology, and cognitive function—Given the assumption that reported pain levels could be col-linear with levels of pain interference, prior to assessing our primary correlations of interest, the associations of ‘average pain’ and ‘pain now’ scores with pain interference scores were generated within the subset of participants reporting at least some pain. Moderate correlations were observed (‘average pain’: $r = 0.46$, $p = 0.085$, $n = 15$; ‘pain now’: $r = 0.49$, $p = 0.269$, $n = 75$) indicating that while there was some overlap with pain severity, participants differentiated pain interference from severity. There was a statistically significant positive correlation between cognitive function and pain interference ($r = 0.46$, $p = 0.001$), indicating that better cognitive function (i.e. higher MMSE score) was related to greater pain interference (i.e. higher pain interference score). The association of depressive symptomology with pain interference was also statistically significant and positive ($r = 0.45$, $p = 0.001$), indicating that greater pain interference (i.e. higher pain interference score) was related to more depressive symptoms (i.e. higher GDS-15 score). There was no statistically significant correlation of MMSE with depressive symptomology ($r = 0.11$, $p = 0.437$). Therefore, when that association was controlled using partial correlation, the association of pain interference (BPI-SF) with depressive symptomology (GDS-15) remained the same after controlling for cognitive functioning (MMSE).

Discussion

To better understand pain interference in older persons with AD, we examined self-reported pain interference using the BPI-SF, along with its association with depressive symptoms (GDS-15) and cognitive function (MMSE). We found that both our hypotheses were supported in that (1) verbally communicative people with mild and moderate cognitive impairment in AD were able to self-report pain interference with daily activities and well-being; (2) better cognitive function was associated with higher levels of pain interference; and (3) higher levels of pain interference were associated with greater depressive symptoms. There was no statistically significant relationship between pain interference and pain severity ('average pain' and 'pain now'), supporting the notion of pain interference as a related but distinct construct from pain severity, and the necessity of measuring pain interference as to improve the accuracy of pain assessment in older persons with AD.

One explanation for the association between pain interference and cognitive function centers on the pain detection threshold. Findings from the larger on-going study suggest that relative to cognitively intact people, communicative people with AD may require increased thermal stimulus to detect warmth, mild pain, and moderate pain (Monroe et al., 2016). Thus, more stimulus may be required for a person to recognize and report pain, which in turn may lead to lower reports of interference from pain in daily activities. As dementia progresses, risk of unrecognized pain increases, which may lead to unmet needs for the management of pain, including pain interference. Another consideration is that people with mild AD would tend to be more active than people with severe AD (Lautenschlager et al., 2008) and, therefore, have more opportunities to experience pain interference with everyday activities. Either way, this finding suggests that earlier, routine assessment of pain interference in older persons with AD is clinically important.

The observed positive association of pain interference with depressive symptoms in this communicative AD sample supports prior similar findings in this population (Chopra & Arora, 2014). This is possibly due to higher attention paid towards pain stimuli among people with depressive symptoms (Dersh et al., 2002; Williams et al., 2006). It is also possible that patients with pain, especially pain with high impact on daily life, tend to avoid the unpleasant experience with activity that is related to pain, and thus become socially excluded and have higher risk for depressive symptoms (Dersh et al., 2002; Vlaeyen & Linton, 2000).

The lack of an apparent association of cognitive function with depressive symptoms, however, seems counterintuitive. One possible contributing factor might be the sampling strategy, which excluded people with a history of severe clinical depression requiring daily medications and people with severe AD (MMSE < 11). Because depression may be a prodromal symptom of dementia (Enache, Winblad, & Aarsland, 2011; Panza et al., 2010), excluding subjects with severe symptoms of depression and AD might have weakened such associations. However, lack of variability in GDS-15 alone might not explain this association, as GDS-15 was still significantly associated to other variables (e.g. pain interference score in BPI-SF).

Clinical implications

Pilot study results confirmed that prior to the progression to non-communicative advanced dementia, persons with AD report significant pain interference. When compared to cognitively intact adults, and in the presence of similar pain-related conditions, verbally communicative people with AD receive less pain medication and report greater pain intensity (Monroe et al. 2014). Given the risk for unrecognized and untreated pain increases as dementia progresses, it is likely that under-managed pain will interfere with these patients' daily well-being to an even greater degree. Our findings also emphasize the need to regularly assess pain earlier and attempt to decrease the level of pain interference with daily activities. Because subjects with chronic pain requiring daily analgesics were excluded, our sample consisted of people with relatively low pain severity. Nevertheless, our findings indicate that assessing pain interference may uncover pain not traditionally reported through standard pain questionnaires in people with mild to moderate AD.

Limitations

To our knowledge, this is the first study to examine self-reported pain interference in older communicative persons with AD. Study limitations include using a cross-sectional design, which did not allow for an examination of the causality of associations between depressive symptoms and pain interference. However, cross-sectional designs are frequently used for their feasibility in studying populations that are difficult to recruit from due to inability of understanding study procedures, such as those with dementia (Mody et al., 2008). A second limitation is that all participants self-reported being free from chronic pain requiring daily analgesics. This inclusion criterion might have rendered a sample with lower pain severity (median of BPI-SF pain severity is 0) than the general population of AD, and thus affected the magnitude of the correlations and the generalizability of our findings. Finally, to increase the likelihood that participants understood the BPISF questionnaire, we excluded participants with severe cognitive impairment, who may not have been able to reliably self-report their symptoms of pain and depression.

Conclusion

Our pilot findings indicate that communicative people with mild to moderate AD were able to self-report their pain interference. Those with better cognitive function reported more pain interference with daily activities and greater depressive symptoms. Assessing pain interference may reveal mild levels of pain and depressive symptoms that potentially require treatment but might otherwise be overlooked in those with AD. Clinicians working with older adults with AD should attempt to obtain self-report data of pain interference early in the course of care. Properly managing pain and depressive symptoms in the initial stages of AD can improve quality of life in this highly vulnerable population.

Acknowledgments

The contents are solely the responsibility of the authors and do not necessarily represent the official views of these institutions. The authors gratefully acknowledge Jessica Harbison for her assistance with manuscript preparation.

Study data were collected and managed using REDCap electronic data capture tools.

Funding

This work was supported by The John A. Hartford Foundation to Todd B. Monroe; Mayday Fund to Todd B. Monroe; Vanderbilt Office of Clinical and Translational Scientist Development to Todd B. Monroe; Vanderbilt Clinical and Translational Research Scholars Program to Todd B. Monroe; National Institute of Health, National Institute on Aging [grant number K23 AG046379-01A1] to Todd B. Monroe; the Vanderbilt University School of Nursing Post-Doctoral Program to Jinjiao Wang; REDCap is supported by Vanderbilt Institute for Clinical and Translational Research grant [grant number UL1 TR000011] from the National Institute of Health, National Center for Advancing Translational Sciences.

References

- Arola HM, Nicholls E, Mallen C, & Thomas E (2010). Self-reported pain interference and symptoms of anxiety and depression in community-dwelling older adults: Can a temporal relationship be determined? *European Journal of Pain*, 14(9), 966–971. [PubMed: 20381389]
- Bair MJ, Robinson RL, Katon W, & Kroenke K (2003). Depression and pain comorbidity: A literature review. *Archives of Internal Medicine*, 163 (20), 2433–2445. doi:10.1001/archinte.163.20.2433 [PubMed: 14609780]
- Blazer DG (2003). Depression in late life: Review and commentary. *Journals of Gerontology Series A*, 58(3), 249–265.
- Chopra K, & Arora V (2014). An intricate relationship between pain and depression: Clinical correlates, coactivation factors and therapeutic targets. *Expert Opinion on Therapeutic Targets*, 18(2), 159–176. doi:10.1517/14728222.2014.855720 [PubMed: 24295272]
- Cleeland C (1991). Pain assessment in cancer In Osoba D (Ed.), *Effect of cancer on quality of life* (pp. 293–305). Boca Raton, FL: Taylor & Francis.
- Conradsson M, Rosendahl E, Littbrand H, Gustafson Y, Olofsson B, & Lövheim H (2013). Usefulness of the Geriatric Depression Scale 15-item version among very old people with and without cognitive impairment. *Aging & Mental Health*, 17(5), 638–645. [PubMed: 23339600]
- Corbett A, Husebo BS, Achterberg WP, Aarsland D, Erdal A, & Flo E (2014). The importance of pain management in older people with dementia. *British Medical Bulletin*, 111(1), 139–148. doi: 10.1093/bmb/ldu023 [PubMed: 25190763]
- Dersh J, Polatin PB, & Gatchel RJ (2002). Chronic pain and psychopathology: Research findings and theoretical considerations. *Psychosomatic Medicine*, 64(5), 773–786. [PubMed: 12271108]
- Enache D, Winblad B, & Aarsland D (2011). Depression in dementia: Epidemiology, mechanisms, and treatment. *Current Opinion in Psychiatry*, 24(6), 461–472. [PubMed: 21926624]
- Folstein MF, Folstein SE, & McHugh PR (1975). “Mini-Mental State”: A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, 12(3), 189–198. [PubMed: 1202204]
- Fountoulakis KN, Tsolaki M, Iacovides A, Yesavage J, O’Hara R, Kazis A, & Ierodiakonou C (1999). The validation of the short form of the geriatric depression scale (GDS) in Greece. *Aging Clinical and Experimental Research*, 11(6), 367–372.
- Ghasemi A, & Zahediasl S (2012). Normality tests for statistical analysis: A guide for non-statisticians. *International Journal of Endocrinology and Metabolism*, 10(2), 486–489 [PubMed: 23843808]
- Herr K (2011). Pain assessment strategies in older patients. *Journal of Pain*, 12(3 Suppl 1), S3–S13. doi:10.1016/j.jpain.2010.11.011 [PubMed: 21396599]
- Horgas AL, Elliott AF, & Marsiske M (2009). Pain assessment in persons with dementia: Relationship between self-report and behavioral observation. *Journal of the American Geriatrics Society*, 57(1), 126–132. doi:10.1111/j.1532-5415.2008.02071.x [PubMed: 19054191]
- Lautenschlager NT, Cox KL, Flicker L, Foster JK, van Bockxmeer FM, Xiao J, ... Almeida OP (2008). Effect of physical activity on cognitive function in older adults at risk for Alzheimer disease: A randomized trial. *JAMA*, 300(9), 1027–1037. doi:10.1001/jama.300.9.1027 [PubMed: 18768414]

- Leong IY, & Nuo TH (2007). Prevalence of pain in nursing home residents with different cognitive and communicative abilities. *Clinical Journal of Pain*, 23(2), 119–127. doi:10.1097/01.ajp.0000210951.01503.3b [PubMed: 17237660]
- Malara A, De Biase GA, Bettarini F, Ceravolo F, Di Cello S, Garo M, ... Rispoli V (2016). Pain assessment in elderly with behavioral and psychological symptoms of dementia. *Journal of Alzheimer's Disease*, 50 (4), 1217–1225. doi:10.3233/JAD-150808
- Mody L, Miller DK, McGloin JM, Freeman M, Marcantonio ER, Magaziner J, & Studenski S (2008). Recruitment and retention of older adults in aging research. *Journal of the American Geriatrics Society*, 56 (12), 2340–2348. [PubMed: 19093934]
- Monroe TB, & Mion LC (2012). Patients with advanced dementia: How do we know if they are in pain? *Geriatric Nursing*, 33(3), 226–228. doi:10.1016/j.gerinurse.2012.03.008 [PubMed: 22657833]
- Monroe TB, Carter M, Feldt K, Tolley B, & Cowan RL (2012). Assessing advanced cancer pain in older adults with dementia at the end-of-life. *Journal of Advanced Nursing*, 68(9), 2070–2078. doi:10.1111/j.1365-2648.2011.05929.x [PubMed: 22272816]
- Monroe TB, Gibson SJ, Bruehl SP, Gore JC, Dietrich MS, Newhouse P, ... Cowan RL (2016). Contact heat sensitivity and reports of unpleasantness in communicative people with mild to moderate cognitive impairment in Alzheimer's disease: A cross-sectional study. *BMC Medicine*, 14(74), 1–9. doi:10.1186/s12916-016-0619-1 [PubMed: 26728489]
- Monroe TB, Gore JC, Bruehl SP, Benningfield MM, Dietrich MS, Chen LM, ... Atalla S (2015). Sex differences in psychophysical and neurophysiological responses to pain in older adults: A cross-sectional study. *Biology of Sex Differences*, 6(25), 1–20. doi:10.1186/s13293-015-0041-y [PubMed: 25653823]
- Monroe TB, Misra SK, Habermann RC, Dietrich MS, Cowan RL, Simmons SF (2014). Pain reports and pain medication treatment in nursing home residents with and without dementia. *Geriatr Gerontol Int*, doi:10.1111/ggi.12130.
- Panza F, Frisardi V, Capurso C, D'Introno A, Colacicco AM, Imbimbo BP, ... Capurso A (2010). Late-life depression, mild cognitive impairment, and dementia: Possible continuum? *The American Journal of Geriatric Psychiatry*, 18(2), 98–116. [PubMed: 20104067]
- Radbruch L, Sabatowski R, Loick G, Jonen-Thielemann I, Kasper M, Gondek B, ... Thielemann I (2000). Cognitive impairment and its influence on pain and symptom assessment in a palliative care unit: Development of a minimal documentation system. *Palliative Medicine*, 14(4), 266–276. [PubMed: 10974978]
- Reyes-Gibby CC, Aday L, Cleeland C (2002). Impact of pain on self-rated health in the community-dwelling older adults. *Pain*, 95((1–2)), 75–82, doi:10.1016/S0304-3959(01)00375-X. [PubMed: 11790469]
- Scudds RJ, & Ostbye T (2001). Pain and pain-related interference with function in older Canadians: The Canadian study of health and aging. *Disability and Rehabilitation*, 23(15), 654–664. [PubMed: 11720115]
- Shiekh J, & Yesavage J (1986). Geriatric depression scale: Recent findings and development of a short version In Blink TL (Ed.), *Clinical gerontology: A guide to assessment and intervention* (pp. 165–173). New York, NY: Howarth Press.
- Stiefel F (1993). Psychosocial aspects of cancer pain. *Supportive Care in Cancer*, 1(3), 130–134. [PubMed: 8149139]
- Tan G, Jensen MP, Thornby JJ, & Shanti BF (2004). Validation of the Brief Pain Inventory for chronic nonmalignant pain. *The Journal of Pain*, 5(2), 133–137. [PubMed: 15042521]
- Thomas E, Peat G, Harris L, Wilkie R, & Croft PR (2004). The prevalence of pain and pain interference in a general population of older adults: Cross-sectional findings from the North Staffordshire Osteoarthritis Project (NorStOP). *Pain*, 110(1–2), 361–368. doi:10.1016/j.pain.2004.04.017 [PubMed: 15275787]
- Tombaugh TN, & McIntyre NJ (1992). The mini-mental state examination: A comprehensive review. *Journal of American Geriatric Society*, 40, 922–935.
- Vlaeyen JW, & Linton SJ (2000). Fear-avoidance and its consequences in chronic musculoskeletal pain: A state of the art. *Pain*, 85(3), 317–332. [PubMed: 10781906]

- White RS, Jiang J, Hall CB, Katz MJ, Zimmerman ME, Sliwinski M, & Lipton RB (2014). Higher perceived stress scale scores are associated with higher pain intensity and pain interference levels in older adults. *Journal of the American Geriatrics Society*, 62(12), 2350–2356. doi:10.1111/jgs.13135 [PubMed: 25516031]
- Williams LJ, Jacka FN, Pasco JA, Dodd S, & Berk M (2006). Depression and pain: An overview. *Acta Neuropsychiatrica*, 18(2), 79–87. [PubMed: 26989796]
- World Health Organization. (2015). 10 facts on dementia. Retrieved January 17, 2017 from <http://www.who.int/features/factfiles/dementia/en/>

Table 1.Demographic characteristics, cognitive functioning, and depression symptoms ($N = 52$).

Characteristics	Statistics
Age (mean (SD) years)	78.2 (7.9)
Female (N (%))	29 (55.8)
Race: percent Caucasian (N (%))	43 (82.7)
>Highschool education ($N = 50$)	38 (76.0)
^a MMSE (mean (SD))	18.5 (5.1)
15 (N (%))	36 (69.2)
^b GDS-15 (median (IQR))	2.0 (1–6, 0, 14)
6 (N (%))	12(23.1)

^aMMSE possible range: 11–30.^bGDS-15 possible range: 0–15.

Table 2.Pain prevalence, severity, and interference ($N = 52$).

Measure	Statistics, N (%)
Having pain on enrollment day	12(23.1)
Pain now (median (IQR, min, max)	0 (0–0, 0, 8)
None	45 (86.5)
At least some	7(13.5)
Average pain (median (IQR, min, max)	0 (0–1, 0, 8)
None	37(71.2)
Have some pain	15 (28.8)
Pain interference with >1 activity	11 (21.2)
Pain interferes specifically with my:	
General activity	7 (13.5)
Mood	7 (13.5)
Walking ability	7 (13.5)
Normal Work	6(11.5)
Relations with other people	5 (9.6)
Sleep	5 (9.6)
ENJOYMENT OF LIFE	6(11.5)
^a BPI-SF interference score (median interquartile range (IQR, min, max))	0.0 (0–0, 0, 8)

^aBPI-SF score: possible range 0–10.